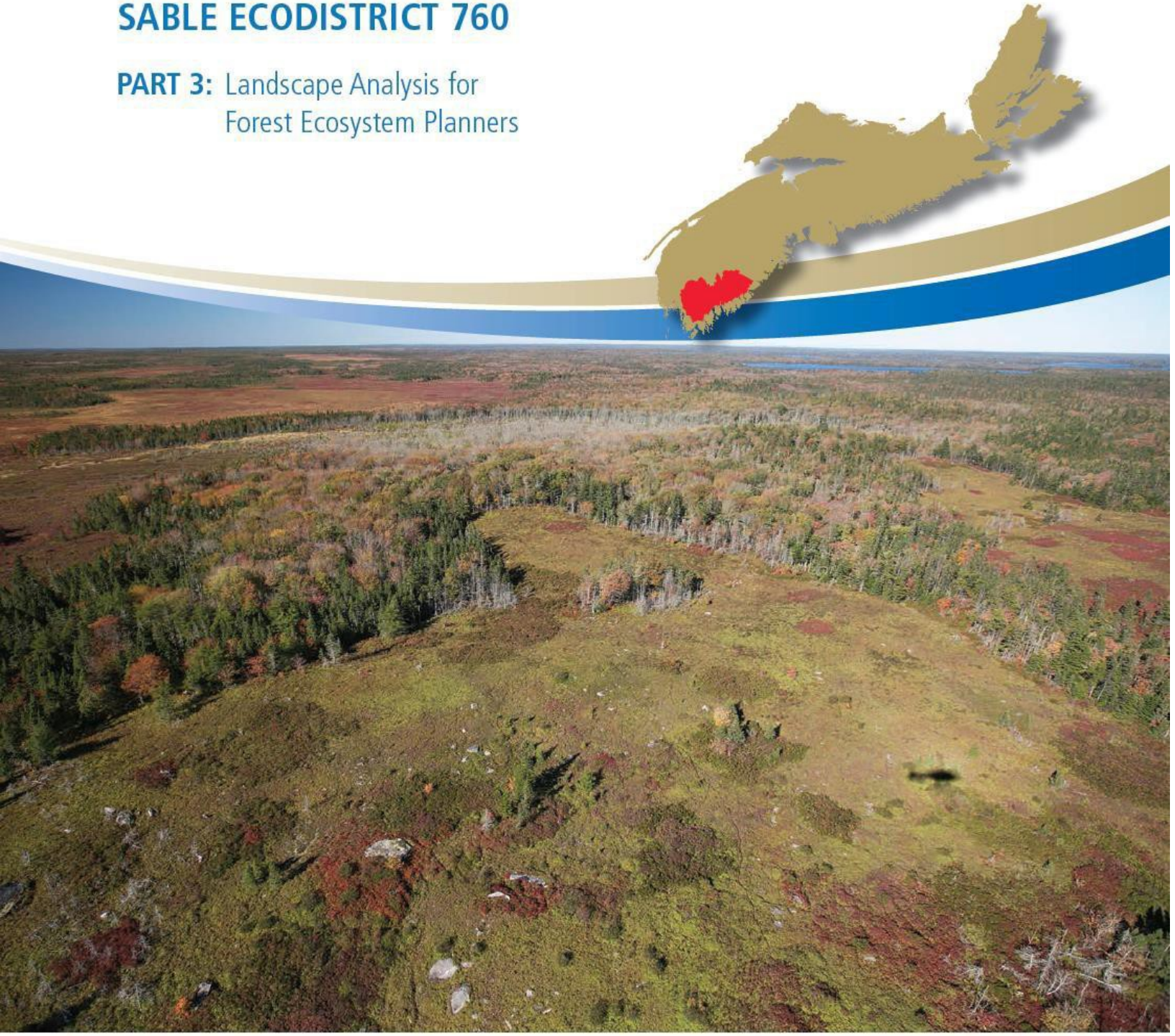
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS SABLE ECODISTRICT 760

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-760

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 760: Sable

Prepared by the Nova Scotia Department of Natural Resources
Authors: Western Region DNR staff

ISBN 978-1-55457-691-2

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

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

Information sources and statistics (benchmark dates) include:

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

REPORT FOR ELA 2014-760

Table of Contents – Part 3

Tables

Appendices

Theme Maps Available on Website

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

This in-depth Ecological Landscape Analysis (ELA) report is a lightly edited version of the original ELA produced by Department of Natural Resources (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 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

- Elements Within Landscapes
- Flow-Element Interactions
- Landscape Connectivity

Landscape Indicators

- Forest Composition Indicators
- Land Use Indicators

Fine Scale Features

- Priority Species and Other Special Occurrences
- Rare Ecosections
- Ecological Representivity

ELA Summary

- Element Interpretation
- Ecosystem Issues and Opportunities

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 mapped to show their distribution across ecodistricts and ecoregions.

Elements Within Landscapes (Map 2)

The landscape analysis identified and mapped six distinctive elements in the Valley Slope Ecodistrict – one matrix, four patches, and a corridor. A matrix is the dominant element. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts (see connectivity section for full discussion of matrix, patch and corridor concepts).

Spruce Pine Hummocks is the matrix element. Black spruce dominates. White pine occurs on the dry, rapidly drained, coarse-textured soils. Red maple is the main hardwood. There is also some red oak. **Wetlands** is the largest patch element, consisting mainly of bogs. The climax tree species is black spruce, along with much smaller numbers of white pine, as individual trees or in stands as drainage improves. The other patch elements, in order of size, are **Spruce Hemlock Pine Hummocks and Hills, Pine Oak Hills and Hummocks**, and **Tolerant Mixedwood Drumlins. Valley Corridors** is the corridor element, which usually follows riparian areas along the major rivers and inter-connected lakes and passes through numerous element types. *The ecodistrict also contains a tiny area of the element Salt Marsh.*

The forested area among Sable's elements is dominated by softwood (53%) and mixedwood (34%) covertypes. The hardwood covertype accounts for only 12% of the total area. The remaining 1% is unclassified. The softwood is largely late seral species such as black spruce and white pine. Mixedwoods are largely mid seral communities of red maple with black spruce, white pine, or red spruce. The small hardwood type is usually mid seral species such as red maple. The soils of Sable are generally not as productive as some of the neighbouring ecodistricts because of soil parent material, drainage, and the effects of past fires.

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: people, moose, water, timber, painted turtles, birds, aggregate (sand and gravel), furbearers, deer, and fish.

Flow occurs throughout the ecodistrict and specific locations of some of the flows are shown in Map 2. The forested landscape of Sable is generally intact and permits good movement or percolation throughout. Movement along riparian corridors in some river systems (e.g. Clyde River) has lessened where fairly concentrated cottage development has occurred along short sections of rivers.

An example of flow-element interactions can be gleaned from the relationship of larger mammals, such as deer and moose, and the softwood matrix. Low-growing deciduous woody plants are an important dietary component of moose and deer. Naturally occurring disturbances such as fire

often result in large areas regenerating to species suitable for moose and deer fodder. Current times, with efficient fire suppression systems are in place, have decrease the area burned and the subsequent amount of new growth. Forest harvesting can produce a similar result as fire and can become an important management tool for deer and moose populations.

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.

River corridors promote connectivity.

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:

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 matrix in the Sable Ecodistrict, because of its extent and distribution, plays an important connective function. Although there has been a long history of logging, the matrix is currently well

forested and does not appear to be unduly fragmented. The ability of many species to move through the matrix has not likely been compromised.

However, since European settlement there have been changes in characteristics, such as species composition, development class, and stand size that would have had an impact on the connective function of the matrix.

Fire protection efforts have been of benefit in restoring some of the connective function by countering the effects of repeated man-induced fires on the fire barrens.

The extensive riparian zones along the many watercourses, besides being important habitat, are critical connectors of ecosystem elements. Generally, the riparian zones are well-forested with a high percentage of mature covertypes. Possible exceptions are short sections of the Clyde River, where road construction and camps and homes are close to the river.

Other than the Wetlands, significant portions of the other elements are located on higher ground. These are usually the most productive in a forestry sense and have had a long history of forest harvesting. Currently, these areas have a higher percentage of mature forest (about 50%) and are the most likely to see increased harvest pressure in the short term. The amount of interior habitat could become an issue.

An additional concern in ecological planning is the maintenance of connectivity among conservation areas such as protected areas, old growth, and ecological reserves. Connectivity will be sustained by applying the natural disturbance guidelines for landscape composition, development class, seral stage, and covertype and recognizing natural linkage opportunities.

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

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

The most obvious linkage is the forest itself. This ecodistrict and adjoining ones are generally a mosaic of connected vegetation types allowing for the flow or movement of many species.

The hydrological system, an important component of this ecodistrict, provides significant linkages. Some of the major rivers which run north and south have headwaters north of the Sable Ecodistrict. These include: Clyde River and Roseway River, which have their headwaters in the Western Barrens Ecodistrict; Jordan River, with headwaters in Western Barrens, South Mountain, and Rossignol ecodistricts; Great Barren, Quinan, and Big Gull lakes in Sable form headwaters of a branch of the Tusket River and adjoin the Clare Ecodistrict. A few of the river systems (Barrington, Clyde, Sable, Tidney, Broad, and Five rivers) flow into the South Shore Ecodistrict. Anadromous fish swim from the oceans up the rivers to spawn.

People, through their activities, provide linkages with the neighbouring ecodistricts of South Shore, Southwest Shore, Clare, Western Barrens, South Mountain, and Rossignol. Activities

include recreation (e.g. ATV use, snowmobiles, hunting, fishing, trapping, canoeing, and camp use) and industrial pursuits such as forestry.

Major transportation routes provide outside linkages. Highway 103 runs along Sable's southern and southwest boundary with connections to the Rossignol and South Shore ecodistricts. Highway 203 links Sable with Western Barrens and Clare. Inland secondary routes follow some of the major rivers and, primarily through forest roads, provide limited access to areas north of Sable.

Riparian corridors along Sable's major waterways often pass through wetlands. Where the corridors are forested they are largely intact and continue to provide important ecological functions (temperature control, nutrients, filters, coarse woody debris habitat). These corridors provide linkages to areas within Sable as well as to adjoining ecodistricts of South Shore, Tusket Islands, Western Barrens, Clare, Rossignol, and South Mountain.

Future management activities could recognize 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 Sable

Element	Successional Stage					
	Early	% *	Middle	%	Late	%
Pine Oak Hills and Hummocks	IH1, SP8	20.0	IH2, IH6, SH9, SP4, SP6	56.0	SP5, **SP9**, SH4, TH6	23.0
Spruce Pine Hummocks	SP8	12.0	SP4, SP6, SH9	45.0	**SP5, SP7**	40.0
Spruce Hemlock Pine Hummocks and Hills	IH3, IH5, IH6, MW4, MW5	17.0	SH5, SH6, SH8, MW2	48.0	**SH1, SH2, SH3, SH4,** MW1, SP9	30.0
Tolerant Mixedwood Drumlins	OF3, OF4, IH3, IH5	14.0	IH6, MW2, MW4, SH4, SH5, SH6, SH8	43.0	TH1, TH2, TH5, **MW1**, MW3, SH1, SH2, SH3	33.0
Wetlands	WC1, WC2, 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).
*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)
  (See 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 Sable is 74 to 76 (Appendices 12a and 12b). This suggests a relatively high state of "naturalness" in the ecodistrict and that habitat is generally favourable for biodiversity. The EEI is highest, or more natural, in the Wetlands patch element and Spruce Pine Hummocks matrix element. The EEI is lower, or less natural, in the Tolerant Mixedwood Drumlins element.

Map 3 shows the geographic distribution of ecological emphasis classes within Sable. Appendices 12a and 12b show the EEC by elements and ecosections.

Close to 80% of the total area of the ecodistrict falls in the extensive EEC. This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions.

A little less than 2% of the area has been converted. This is largely settlement of communities, transportation and power routes and a small amount of agricultural land.

The reserve class account for approximately 10%, or 28,000 hectares. The reserve is divided into two categories: legal reserves and policy reserves. The legal reserves are those areas that have legal status under IUNC (International Union for the Conservation of Nature and Natural Resources) codes of I, II, or III, such as wilderness areas and designated provincial parks. The second type of reserve is those set aside under various provincial policies, such as the Old Forest Policy. Wilderness areas (Tidney, portion of the Tobeatic) account for most of the reserve area in Sable. Area could be added to the reserve class by adding under-represented or uncommon ecosections or community types.

The intensive EEC, which represents about 1% of the area, is land 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 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 landscape 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.

Land which has not yet been classified makes up the remainder of the ecodistrict.

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.

Sable has an overall Road Index Value of 4 which falls within the "remote" range of 0 to 6. This value denotes a landscape with a small number of roads with forest access and trails. The majority of the ecodistrict (88%) falls within two index values: remote and forest resources (Appendix 7,

Table 2). Remote areas are scattered throughout the ecodistrict. The Spruce Pine Hummocks matrix, which represents more than half of Sable, is in the remote class.

Some of the challenges for road and trail development in future management 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 analyzed 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 as natural a state as possible, removal of bridges and culverts, restoration of chainage to measure distance, and establishment of a new forest.
- Minimize the impact of road and trail construction by ensuring that best management practices are used in all facets of road and trail construction.
- Encourage the sharing of road networks to 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 as 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 (See 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. (See http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf).*

Atlantic Coastal Plain Flora and Other Plants

A significant occurrence of rare species in the Sable Ecodistrict is several species of plants belonging to a group known as Atlantic Coastal Plain Flora (ACPF). These plants became established in southwestern Nova Scotia around 10,000 to 14,000 years ago as a result of a land bridge that existed between Nova Scotia and Massachusetts. Sea level was likely about 110 metres lower than today, exposing a broad plain along the Atlantic coast, which is now under water. A rise in sea level from melting glaciers eventually cut off the bridge, leaving disjunctive populations of plants geographically and genetically isolated 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 red "at risk" species under the NS General Status Ranks.

The Sable Ecodistrict has a known total of 20 ACPF species which are at risk in Nova Scotia – seven of which are listed under the Nova Scotia Endangered Species Act. Sites of occurrence are wetlands and along lake and watercourse shorelines.

The Sable Ecodistrict includes lake shorelines known to support pink coreopsis (*Coreopsis rosea*) and plymouth gentian (*Sabatia kennedyana*). Both species are designated endangered in Nova Scotia and they have also been assigned rare status (endangered and threatened, respectively) nationally by COSEWIC and under SARA. Both species have a G3 ranking, indicating that they are globally rare. The handful of lakes in the Sable and Clare ecodistricts on which these plants depend support the entire Canadian populations of these species.

The thread-leaved sundew (*Drosera filiformis*) is a bog plant whose Canadian population is also restricted to southwestern Nova Scotia. One of the five bogs on which it occurs is Quinns Meadow in the Sable Ecodistrict. Thread-leaved sundew has endangered status in Nova Scotia and Canada.

Golden crest (*Lophiola aurea*) is another wetland ACPF plant with threatened status provincially and nationally. Golden crest occurs at one site in the ecodistrict at Dunraven Bog in Queens County. This very important bog also supports populations of Long's bulrush (*Scirpus longii*), a

vulnerable species in Nova Scotia and a species of special concern in Canada. Long's bulrush has also been found at a wetland near Wilkins Lake, Shelburne County.

Shelburne Harbour is one of five estuarine locations in southwestern Nova Scotia that support the entire populations of eastern lilaeopsis (*Lilaeopsis chinensis*), a plant that grows on the muddy banks of estuaries. The plant's designations are vulnerable provincially and as a species of special concern nationally.

A shrub species of ACPF, sweet pepperbush (*Clethra alnifolia*) is found on the shores of two lakes in the ecodistrict, and is listed as vulnerable in Nova Scotia and of special concern in Canada. The long-tubercled spikerush (Eleocharis tubeculosa) occurs on the shorelines of only five lakes in Nov Scotia and has threatened status both provincially and nationally.

The eastern ribbonsnake (Thamnopis sauritus), which is listed as threatened nationally and provincially, is found in vegetated freshwater wetlands, lake shorelines, and shallow coves and may overwinter in adjacent terrestrial habitats.

More than 10 other ACPF species occurring in Sable have been assigned red or yellow status by DNR but are not yet listed under the Endangered Species Act. These are:

Brook-side alder (*Alnus serrulata*)
Common buttonbush (*Cephalanthus occidentalis*)
Hairy swamp loosestrife (*Decodon verticillatus*)
Joe-Pye-thoroughwort (*Eupatorium dubium*),
Grassed-leaved goldenrod (*Euthamia tenuifolia*)
Grassleaf rush (*Juncus marginatus*)
Panic grass (*Panicum longifolium*),
Southern rein orchid (*Platanthera flava*),
Humped bladderwort (*Utricularia gibba*),
Northeastern bladderwort (*Utricularia resputinata*)
Netted chainfern (*Woodwardia areolata*)

Howe's sedge (*Carex atlantica,* subspecies *capillacea)* also occurs in the ecodistrict. The status of this sedge is undetermined due to a lack of information on its distribution in the province.

In addition to the ACPF group of species, six other plants in the Sable ecodistrict have red or yellow status in Nova Scotia and are thus also considered to be at risk:

Canada mountain-ricegrass (*Piptatherum canadense*)
Disguised St. John's-wort (*Hypericum dissimulatum*)
Beaked spikerush (*Eliocharis rostellata*)
Case's ladies'-tresses (*Spiranthes casei*)
Mudwort (*Limosella australis*)
Water pimpernel (*Samolus valerandi*)

Lichens

The Sable Ecodistrict supports part of a globally significant coastal forest that has the highest diversity of lichens in Nova Scotia. Lichen species of global significance and rarity are found here.

The nationally and provincially endangered boreal felt lichen (*Erioderma pedicellatum*) is found in small numbers in cool moist forested habitats. Boreal felt lichen is listed as globally critically endangered by the International Union for the Conservation of Nature (IUCN) and occurs in only five locations in the world.

Vole ears lichen (*Erioderma mollissimum*) is also nationally and provincially endangered and the highest population in the world of this lichen occurs in the Sable and South Shore ecodistricts.

The Sable Ecodistrict is one of only three locations in North America for the rare jellyskin lichen (*Leptogium hibernic*um).

An old growth and national species of special concern, frosted-glass whiskers lichen (*Schlerophora peronella*), occurs in several red maple fens in this ecodistrict, indicating that several of the red maple wetland forests and their red maple trees may be very old.

Blue felt lichen (*Degelia plumbea*), a national species of special concern and listed as vulnerable under the Nova Scotia Endangered Species Act, occurs in this ecodisctrict. Nova Scotia has the highest population in North America of this species.

More than 15 other lichen species that have suffered significant declines in New England occur in this ecodistrict, including at least two species that are believed to be extirpated from New England. Most of these lichens (except frosted-glass whiskers) are cynolichens and are very sensitive to air pollution, acid rain, and activities that may lead to drying or a decrease in the humidity of their habitat.

In addition to the cyanolichens, a number of other significant lichens occur including the Dixie reindeer lichen (*Cladonia subtenuis*), a coastal plain species found nowhere else in Canada. Two globally rare lichens, *Anzia colpodes* and *Pannaria lurida*, are being assessed by COSEWIC in the next year. Early data analysis suggests that Nova Scotia may have the highest world populations of the former.

Red maple wetlands, often riparian areas or fens with associated *sphagnum* species, are the richest habitat for lichens. Mature balsam fir is also an important habitat and supports boreal felt lichen and other associated rare species, particularly if the forests are cool with high humidity. Old upland tolerant hardwood forests may also support rare lichens such as *Anzia colpodes* and frosted-glass whiskers.

Bryophytes

Although less well-researched than the lichens, Sable Ecodistrict supports several significant bryophytes (mosses) including *Sphagnum cyclophyllum*, an endemic found only in eastern North America and rare wherever found. The Clyde River is its only site in Canada. *Sphagnum*

torreyanum and *S. macrophyllum* are also considered rare wherever they are found in eastern North America but occur in abundance in the Sable Ecodistrict. Other rare bryophytes include *Sphagnum wulfianum* (global ranking S1) which is found in red maple fens; *Isopterigium tenerum*, a subtropical moss with its only Canadian location here; *Buxbaumia aphylla* (global ranking S2); and *Mnium stellare* and *Sphagnum angustifolium*, both of which are globally ranked S1.

Birds

The olive-sided flycatcher (*Contopus cooperi)* has threatened status in Nova Scotia and prefers coniferous forest edges and openings such as meadows, rivers, bogs, and ponds.

Fish

Atlantic salmon historically utilized the Barrington, Clyde, Roseway, Jordan, East, Sable, and Tidney rivers systems, but are presently considered to be extirpated from these rivers. Soils in this ecodistrict have a low capacity for buffering acid precipitation, and acid rain is believed to be the major cause of salmon and trout declines in the rivers of southwestern Nova Scotia and elsewhere in the province. The Atlantic salmon has a red status in Nova Scotia and has been designated nationally as endangered.

Two other fish species using rivers in the Sable Ecodistrict are considered to be at risk in Nova Scotia with striped bass and gaspereau designated red and yellow, respectively.

Moose

In Nova Scotia, the mainland moose has been designated an endangered species under the Nova Scotia Endangered Species Act. Mainland moose are genetically distinct from those on Cape Breton Island. One of the remnant populations of moose on the mainland is in southwestern Nova Scotia, in a large area encompassing most of the Tobeatic Wilderness Area and extending southwest to Pubnico in Yarmouth County, and southeast to Liverpool in Queens County.

Moose are commonly associated with forested landscape habitats that have been altered by a disturbance regime, such as fire, wind, disease, or timber harvesting. The habitat requirements of moose are largely dependent on succession forest stages. Early successional hardwood trees and shrubs provide important browse, while mature conifer cover is valuable for shelter and protection in winter and summer.

Prior to the introduction of forest harvesting as a disturbance regime, the availability of moose habitat in this ecodistrict would have historically been tied to natural disturbances.

Forestry / Wildlife Guidelines and Standards provide minimum habitat specifications for moose on Crown land through the 8% retention for old growth, maintenance of a 20 metre minimum buffer zone along water courses, and through the maintenance of reasonable 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 required on Crown land where appropriate.

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.

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.

American Marten

American martens are known to occur in the northeastern part of the Sable Ecodistrict, but status in the remainder is unknown. Formerly called pine marten, they were once more widespread throughout Nova Scotia but had declined to a few scattered populations by 1900. In recent years several projects undertaken by DNR's 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, there is evidence that they are also using mixedwood forests and younger-aged softwood stands, possibly related to the relatively moderate winter weather in this part of the province. Food in the way of 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. Much of the Sable Ecodistrict likely has the capability to supply habitat (although presently there is a lack of late succession softwood in some areas) so it will be important to address marten habitat considerations in Crown land forest management decisions.

American marten in Sable are most likely descendants of New Brunswick marten released in Kejimkujik National Park in the 1980s, but it is possible that these may have mixed with some remnants of the original southwest Nova Scotia population.

The American marten has been designated a red species in Nova Scotia. The Cape Breton population is also listed as endangered, but more information on the status of marten in southwest Nova Scotia is needed before mainland marten receive a possible designation under the Endangered Species Act.

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.

Table 9 – Elements, Ecosections, Disturbance Regimes and Climax Types

760 Sable Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Spruce Pine Hummocks (Matrix)	ICHO IMHO IMSM	Frequent	black Spruce (bS), white Pine (wP)
Wetlands (Patch)	WTLD PMHO ICSM	Open seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Spruce Hemlock Pine Hummocks and Hills (Patch)	WMHO	Infrequent	red Spruce (rS), eastern Hemlock (eH), wP
Pine Oak Hills and Hummocks (Patch)	WCHO WCKK	Frequent	wP, red Oak (rO)
Tolerant Mixedwood Drumlins (Patch)	WMDM IMDM	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be), rS, eH, wP
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

Ecosections that are rare (< 2% of ecodistrict area) or under high land use pressure (> 75% land conversion) are identified in Appendix 3.

Sable contains four ecosections that fall in the rare category: ICSM, IMDM, WCKK, and WMDM. WMDM is more common at the ecoregional level (7.9%). Relatively low percentages of the ecodistrict ecosections have been removed from a forested state (0.8 to 8.0%).

These ecosections have experienced significant levels of forestry activity over the years. The largest areas of ICSM are at Lower Ohio and Great Barren Lake. Linear-like occurrences of IMDM are centred around Deception Lake and West Branch of the Roseway River. WCKK is an isolated ecosection in the interior at Spar Ridge while WMDM is found on higher ground in several areas in the northern part of the ecodistrict in the vicinity of West Beech Hill.

Tolerant mixedwoods are the potential climax species on only 1% of the ecodistrict. Currently, there appears to be very little of this community type present. Potential issues for future management could include implementing existing policies and developing additional, effective practices to address fine filter issues such as:

- conservation of species that are threatened as indicated by DNR's General Status of Species that are listed as yellow or red
- conservation of significant habitats
- restoring, where feasible, climax communities in locations where they have significantly declined
- identifying and mapping cultural sites of importance
- identifying and mapping, through collaboration, further species and habitats that may be of concern in conservation efforts (treed swamps, declining species such as eastern hemlock)
- developing extension programs to inform and educate those who have an impact on rare, uncommon, threatened species, sites, and habitats

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.

Protected reserves in Sable include wilderness areas (Tidney River, Sable), nature reserves (Great Barren and Quinan lakes, Quinns Meadow), sites of ecological significance under moratorium (Louis Lake, Shelburne Barrens), designated provincial parks (The Islands, Sable River), park reserves (Indian Fields, Shelburne Barrens), and old forest set aside under the provincial Old Growth Policy.

Areas under Crown legal reserves total 24,925 hectares (Appendix 5). The challenge in improving representation in future management might include consideration of:

- ecosections that form less than 2% of the ecodistrict and ecoregion with little or no representation, such as IMDM and ICSM
- the relatively small amount of the tolerant mixedwood community / type

ELA Summary

Element Interpretation (All appendices and maps)

The Sable Ecodistrict is easily separated from the adjacent ecodistricts by the abundance of poorly drained soils and extensive areas of bogs and wetlands. Most of the area is less than 60 metres above sea level and is characterized by low hills, hummocks, and the extensive poorly drained flats. Quartzite and slate underlay most of the ecodistrict with granite ridges in the westerly portion. Soils are typically coarse to moderately coarse-textured, imperfectly to poorly drained, shallow, and rocky.

Although the bedrock and soils are similar to the adjacent Rossignol Ecodistrict 750, the Sable Ecodistrict is somewhat less hilly with extensive areas of bogs (e.g. Dunraven Bog). Almost one-quarter of the ecodistrict is poorly drained. On the south, the ecodistrict is bounded by the South Shore Ecodistrict 830, which extends inland following inlets and harbours such as Port Joli, Port L'Hebert, Sable River, Jordan Bay, and Shelburne Harbour. The Sable Ecodistrict extends west as far as Great Pubnico Lake, where it meets the coastal Tusket Islands Ecodistrict 840.

On the northwest, the presence of drumlins and a higher percentage of well-drained ecosections serve to separate the Clare Ecodistrict 730. Coarse-textured soils and granite bedrock delineate the boundaries of the Western Barrens 770 and South Mountain 720 ecodistricts on the north. Excluding the adjacent coastal ecodistricts, which are cooled in summer by the ocean, the Sable Ecodistrict is the most southerly part of Nova Scotia, so the summers are hot.

There are some extensive areas of coarse-textured soil near Shelburne in the southwestern end of the ecodistrict. The well-drained sites can be somewhat dry during the growing season. Fresh water in lakes and rivers accounts for about 6% of the total area of the ecodistrict.

On the well-drained hills and hummocks (WCHO) with coarse-textured soils, a climax forest of red oak, white and red pine will occur. Where the soil becomes less coarse (WMHO), these ecosections will support a forest of red spruce, hemlock, and white pine.

About one-quarter of the ecodistrict is treeless bog, or supports a stunted black spruce forest.

Better-drained hummocks in the boggy areas support a forest of white pine and black spruce. About half of the ecodistrict is covered by imperfectly drained, moderately coarse soils. These ecosections have a climax forest of black spruce, with white pine on the upper slopes of hills and on better-drained microsites. The poorly drained sites support a forest of stunted black spruce. A total of 2.2% of the ecodistrict is exposed bedrock.

The Sable Ecodistrict comprises imperfect and poorly drained uplands interspersed with wetlands and open water over 85% of the ecodistrict. The poor nutritional status of the parent material (granite), the accumulation of acidic plant materials from the subsequent ericaceous vegetation, the dryness of the soils (due to the coarse texture), and the formation of hardpans in the soil which restrict drainage and rooting, have all combined with the negative impacts of fire on this type of site to contribute to the barren and woodland conditions throughout the ecodistrict.

Based on 40 years of fire records between 1959 and 1999, the potential for a lightning-caused fire in the Sable is above average for the province. The records indicate that the probability of a lightning-caused fire is about one every 2.1 years. The occurrence of hurricanes in this ecodistrict may be comparable to other areas of the province in terms of frequency and intensity but the impact of these hurricanes on forest composition and structure is negligible given the over-riding influence of fire.

Insect epidemics are not known to cause stand-level destruction of forests in the Sable Ecodistrict. Most damage is restricted to individual trees or small patches. The introduction of the balsam woolly adelgid in the early 1900s has significantly impacted balsam fir and reduced the species to a lesser component in most stands. Bark beetle losses are usually restricted to individual trees or small patches. Pine shoot moths and white pine weevil cause tree deformity but seldom result in mortality.

Spruce Pine Hummocks

(Matrix) (ICHO, IMHO, IMSM ecosections) (153,507 ha)

Forests of the matrix have a frequently disturbed natural disturbance regime (NDR). Fire is the dominant disturbance. Fernow reported that in 1903 a fire burned the northern and eastern portions of Shelburne County and extended west into Yarmouth and Digby counties and east into Queens County. Over the years a common cultural practice was to set fires to stimulate both blueberry production and food for wildlife. These fires often covered large areas and were sometimes repeatedly set.

Extensive areas of barren covered the matrix in past times. Fernow in 1912 reported that two-thirds of Shelburne County was composed of barrens. Natural infill of regeneration has greatly reduced the area. The matrix currently has about 6,000 hectares of barrens, which is roughly 50% of the barrens in the ecodistrict.

The matrix, located on imperfectly drained soils, is now dominated by a late seral, generally mature forest. The softwood covertype is most common (55%). Black spruce is most prominent, occurring primarily on the flatter areas but also in mixture with other species on the hummocks. White pine is present as a minor component of black spruce stands or as pure stands of pine.

Mixedwood covertypes, largely mid seral, occupy 35% of the forested area. Most of the hardwood in the mixedwood component is red maple mixed with white pine or black spruce. Some of the hummocks support red oak, often mixed with red maple or white pine.

Hardwood covertype is much less common (9%) and is usually the intolerant red maple, along with some red oak stands and a small amount of tolerant hardwoods.

Roughly equal areas of young (30%), mature (34%), and multi-aged (29%) development classes are present with much less area in the establishment phase (7%).

Since the matrix occupies a large proportion of the ecodistrict, movement through it by organisms is a critical function. The matrix is currently well-connected and not fragmented.

Flows

People (habitation, hunting, fishing, trapping, ATV use, camps); deer (habitat); moose (habitat, food, shelter, winter / summer cover and calving areas); water (groundwater, recharge nutrients, catchment filter); timber; painted turtle; furbearers (in wetlands); aggregate.

Composition

Sable Ecodistrict 760 (based on statistics up to 2007)

Composition of Spruce Pine Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	7%	30%	63% (34 Mat + 29 OF)	29%
Seral Stage	Early	Mid	Late	Unclassified
	12%	45%	40%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	55%	9%	35%	1%

Desired Condition

Black spruce and white pine-dominated element in a variety of patch sizes and developmental stages. Scattered inclusions of tolerant hardwood, red oak, and red maple fens. Maintenance of connectivity between patch elements, reserves, and river corridors.

Issues

Historically, white pine was likely the dominant species on the hummocks of the matrix. Those areas where soil drainage was an impediment favoured black spruce. Centuries of harvesting has likely depleted the overall amount of white pine but much of the matrix area still has white pine as at least a minor component of many stand types.

Partial cuts (shelterwoods) and seed tree cuts implemented by some private landowners have produced very good pine regeneration. Scarification, necessary because of an often present ericaceous root mat, was conducted in conjunction with seed tree cuts. Areas where restoration of white pine is possible using the above strategy could be identified and silviculturally treated.

The amount of area in late seral species could be increased by thinnings in mixedwoods to favour late seral white pine and black spruce.

Because of the relatively small amount of red oak and tolerant hardwood, efforts could be made to maintain their presence in the matrix. Relatively little is known about securing red oak regeneration. This should be investigated.

Wildlife benefits from a variety of patch sizes. Sable Ecodistrict has more area in mid-size class (10 to 100 ha) than in the larger and smaller size classes. Efforts could be made to increase the area in the two latter mentioned classes.

Management practices should ensure that practices in the matrix do not adversely affect connectivity to other elements, wetlands, corridors, and reserves in the matrix.

Wetlands

(Patch) (WTLD, PMHO, ICSM ecosections) (63,415 ha)

This is the largest patch type in the ecodistrict. Historically, vegetation around the wetlands supported a community type of black spruce on the more poorly drained soils with pine showing up on better-drained microsites. Pine stands occurred on some of the higher hummocks.

At present, this patch is largely softwood (72%). The area in the establishment phase (7%) is significantly lower than in the other development classes. Pine stands are present on some of the higher ground.

Mid seral mixedwoods dominated by intolerant hardwood with pine or black spruce are present on about 23% of the area. Hardwood covertype is uncommon (less than 5%). Some of the larger wetlands are located at Dunraven Bog and along the Tidney River. These wetlands play an important role in water collection, filtering, and groundwater recharge.

The many wetlands in this patch are a critical component of moose habitat.

Flows

People (fishing, hunting, trapping, ATV use); water (groundwater recharge, storage, filter, headwaters of several rivers); moose, painted turtle, deer, furbearers (important habitat for all).

Composition

Sable Ecodistrict 760 (based on statistics up to 2007)

Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	7%	38%	55% (26 Mat + 29 OF)	29%
Seral Stage	Early	Mid	Late	Unclassified
	9%	42%	47%	2%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	72%	4%	23%	1%

Desired Condition

Relatively undisturbed and well-connected wetlands in a black spruce with scattered white pine forest with a variety of developmental and seral stages.

Issues

Since wetlands perform important ecological functions, maintaining their integrity is a high priority. Any activity on the wetlands themselves must not contravene the Department of Environment Wetland Designation Policy, which covers the filling, draining, flooding, or excavation of wetlands. Wetlands should be adequately buffered and forestry practices should not negatively affect the wetland or the buffered area. The Wildlife Habitat and Watercourse Protection Regulations protect wetlands though provisions for buffers and regulation of forestry practices.

Harvesting of wood on the better-drained portions of this patch should be consistent with the NDR for the vegetation types present. The dominant vegetation type, black spruce-white pine, should be harvested following the frequent NDR with an aim for a range of developmental classes with more than 40% in the mature category. The mature category should have early, mid, and late seral representation.

Connectivity between wetlands, both riparian and upland, is essential for the maintenance of biodiversity.

Spruce Hemlock Pine Hummocks and Hills

(Patch) (WMHO ecosection) (31,465 ha)

This well-drained, medium-textured soil located on hummocky terrain has a climax community of tolerant softwoods (red spruce, hemlock, and white pine). These productive sites do not seem to have been burned repeatedly as some of the elements in the ecodistrict. This patch element has, in the past, been heavily logged.

Roughly 50% of the area is mature. The mature development class is primarily mid and late seral species.

Intolerant hardwoods in pure stands or as part of mixedwoods or the occasional tolerant hardwood types occupy 64% of the area. This is a dramatic change from pre-settlement times. Intolerant hardwoods and mixedwoods are often characterized by red maple with varying amounts of white pine and red spruce. Tolerant softwood regeneration can often be found beneath these types.

Tolerant hardwood is occasionally present on top of some of the hummocks.

Softwood covertypes comprise 35% of the area. Red spruce is a common species often occurring with lesser amounts of white pine and hemlock.

Flows

People (recreation-camping, hunting, fishing, ATV); moose, deer, and furbearers (habitat for all); timber.

Composition

Sable Ecodistrict 760 (based on statistics up 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
	9%	15%	76% (50 Mat + 26 OF)	26%
Seral Stage	Early	Mid	Late	Unclassified
	17%	48%	30%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	35%	25%	39%	1%

Desired Condition

Primarily mature mid and late seral tolerant softwoods with some representation of younger development classes. Some of the forest should be multi-aged and old growth.

Issues

Consideration should be given to restoration of climax types. Partial cuts in mature tolerant softwoods, in intolerant and mixedwood types with a tolerant component, and in intolerant and mixedwood types with tolerant softwood regeneration could be considered.

All silviculture treatments could favour tolerant species.

Pine Oak Hills and Hummocks
(Patch) (WCHO, WCKK ecosections) (9,172 ha)

Prior to European settlement, the main species of this patch element would have been red oak, white pine, red pine climax with a frequent disturbance regime of fire. Currently, red oak, generally of poor quality (scrub oak), and white pine are still present. Red pine is difficult to find.

The largest parts of the patch are in the Spar Ridge (Big Gull Lake, Quinan Lake) area of Yarmouth County. Significant areas of this patch are located near Shelburne with smaller areas near First Lake in Yarmouth County and along the lower reaches of the Sable and Jordon rivers. Generally, these are granite-based soils heavily harvested in the past for the large white pine and red oak. The forest is now mostly mature with a fairly significant multi-aged component (25%). The mature forest is mainly mid seral mixedwoods and hardwoods dominated by the intolerant red maple and occasionally red oak. White pine is often a component of these types. Black spruce and white pine are common softwood communities.

Only 3% of the element is in the establishment class. Ericaceous vegetation is a common component of much of the forested area.

The Great Barren and Quinan Lakes Nature Reserve is located in this element.

Flows

People (habitation); recreation (camping, hunting, fishing, ATV use); moose (habitat); deer (habitat).

Composition

Sable Ecodistrict 760 (based on statistics up 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
	3%	21%	76% (51 Mat + 25 OF)	25%
Seral Stage	Early	Mid	Late	Unclassified
	20%	56%	23%	1%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	24%	33%	43%	<1%

Desired Condition

A more or less balanced mix of development classes with the most dominant being a mature softwood covertype with early, mid, and late seral representation.

Issues

Consider encouragement of more late seral species such as white pine and red oak by favouring them in silviculture treatments. Look for opportunities to release or encourage development of white pine regeneration in intolerant or mixedwood stands with a pine component. Look at alternative practices such as inter-planting. Develop strategies to secure red oak regeneration, which is a difficult species to regenerate.

Tolerant Mixedwood Drumlins
(Patch) (WMDM, IMDM ecosections) (4,966 ha)

This area historically supported a mixture of mature tolerant hardwood and late seral softwoods on well-drained drumlins. This patch element is found mainly in three areas, the largest being around Beech Hill Lake with smaller areas close to Deception Lake and Philips Lake.

These productive sites now have approximately equal areas in softwood and mixedwood covertypes. The majority of forest land is mature with most of the mature area in late seral softwood of white pine, hemlock, and red spruce, and mid seral mixedwoods of red maple often

with white pine, red spruce, and occasionally hemlock and red oak. The hardwood covertype is mid seral, generally mature and most often red maple, and occasionally red oak.

Parts of this element can be found on the imperfectly drained medium-textured soils on drumlins bordering or close to the Roseway River. Mixedwoods make up 43% of an area which inherently supported tolerant softwoods. Mixedwoods are often mature and comprised of white pine, red maple, and red spruce. The softwood covertype is usually late or mid seral types and are often white pine in association with red spruce, balsam fir, and occasionally hemlock.

Flows

People (hunting, fishing, trapping, ATV use); moose habitat, deer habitat, timber, furbearers, and painted turtles in adjacent wetlands.

Composition

Sable Ecodistrict 760 (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
	13%	15%	72% (52 Mat + 20 OF)	20%
Seral Stage	Early	Mid	Late	Unclassified
	14%	43%	33%	10%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	39%	15%	44%	2%

Desired Condition

Continuous mature, uneven-aged mixedwood forest of late seral red spruce, eastern hemlock, white pine, sugar maple, yellow birch, and beech.

Primarily mature mid and late seral tolerant softwoods with some representation of younger development classes.

Issues

Forest management could be encouraged to move towards creating the combination of development classes, seral stages, and covertypes that is characteristic of the gap disturbance regime.

Thinning at the pre-commercial and commercial stages could favour late seral species. Partial cuts in intolerant community types with a minor tolerant component could increase the amount of late seral regeneration. Consideration could be given to increasing the rotation age, keeping more of the forest in the mature stage.

Consider restoration of climax types through appropriate partial cuts, planting if required. Favour late seral species in all phases of silviculture treatments.

Valley Corridors

(Corridor) (Various ecosections) (23,988 ha)

The Sable Ecodistrict contains a large number of streams, rivers, and lakes (about 6% of ecodistrict is water). Riparian corridors exist around all inland water systems. The riparian corridors around water systems are very important for biodiversity and ecosystem function. Many species utilize both aquatic and adjacent terrestrial habitats. Wetlands are a common feature in the riparian corridors and are extensive throughout the Quinan, Barrington, Clyde, Tidney, Broad, and Five rivers and in the upper reaches of the Roseway, Jordon, and Sable rivers.

Fertile soils, where drainage permits, are often found adjacent to these waterways. In the past, productive forests within the corridors have been harvested. The corridors are generally now well-forested, although there is notable cottage development along sections of the Clyde River. Mature and multi-aged development classes make up 72% of the corridor area. Late seral softwoods, such as black spruce and white pine, and mid seral mixedwoods of intolerant hardwoods, such as red maple with spruce and pine, dominate. Dams to regulate water flow for power production are present on the Tusket River system.

Flows

Fish; people (habitation, canoeing, hunting, trapping); moose and deer habitat, connectors of lakes and wetlands, aggregate, timber, furbearers, painted turtle.

Composition

Sable Ecodistrict 760 (based on statistics up to 2007)

Composition of Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	4%	24%	72% (42 Mat + 30 OF)	30%
Seral Stage	Early	Mid	Late	Unclassified
	11%	48%	40%	1%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	49%	10%	40%	1%

Desired Condition

Generally continuous natural forest conditions emphasizing lower impact resource management.

Issues

Beyond its importance to the ecological functioning of waterways, recognize the role of all riparian corridors as habitat. Consider sustaining natural forest conditions in the corridors. Look at

promoting late seral species in forest management activities and managing adjacent vegetation communities to maintain the integrity of corridors. Encourage restoration of forested corridor where gaps exist. Design road systems that minimize environmental damage to riparian corridors.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Sable 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:

- Manage climax forest communities in relation to the NDR, development class, and seral stage.
- Increase the amount of late seral species in elements where the predicted climax is tolerant species by:
    - implementing partial cuts in intolerant hardwood or mixedwood stands containing a minor tolerant species component, resulting in increased tolerant species regeneration
    - consider underplanting of intolerant hardwoods or mixedwoods with tolerant species (red spruce, white pine)
    - favouring tolerant species in all thinning treatments (pre-commercial thinning, commercial thinning)
- Patch sizes within the ecodistrict are generally medium (10 to 100 ha). To improve habitat for wildlife look for opportunities to increase the amount of small (< 10 ha) and large (> 100 ha) patch sizes.
- Recognize the importance of riparian corridors on all watercourses both as protectors of aquatic ecosystems and as habitat. Maintain the integrity of corridors through appropriate management practices (type of harvesting, rate of harvesting) both within the corridor and in adjacent areas.
- Protect existing wetlands and wetland complexes. Ensure wetland integrity is not compromised by resource management activity (harvesting, road construction). Recognize importance of wetland-adjacent land relationships for biodiversity.
- Develop road plans for Crown blocks. Assess impact of road construction on ecological concerns such as fragmentation, aquatic ecosystems, sensitive sites, and protected areas.
- Develop a road maintenance plan to ensure road deterioration does not become a harmful effect. Encourage sharing of road networks. Consider decommissioning of roads where secondary use (ATV use, snowmobiling) of roads is not an issue.
- Look for opportunities to inform the public about ecosystem management. Involvement by small private woodland owners would help ensure that ecosystem management occurs across the landscape.
- Enhance connectivity by sustaining or restoring natural patterns within the ecodistrict.
- Improve representivity in the ecodistrict by considering additional ecosections ICSM, IMDM, WCKK, and tolerant mixedwoods.
- Maintain an acceptable balance among the four ecological emphasis classes.

Appendix 1: Flow - Element Interactions

Element	People	Moose	Water	Timber	Painted Turtle	Birds	Aggregate	Furbearers	Deer	Fish
Matrix Spruce Pine Hummocks (IMHO, ICHO, IMSM)	- habitation - hunting, fishing, trapping, ATV use, camps	- habitat (food, shelter) Winter /summer cover, calving areas	- catchment, filter, groundwater recharge, nutrients, feeder streams - number of major rivers flow through (notably, Clyde, Jordan, Sable) - water supply area at Hayden Lake	- extensive harvesting - silviculture	- habitat inside wetlands	- white throated sparrow (wetlands) - swamp sparrow - common yellow throat (open and shrubby habitat)	- some	- mink, muskrat associated with wetlands	- habitat depend on forestry harvesting	_____
Patch Tolerant Mixedwood Drumlins (IMDM, WMDM)	Hunting ATV use - fishing, trapping	- habitat (food, shelter) winter/ summer cover, caving areas	- number of wetlands within and adjacent to this patch - fairly dry - feeder streams	- extensive harvesting, silviculture	- habitat in adjacent wetlands	- white throated sparrow - birds of softwood and mixedwood forest	_____	- mink, muskrat associated with bordering wetlands	- habitat	_____
Patch Spruce Hemlock Pine Hummocks and Hills (WMHO)	- habitation, camping, hunting, fishing, ATV use	- habitat	adjacent to some wetlands	- extensive harvesting	_____	- white throated sparrow	_____	- mink, muskrat associated with bordering wetlands	- habitat	_____
Patch Pine Oak Hills & Hummocks (WCHO, WCKK)	- habitation, camping, hunting, fishing	- habitat	_____	- heavily harvested	_____	- white throated sparrow	_____	_____	- habitat	_____
Patch Wetlands (wetlands, (ICSM, PMHO)	- fishing, trapping, hunting, ATV use	- important habitat	- groundwater recharge storage, filter - headwaters of Tidney and Sable rivers	_____	- important habitat	- swamp sparrow, common yellow throat	_____	- important furbearer habitat	- habitat	_____
Corridor Valley Corridors Clyde	- houses, camps, ATV, trapping, canoeing, hunting, farmland	- upper portion habitat	Connector of lakes and wetlands	- log drives - historic high value timber	- habitat, travel	- white throated sparrow, merganser	- sand and gravel deposits	- otter, beaver, muskrat, habitat, and travel	- habitat	- liming for salmon improvement

Appendix 1: Flow - Element Interactions

Element	People	Moose	Water	Timber	Painted Turtle	Birds	Aggregate	Furbearers	Deer	Fish
Roseway	- camps, houses, trapping, canoeing, hunting	- habitat	- upper reaches connectors of lakes and wetlands	- high value timber						- sea trout, eel
Barrington	- camps, ATV, trapping, canoeing, hunting - houses on lower Barrington		- connectors lakes and wetlands	- log drives		- waterfowl, Canada geese, black duck habitat				- gaspereau runs
Sable	- ATV, trapping, hunting, Tidney River Protected Area - uninhabited	- good moose habitat surrounding	- connector of wetlands							- gaspereau runs
Jordan	- ATV, trapping, canoeing, hunting Upper Jordan - uninhabited	- habitat	- limited lakes - connector of wetlands upper reaches	- historical and present harvesting	----------	- white-throated sparrow, merganser				- liming
Tidney	- ATV, trapping, hunting, Tidney River Protected Area - uninhabited		- includes and connects wetlands			- waterfowl, Canada Geese, black duck habitat				
Broad River	- uninhabited	- habitat	- includes and connects wetlands	- harvesting						
Tusket		- power	- includes and connects wetlands	- harvesting						
Five Rivers			- includes wetlands							

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 Hummocks	Matrix	High	IMHO, ICHO, IMSM	Landscape	Frequent	- Black Spruce, white pine, spruce/fir, intolerant mixedwoods, intolerant hardwoods	- Wetlands - intolerant mixedwoods and hardwoods	- Possible fragmentation with increase in harvest levels - Species composition within Matrix	- Amount of late seral species - Amount of larger and smaller patch size - Moose habitat conservation - Harvesting near watercourses and wetlands	- Promote more late seral species by favouring these species in thinning - Promote more late seral white pine through seed tree cuts in mixedwood stands with pine component - Consider underplanting of white pine in intolerant stands - Promote both larger and smaller patch size - Maintain and improve connectivity - Follow applicable guidelines for moose management - Follow appropriate guidelines when harvesting near watercourses and wetlands
Wetlands (open bogs, black spruce swamps, red maple fens)	Patch	High	- PMHO, ICSM, WTLD - Dunraven Bog, Lowes Meadow, Tidney Protected Area	Landscape	Open seral / frequent	- Black spruce/white pine - ericaceous species - Sphagnum - Red maple fens	- All other elements	- Road construction - Development near wetlands - Effect of harvesting on wetlands - Not under current resource pressure	- ATV use - Conservation of moose habitat	- Education - Enforcement - Follow appropriate guidelines for moose management

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 Hemlock Pine Hummocks and Hills	Patch	Moderate	- WMHO	Landscape	Infrequent	- Tolerant softwoods - Intolerant hardwood mixedwoods - Intolerant hardwoods	- Black spruce/white pine - Intolerant hardwood mixedwoods	- Changes in species composition - history of fire	- Amount of late seral species	- Promote late seral species in all silviculture and harvesting methods
Pine Oak Hills and Hummocks	Patch	High (uncommon)	- WCHO, WCKK - south of Quinan Lake - Spar Ridge	Local	Frequent	- Intolerant hardwoods mixedwoods - Tolerant softwoods	- Black spruce/white pine - Intolerant hardwood mixedwoods - Wetlands	- Species composition	- Securing oak regeneration in forest harvests	- Investigate means of securing oak regeneration
Tolerant Mixedwood Drumlins	Patch	High (uncommon)	IMDM WMDM	Local	Infrequent Gap	- Intolerant hardwood mixedwood - White pine - Red spruce - Spruce/pine/ hemlock	- Wetlands - Intolerant mixedwoods - Black spruce/white pine	- Species composition - Fragmentation within patch - Age class structure	- Amount of late seral species - Amount of old growth - Moose habitat conservation - Small amount of tolerant hardwood	- Increase late seral species by favouring them in thinnings of mid seral intolerant mixedwoods - Promote more late seral species by appropriate harvesting methods in all stand types - Increase rotation age - Follow applicable guidelines for moose management
Valley Corridors	Corridor	High	Tusket, Barrington, Clyde, Roseway, Jordon, Sable, Tidney, Broad, Five River systems	Landscape	Dependent on element through which they pass usually frequent or open seral	Dependent on element passing through usually wetlands or elements with climax of black spruce/white pine	- Wetlands - Black spruce/white pine	- Dams (Tusket) - Generally intact corridors with limited development		- Maintain continuity

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 760)

Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Chimney Swift	*Chaetura pelagica*	Endangered	Threatened	Threatened
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
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Coast Pepper-Bush	*Clethra alnifolia*	Vulnerable	Special Concern	Special Concern
Thread-leaved Sundew	*Drosera filiformis*	Endangered	Endangered	Endangered
Eastern Lilaeopsis	*Lilaeopsis chinensis*	Vulnerable	Special Concern	Special Concern
Plymouth Gentian	*Sabatia kennedyana*	Endangered	Threatened	Endangered
INSECTS	-			
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
LICHENS	-			
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Graceful Felt Lichen	*Erioderma mollissimum*	Endangered	N/A	Endangered
Boreal Felt Lichen - Atlantic population	*Erioderma pedicellatum* (Atlantic pop.)	Endangered	Endangered	Endangered
Frosted Glass-whiskers Lichen - Nova Scotia population	*Sclerophora peronella* (Nova Scotia pop.)	N/A	Special Concern	Special Concern
MAMMALS				
Moose	*Alces americanus*	Endangered	N/A	N/A
MONOCOTS				
Tubercled Spike-rush	*Eleocharis tuberculosa*	Vulnerable	Threatened	Special Concern
Goldencrest	*Lophiola aurea*	Vulnerable	Threatened	Special Concern
Long's Bulrush	*Scirpus longii*	Vulnerable	Special Concern	Special Concern
REPTILES	-			
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Eastern Ribbonsnake - Atlantic population	*Thamnophis sauritus* pop. 3	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 760)

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**	**AC CDC S-Rank***
AMPHIBIANS	-		
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS	-		
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow) May	S3S4B
Blue-winged Teal	*Anas discors*	Be At Risk (Orange)	S3B
American Bittern	*Botaurus lentiginosus*	Sensitive (Yellow)	S3S4B
Least Sandpiper	*Calidris minutilla*	Secure (Green)	S1B,S5M
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3M
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B
Black-billed Cuckoo	*Coccyzus erythropthalmus*	May Be At Risk (Orange)	S3?B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Cape May Warbler	*Dendroica tigrina*	Sensitive (Yellow)	S3?B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Willow Flycatcher	*Empidonax traillii*	Sensitive (Yellow)	S2B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Sensitive (Yellow)	S3M S3B
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3S4B
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow) May	S3?B,S5N
Pine Grosbeak	*Pinicola enucleator*	Be At Risk (Orange)	S3S4B
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S3B,S5M
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S2S3B
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	S1?B
Warbling Vireo	*Vireo gilvus*	Undetermined (Undetermined)	
DICOTS			
Nova Scotia Agalinis	*Agalinis neoscotica Alnus*	Secure (Green) Sensitive	S3
Smooth Alder	*serrulata Amelanchier*	(Yellow) Undetermined	S3
Fernald's Serviceberry	*fernaldii Bartonia virginica*	(Undetermined)	S2?
Yellow Bartonia	*Cephalanthus occidentalis*	Secure (Green)	S3
Common Buttonbush	*Conioselinum chinense*	Sensitive (Yellow)	S3
Chinese Hemlock-parsley		Sensitive (Yellow)	S2

Appendix 3: Special Occurrences (Ecodistrict 760)

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**	**AC CDC S-Rank***
Swedish Bunchberry	*Cornus suecica Decodon*	Sensitive (Yellow)	S1S2
Swamp Loosestrife	*verticillatus Eupatorium*	Sensitive (Yellow)	S3
Coastal Plain Joe-pye-weed	*dubium Hudsonia*	May Be At Risk (Orange)	S2
Pinebarren Golden Heather	*ericoides Hypericum*	Sensitive (Yellow)	S2
Disguised St John's-wort	*dissimulatum*	Sensitive (Yellow)	S2S3
Narrow-leaved Evening Primrose	*Oenothera fruticosa ssp. glauca*	Undetermined (Undetermined)	S2
Canada Cinquefoil	*Potentilla canadensis*	Undetermined (Undetermined)	S3?
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
Knotted Pearlwort	*Sagina nodosa*	Secure (Green)	S2S3
Knotted Pearlwort	*Sagina nodosa ssp. borealis*	Secure (Green)	S2S3
Seaside Brookweed	*Samolus valerandi ssp. parviflorus*	Sensitive (Yellow)	S2
Elliott's Goldenrod	*Solidago latissimifolia*	Secure (Green)	S3
Canada Germander	*Teucrium canadense*	Sensitive (Yellow)	S3
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)	S3
Highbush Blueberry	*Vaccinium corymbosum*	Secure (Green)	S3
Arrow-Leaved Violet	*Viola sagittata var. ovata*	Secure (Green)	S3S4
FERNS AND THEIR ALLIES			
Acadian Quillwort	*Isoetes acadiensis*	Sensitive (Yellow)	S3
Southern Bog Clubmoss	*Lycopodiella appressa*	Secure (Green)	S3S4
Northern Clubmoss	*Lycopodium complanatum*	Secure (Green)	S3S4
Little Curlygrass Fern	*Schizaea pusilla*	Secure (Green)	S3
Netted Chain Fern	*Woodwardia areolata*	Sensitive (Yellow)	S2S3
FISH			
Striped Bass	*Morone saxatilis*	May Be At Risk (Orange)	S1
Atlantic Salmon	*Salmo salar*	May Be At Risk (Orange)	S2
INSECTS			
Mottled Darner	*Aeshna clepsydra*	Secure (Green)	S3
Ocellated Darner	*Boyeria grafiana*	Sensitive (Yellow)	S3
Juvenal's Duskywing	*Erynnis juvenalis*	Secure (Green)	S2S3

Appendix 3: Special Occurrences (Ecodistrict 760)

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**	**AC CDC S-Rank***
Seaside Dragonlet	*Erythrodiplax berenice*	Sensitive (Yellow)	S3
Harlequin Darner	*Gomphaeschna furcillata*	Sensitive (Yellow)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Elfin Skimmer	*Nannothemis bella*	Secure (Green)	S3
Spot-Winged Glider	*Pantala hymenaea*	Sensitive (Yellow)	S2B
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
Clamp-Tipped Emerald	*Somatochlora tenebrosa*	Secure (Green)	S3
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
LICHENS			
Black-foam Lichen	*Anzia colpodes Collema*	Sensitive (Yellow)	S3?
Crumpled Bat's Wing Lichen	*leptaleum Collema*	Sensitive (Yellow)	S2S3
Blistered Tarpaper Lichen	*nigrescens Fuscopannaria*	Sensitive (Yellow)	S2S3
Rimmed Shingles Lichen	*leucosticta Leptogium*	May Be At Risk (Orange)	S1S2
Blistered Jellyskin Lichen	*corticola Leptogium*	Sensitive (Yellow)	S2S3
Stretched Jellyskin Lichen	*milligranum Leptogium*	Sensitive (Yellow)	S2S3
Appressed Jellyskin Lichen	*subtile Nephroma bellum*	Sensitive (Yellow)	S1S3
Naked Kidney Lichen	*Nephroma resupinatum*	Sensitive (Yellow)	S3?
a lichen	*Pannaria lurida*	May Be At Risk (Orange)	S1S2
Veined Shingle Lichen	*Parmelinopsis horrescens*	May Be At Risk (Orange)	S1?
Hairy-spined Shield Lichen	*Pseudevernia cladonia*	May Be At Risk (Orange)	S1?
Ghost Antler Lichen	*Sticta fuliginosa*	Sensitive (Yellow)	S2S3
Peppered Moon Lichen	*Usnea ceratina*	Sensitive (Yellow)	S3?
Warty Beard Lichen		Sensitive (Yellow)	S2S3
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined (5)	Unranked
MONOCOTS			
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined (Undetermined)	S2
Hidden-scaled Sedge	*Carex cryptolepis*	Secure (Green)	S3?
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Swan's Sedge	*Carex swanii*	Sensitive (Yellow)	S2S3
Early Coralroot	*Corallorhiza trifida Cyperus*	Secure (Green)	S3
Toothed Flatsedge	*dentatus Dichanthelium*	Secure (Green)	S3S4
Deer-tongue Panic Grass	*clandestinum Dichanthelium*	Secure (Green)	S3
Eaton's Witchgrass	*spretum*	Secure (Green)	S3S4
Beaked Spikerush	*Eleocharis rostellata*	Sensitive (Yellow)	S3

Appendix 3: Special Occurrences (Ecodistrict 760)

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**	**AC CDC S-Rank***
Russet Cotton-Grass	*Eriophorum chamissonis*	Secure (Green)	S3S4
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Grassleaf Rush	*Juncus marginatus*	Sensitive (Yellow)	S3
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Fall Panic Grass Redtop	*Panicum dichotomiflorum var. puritanorum*	May Be At Risk (Orange)	S1?
Panic Grass Tuckerman's	*Panicum rigidulum var. pubescens*	Sensitive (Yellow)	S3
Panic Grass Canada Rice	*Panicum tuckermanii*	Sensitive (Yellow)	S2S3
Grass Southern Rein	*Piptatherum canadense*	Sensitive (Yellow)	S2
Orchid	*Platanthera flava var. flava*	Sensitive (Yellow)	S2
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Eastern Blue-Eyed-Grass	*Sisyrinchium atlanticum*	Secure (Green)	S3S4
Round-leaved Greenbrier	*Smilax rotundifolia (Atlantic pop.)*	Secure (Green)	S3
Case's Ladies'-Tresses	*Spiranthes casei*	Sensitive (Yellow)	S2
Case's Ladies'-Tresses	*Spiranthes casei var. novaescotiae*	Sensitive (Yellow)	S2
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	Sensitive (Yellow)	S2S3
Gaspe Arrowgrass	*Triglochin gaspensis*	Undetermined (Undetermined)	S1?
BRYOPHYTES			
A Sphagnum moss	*Sphagnum cyclophyllum*		SNR
Torrey's Peat Moss	*Sphagnum torreyanum*	Undetermined	S4?
A Sphagnum moss	*Sphagnum macrophyllum*	Undetermined	S4?
Wulf's Peat Moss	*Sphagnum wulfianum*	Undetermined	S2/S3
Narrowleaf Peat moss	*Sphagnum angustifolium*	Undetermined	SNR
Delicate Luster Moss	*Isopterigium tenerum*	Undetermined	S4?
Brown Shield Moss	*Buxbaumia aphylla*	Undetermined	S4?
Starry Leaf Moss	*Mnium stellare*	Undetermined	SNR
		Undetermined	

*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 760)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Applicable Legislation
Lakes - Great Pubnico Lake, complex of Great Barren Lake, Big Gull Lake and Quinan Lake, Rossignol, others	Ecosystems	Service Nova Scotia	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regs)
Loon Nesting Lakes	Bird Habitat	Significant Habitats of Nova Scotia Database (SHNSD)	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regulations)
Eagle Nests	Bird Habitat	SHNSD	Nova Scotia Wildlife Act (NSWA)
Lake Watersheds - Hayden Lake, Rodney Lake	Water Supply	SOURCE	Nova Scotia Environment Act
Wilderness Areas – Tobeatic, Tidney River, Sable	Ecosystems	SOURCE	ACT
Provincial Parks – The Islands, Sable River	Ecosystems/ Recreation	SOURCE	NS Parks Act
Nature Reserves - Quinan Meadows, Great Barren and Quinan Lakes, Park Reserves - Indian Fields, Shelburne Barrens	Ecosystems	SOURCE	ACT
Significant Wetlands – Dunraven Bog, Quinns Meadow, Turtle Creek Fen	Ecosystems	SHNSD	ACCDC

Appendix 3: Special Occurrences (Ecodistrict 760)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Applicable Legislation
Rivers - Clyde, Roseway, Jordan, Sable, Broad, Tusket, Quinan, Barrington, Tidney, others	Ecosystems	Service Nova Scotia	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regulations)
Sites of Ecological Significance – Shelburne Barrens, Great Barren Lake, Louis Lake	Ecosystems	SHNSD	ACCDC
Coastal Lichen Forest	Ecosytems / Species	ACCDC	Nova Scotia Endangered Species Act

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	%		
ICHO	bS wP	18,287	6.2	173,739	59.0	72 to 73	2.5	270,098	16.0	419,644	24.9	75 to 79	1.4
ICSM	bS wP	4,365	1.5	173,739	59.0	69 to 71	6.2	37,858	2.2	419,644	24.9	76 to 79	2.5
IMDM	rS eH wP	2,383	0.8	34,522	11.7	67 to 71	3.4	25,961	1.5	616,727	36.6	64 to 69	9.9
IMHO	bS wP	113,050	38.4	173,739	59.0	74 to 76	1.1	222,050	13.2	419,644	24.9	70 to 73	3.0
IMSM	bS wP	29,224	9.9	173,739	59.0	75 to 77	0.9	92,050	5.5	419,644	24.9	71 to 74	3.7
PMHO	wetlands	20,284	6.9	0	0.0	74 to 75	2.2	20,284	1.2	0	0.0	74 to 75	2.2
WCHO	rO wP rP	7,932	2.7	9,485	3.2	69 to 70	8.0	187,670	11.1	53, 642.8	3.2	73 to 77	3.9
WCKK	rO wP rP	1,553	0.5	9,485	3.2	78	0.9	152,022	9.0	53,643	3.2	66 to 73	3.5
WMDM	rS eH wP sM yB Be	2,893	1.0	2,893	1.0	68 to 73	2.7	132,982	7.9	187,322	11.1	58 to 63	13.5
WMHO	rS eH wP	32,139	10.9	34,522	11.7	71 to 74	1.9	154,580	9.2	616,727	36.6	64 to69	7.5
WTLD	wetlands	45,370	15.4	0	0.0	80	0.8	87,241	5.2	0	0.0	77 to 78	3.0

*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)
IMHO	bS wP	113,050	63.3	7,839	0	1,964	0	9,803	8.7	0	0.0	9,803	8.7
WTLD	wetlands	45,370	73.5	10,390	0	365	0	10,755	23.7	5	0.0	10,760	23.7
WMHO	rS eH wP	32,139	54.1	1,795	0	124	0	1,919	6.0	0	0.0	1,919	6.0
IMSM	bS wP	29,224	54.4	2,629	0	364	0	2,993	10.2	0	0.0	2,993	10.2
PMHO	wetlands	20,284	65.5	785	0	516	0	1,301	6.4	0	0.0	1,301	6.4
ICHO	bS wP	18,287	62.9	0	0	312	0	312	1.7	0	0.0	312	1.7
XXWA	NONE	16,952	0.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WCHO	rO wP rP	7,932	48.0	0	0	634	0	634	8.0	4	0.1	638	8.0
ICSM	bS wP	4,365	37.6	0	0	177	0	177	4.0	0	0.0	177	4.0
IMDM	rS eH wP sM yB Be	2,893	19.1	49	0	7	0	56	1.9	0	0.0	56	1.9
IMDM	rS eH wP	2,383	35.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WCKK	rO wP rP	1,553	100.0	0	0	248	0	248	16.0	0	0.0	248	16.0
XXMS	salt marsh	40	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**294,472**		**23,486**	**0**	**4,710**	**0**	**28,197**		**10**		**27,726**	

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	20,760	0	Operational Non Designated Parks and Reserves	115	0
Sites of Ecological Significance Under Moratorium	3,047	0	Old Forest	15,379	0
Operational Non Designated Parks and Reserves	1,118	0	Areas under the Special Places Act	594	10
			Designated Provincial Parks and Park Reserves	157	0

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, watercourse 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 mapping.

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.

DNR 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	974
Utility corridors	3	250
Gravel Roads and active railways	6	644
Paved streets and roads collectors	10	108
Highways	15	74

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	167,211	56.8
Forest Resource	7 to 15	91,990	31.2
Mixed Rural	16 to 24	22,883	7.8
Agriculture Suburban	25 to 39	9,387	3.2
Urban	40 to 100	2,477	0.8
Total		**294,471**	**100.0**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	23,988	8.6
Spruce Pine Hummocks	153,507	3.6
Tolerant Mixedwood Drumlins	4,966	8.6
Pine Oak Hills and Hummocks	9,172	10.1
Spruce Hemlock Pine Hummocks and Hills	31,465	6
Wetlands	63,415	3.4
Total	**286,513***	**4.6**

*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

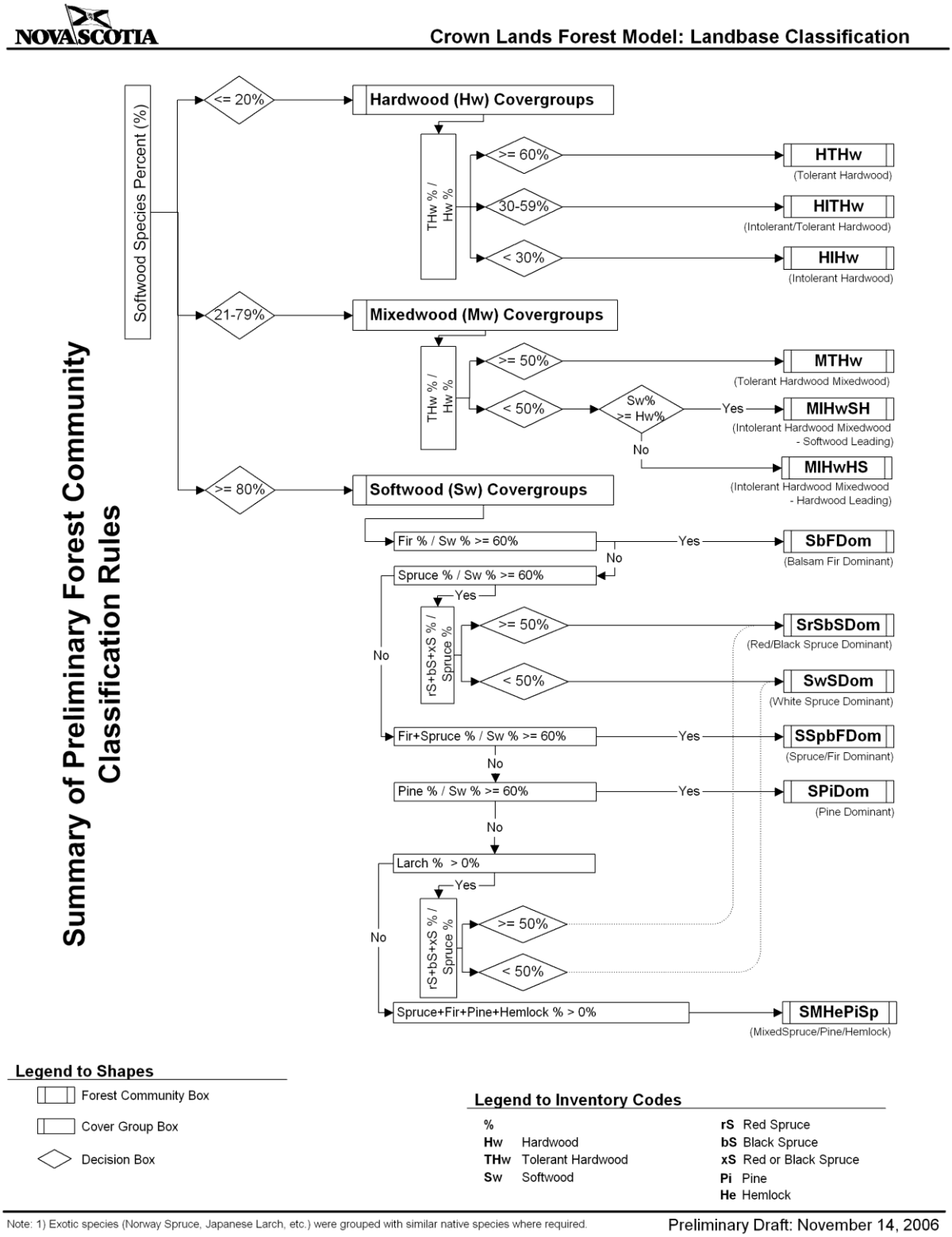
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and 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																																						
		100	210	220	310	320	330	340	350	360	370	380	410	420	430	440	450	510	520	530	540	550	560	610	620	630	710	720	730	740	750	760	770	780	810	820	830	840	910	
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 (Sable 760)

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 Hummocks Matrix	IMHO (71.0%) IMSM (18.1%) ICHO (10.8%)	Softwood	bS Wp	Frequent	142,365; 92.7	Early	543	1,659	603	837	3,640	70,697; 54.7	EARLY	15,573; 12.1
						Mid	1,128	9,705	2,879	6,728	20,441			
						Late	2,340	16,177	15,296	10,543	44,355			
						Uncl	2,261	0	0	0	2,261			
		Mixedwood				Early	125	2,143	2,512	2,216	6,995	44,961; 34.8	MID	57,921; 44.8
						Mid	347	6,863	10,767	12,735	30,712			
						Late	39	877	2,392	3,120	6,427			
						Uncl	827	0	0	0	827			
		Hardwood	rM		5,571; 3.6	Early	197	871	2,843	453	4,364	12,160; 9.4	LATE	51,775; 40.1
						Mid	41	955	5,090	684	6,769			
						Late	9	69	862	52	993			
						Uncl	34	0	0	0	34			
		Unclassified				Early	573	0	0	0	573	1,388; 1.1	UNCL	3,936; 3.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	814	0	0	0	814			
Total					**153,507***	**# ha**	**9,278**	**39,318**	**43,243**	**37,367**	**129,205**			
						%	**7.2%**	**30.4%**	**33.5%**	**28.9%**	**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 (Sable 760)

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 (64.1%) PMHO (29.0%) ICSM (6.8%)	Softwood	bS wP bS	None/ Frequent	28,009; 44.2	Early	251	729	188	334	1,501	26,065; 71.6	EARLY	3,384; 9.3
						Mid	453	4,293	806	2,480	8,032			
						Late	976	6,528	4,983	3,699	16,185			
						Uncl	347	0	0	0	347			
		Mixedwood				Early	59	339	370	387	1,155	8,521; 23.4	MID	15,135; 41.6
						Mid	126	1,475	1,851	2,948	6,399			
						Late	1	142	318	362	822			
						Uncl	145	0	0	0	145			
		Hardwood	rM		862; 1.4	Early	16	170	462	59	707	1,579; 4.3	LATE	17,104; 47.0
						Mid	5	106	536	59	705			
						Late	0	18	77	2	97			
						Uncl	71	0	0	0	71			
		Unclassified				Early	20	0	0	0	20	255; 0.7	UNCL	796; 2.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	234	0	0	0	234			
Total					**63,415***	**# ha**	**2,703**	**13,798**	**9,590**	**10,329**	**36,419**			
						%	**7.4%**	**37.9%**	**26.3%**	**28.4%**	**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 (Sable 760)

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	WMHO	Softwood	rS eH wP	Infrequent	31,465; 100.0	Early	145	284	172	95	697	9,736; 34.6	EARLY	4,649; 16.5
						Mid	114	696	672	978	2,460			
						Late	277	995	2,886	1,530	5,688			
						Uncl	892	0	0	0	892			
		Mixedwood				Early	137	264	716	566	1,683	11,090; 39.4	MID	13,446; 47.8
						Mid	160	1,070	3,303	2,444	6,976			
						Late	36	181	1,083	850	2,151			
						Uncl	281	0	0	0	281			
		Hardwood				Early	94	344	1,490	326	2,254	7,080; 25.2	LATE	8,543; 30.4
						Mid	113	451	3,001	446	4,011			
						Late	1	51	609	43	704			
						Uncl	111	0	0	0	111			
		Unclassified				Early	15	0	0	0	15	216; 0.8	UNCL	1,485; 5.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	201	0	0	0	201			
Total					**31,465***	**# ha**	**2,576**	**4,337**	**13,932**	**7,278**	**28,123**			
						%	**9.2%**	**15.4%**	**49.5%**	**25.9%**	**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 (Sable 760)

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	WTLD (19.7%) IMHO (16.8%) PMHO (7.8%) ICHO (6.8%) IMSM (5.7%) WMHO (2.8%) WCHO (1.3%) WMDM (0.9%) IMDM (0.4%)	Softwood	bS wP rS eH wP bS	None Infrequent Frequent	10,167; 42.4	Early	37	95	55	90	278	4,841; 49.3	EARLY	1,091; 11.1
						Mid	48	616	172	500	1,336			
						Late	70	903	1,384	831	3,187			
						Uncl	40	0	0	0	40			
		Mixedwood	rO wP rP rS eH wP sM yB Be	Infrequent Gap	535; 2.2	Early	22	123	188	175	507	3,949; 40.2	MID	4,759; 48.4
						Mid	15	491	1,294	1,040	2,840			
						Late	9	66	278	230	584			
						Uncl	18	0	0	0	18			
		Hardwood	rM		272; 1.1	Early	8	43	206	10	267	966; 9.8	LATE	3,883; 39.5
						Mid	0	45	495	42	582			
						Late	0	3	96	13	112			
						Uncl	5	0	0	0	5			
		Unclassified				Early	39	0	0	0	39	68; 0.7	UNCL	91; 0.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	28	0	0	0	28			
Total					**23,988***	**# ha**	**341**	**2,385**	**4,168**	**2,930**	**9,824**			
						%	**3.5%**	**24.3%**	**42.4%**	**29.8%**	**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 (Sable 760)

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	WCHO (83.1%) WCKK (16.9%)	Softwood				Early	5	102	27	52	186	1,980; 24.0	EARLY	1,653; 20.1
						Mid	22	322	126	196	665			
						Late	40	296	585	192	1,112			
						Uncl	16	0	0	0	16			
		Mixedwood	rO wP rP	Frequent	9,172; 100.0	Early	48	176	220	171	615	3,552; 43.1	MID	4,585; 55.6
						Mid	34	500	907	908	2,349			
						Late	13	96	287	167	563			
						Uncl	26	0	0	0	26			
		Hardwood				Early	15	57	526	247	846	2,680; 32.5	LATE	1,914; 23.2
						Mid	5	110	1,306	151	1,571			
						Late	6	43	179	12	240			
						Uncl	24	0	0	0	24			
		Unclassified				Early	7	0	0	0	7	28; 0.3	UNCL	87.5; 1.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	21	0	0	0	21			
Total					**9,172***	**# ha**	**282**	**1,702**	**4,162**	**2,095**	**8,240**			
						%	**3.4%**	**20.7%**	**50.5%**	**25.4%**	**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 (Sable 760)

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	WMDM (53.7%) IMDM (46.3%)	Softwood	rS eH wP	Infrequent	2,297; 46.3	Early	8	72	5	21	107	1,758; 38.6	EARLY	650; 14.3
						Mid	37	183	98	136	453			
						Late	61	156	731	175	1,123			
						Uncl	76	0	0	0	76			
		Mixedwood	rS eH wP sM yB Be	Gap	2,668; 53.7	Early	36	77	179	59	350	2,011; 44.2	MID	1,946; 42.7
						Mid	5	116	643	345	1,109			
						Late	0	13	206	100	319			
						Uncl	234	0	0	0	234			
		Hardwood				Early	0	55	120	4	178	686; 15.1	LATE	1,523; 33.4
						Mid	0	3	328	55	385			
						Late	0	0	81	0.0	81			
						Uncl	41	0	0	0	41			
		Unclassified				Early	14	0	0	0	14	98; 2.2	UNCL	434; 9.5
						Mid	0	0	0	0	0			
						Late	84	0	0	0	84			
						Uncl	8	72	5	21	107			
Total					**4,966***	**# ha**	**596**	**673**	**2,391**	**894**	**4,554**			
						%	**13.1%**	**14.8%**	**52.5%**	**19.6%**	**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 Sable 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 Hummocks Matrix	ICHO IMHO IMSM	Frequent Frequent Frequent	bS wP bS wP bS wP	S	SrSbSDom	43,504	34.0%	L	**Well-drained** early/mid/late - bS - wP - bS - barrens - rO - wP **Moist** early/mid/late - bS **Wet** early/mid/late - wetlands - rM
				S	SpiDom	12,623	9.9%	L	
				S	SspbFDom	8,790	6.9%	M	
				S	SMHePiSp	2,997	2.3%	L	
				S	SbFDom	2,431	1.9%	E	
				S	SwSDom	352	0.3%	E	
				M	MIHwSH	29,755	23.3%	M	
				M	MIHwHS	14,059	11.0%	E	
				M	MTHw	1,147	0.9%	L	
				H	HIHw	9,494	7.4%	E	
				H	HITHw	1,737	1.4%	M	
				H	HTHw	929	0.7%	L	
Total						**127,818**	**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 Sable 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
Wetlands	ICSM PMHO WTLD XXMS	Frequent None None None	bS wP salt marsh	S	SrSbSDom	18,261	50.5%	L	**Moist** early/mid/late - bS **Wet** early/mid/late - wetlands, rM
				S	SpiDom	3,811	10.5%	L	
				S	SspbFDom	2,503	6.9%	M	
				S	SMHePiSp	727	2.0%	L	
				S	SbFDom	711	1.9 %	E	
				S	SwSDom	52	0.1 %	E	
				M	MIHwSH	5,726	15.8%	M	
				M	MIHwHS	2,593	7.2%	E	
				M	MTHw	202	0.6%	L	
				H	HIHw	1,336	3.7%	E	
				H	HITHw	141	0.4%	M	
				H	HTHw	102	0.3%	L	
Total						**36,164**	**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 Sable 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	WMHO	Infrequent	rS eH wP	S	SrSbSDom	4,984	17.9%	L	**Well-drained** early - rM, wB mid - rS - rS, bF - rS, bF, wP late - rS, eH, wP - eH - eH, wP **Moist** early/mid/late - bS - eH
				S	SpiDom	1,765	6.3%	L	
				S	SMHePiSp	1,272	4.6%	L	
				S	SspbFDom	1,097	3.9%	M	
				S	SbFDom	512	1.8%	E	
				S	SwSDom	106	0.4%	E	
				M	MIHwSH	6,193	22.2%	M	
				M	MIHwHS	4,448	15.9%	E	
				M	MTHw	450	1.6%	L	
				H	HIHw	5,063	18.1%	E	
				H	HITHw	1,345	4.8%	M	
				H	HTHw	673	2.4%	L	
Total						**27,907**	**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 Sable 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	ICHO ICSM IMDM IMHO IMSM PMHO WCHO WCKK WMDM WMHO WTLD XXMS XXWA	Frequent Frequent Infrequent Frequent Frequent None Infrequent Infrequent Gap Infrequent None None None	bS wP bS wP rS eH wP bS wP bS wP rO wP rP rO wP rP rS eH wP sM yB Be rS eH wP salt marsh	S	SrSbSDom	2,999	30.7%	L	Corridors pass through many elements. See descriptions of successional types under corresponding element in this table.
				S	SpiDom	956	9.8%	L	
				S	SspbFDom	454	4.7%	M	
				S	SMHePiSp	329	3.4%	L	
				S	SbFDom	89	0.9%	E	
				S	SwSDom	14	0.1%	E	
				M	MIHwSH	2,213	22.7%	M	
				M	MIHwHS	1,591	16.3 %	E	
				M	MTHw	145	1.5 %	L	
				H	HIHw	714	7.3%	E	
				H	HITHW	135	1.4%	L	
				H	HTHW	117	1.2%	L	
Total						**9,756**	**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 Sable 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 Oak Hills and Hummocks	WCHO WCKK	Frequent Frequent	rO wP rP	S	SrSbSDom	637	7.8%	E/L	**Well-drained** early/mid: - rM, wB - rO, rM, wP - rO - barrens late: - rO - barrens **Moist** early/mid/late: bS
				S	SpiDom	584	7.1%	L	
				S	SspbFDom	462	5.6%	M	
				S	SMHePiSp	167	2.0%	L	
				S	SbFDom	107	1.3%	E	
				S	SwSDom	22	0.2%	E	
				M	MIHwSH	1,987	24.2%	M	
				M	MIHwHS	1,399	17.0%	M	
				M	MTHw	166	2.0%	L	
				H	HIHw	1,735	21.1%	E	
				H	HITHw	649	7.9%	M	
				H	HTHw	296	3.6%	L	
Total						**8,212**	**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 Sable 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 IMDM	Gap Infrequent	rS eH wP sM yB Be rS eH wP	S	SMHePiSp	473	10.6%	L	**Well-drained** Early: - rM, wB mid: - rS - rS, bF - rS, wP late: - rS, eH, wP - eH - eH, wP **Moist** early/mid/late: - bS - eH - wP
				S	SPiDom	461	10.3%	M	
				S	SrSbSDom	390	8.7%	M	
				S	SSpbFDom	286	6.4%	L	
				S	SbFDom	129	2.9%	E	
				S	SwSDom	21	0.5%	E	
				M	MIHwSH	1,323	29.7%	M	
				M	MIHwHS	627	14.1%	E	
				M	MTHw	61	1.4%	L	
				H	HIHw	381	8.5%	E	
				H	HITHw	250	5.6%	M	
				H	HTHw	55	1.2%	L	
Total						**4,455**	**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
bS wP	173,739	59.0%	419,644	24.9%
rS eH wP	34,522	11.7%	616,727	36.6%
rO wP rP	9,485	3.2%	53,643	3.2%
rM	6,718	2.3%	12,902	0.8%
bS	6,085	2.1%	75,102	4.5%
rS eH wP sM yB Be	2,893	1.0%	187,322	11.1%
Total	**233,442**	**79.3%***	**1,365,340**	**81.1%****

*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
Spruce Pine Hummocks (Matrix)	153,475	12,516	132,123	1,386	1,593	5,857	113,418 to 116,347	74 to 76
Wetlands	63,403	11,100	50,232	185	877	1,010	49,070 to 49,575	77 to 78
Spruce Hemlock Pine Hummocks and Hills	31,450	1,876	26,376	386	586	2,226	22,311 to 23,424	71 to 74
Valley Corridors	14,987	1,807	12,213	79	688	200	11,036 to 11,136	73 to 74
Pine Oak Hills and Hummocks	9,169	844	7,463	83	589	191	6,509 to 6,605	71 to 72
Tolerant Mixedwood Drumlins	4,965	56	4,175	70	140	524	3,335 to 3,597	67 to 72
Total	**277,449**	**28,198**	**232,582**	**2,189**	**4,473**	**10,007**	**205,694 to 210,697**	**74 to 76**

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
ICHO	18,287	312	17,037	174	448	316	13,212 to 13,370	72 to 73
ICSM	4,365	177	3,747	26	271	145	3,029 to 3,102	69 to 71
IMDM	2,383	0	2,039	61	80	203	1,595 to 1,697	67 to 71
IMHO	113,050	9,803	95,873	1,204	1,247	4,923	83,239 to 85,701	74 to 76
IMSM	29,233	2,993	25,146	56	249	779	22,062 to 22,451	75 to 77
PMHO	20,284	1,301	17,991	56	451	485	14,930 to 15,172	74 to 75
WCHO	7,932	638	6,382	85	636	191	5,493 to 5,589	69 to 70
WCKK	1,553	248	1,289	0	15	1	1,215	78
WMDM	2,893	56	2,417	9	79	332	1,953 to 2,119	68 to 73
WMHO	32,139	1,919	26,984	387	612	2,238	22,813 to 23,931	71 to 74
WTLD	45,363	10,760	33,691	131	385	396	36,160 to 36,358	80
Total	**277,481**	**28,206**	**232,593**	**2,189**	**4,473**	**10,009**	**205,701 to 210,706**	**74 to 76**

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 diversity of plants, animals, and other living organisms, in all their forms and level of organization, including genes, species, ecosystems, and the evolutionary and functional process that link them.
Canopy	The uppermost continuous layer of branches and foliage in a stand of trees.
Climax forest community	A relatively stable and self-perpetuating forest community condition that maintains itself (more or less) until stand-level disturbance causes a return to an earlier successional stage. The final stage of natural succession for its environment.
Climax vegetation	A forest or non-forest community that represents the final stage of natural succession for its environment.
Coarse filter approach	A habitat-based approach to conserving biodiversity by maintaining a natural diversity of structures within stands, and representation of ecosystems across landscapes. The intent is to meet the habitat requirements of most native species over time. Usually combined with a fine filter approach to conserve specific rare species and ecosystems.
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.)
Pre-commercial 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 activities or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

Literature Referenced

Bruce, J. and B. Stewart. 2005. Development of a "road index" for landscape level assessment of linear transportation features using density, distance, and class measures. Unpublished report.

Diaz, N. and D. Apostol. 1992. Forest landscape analysis and design: a process for developing and implementing land management objectives for landscape patterns. R6 ECO-TP-043-92. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region.

Duke, T. and L. Benjamin. 2005. Forest / wildlife habitat and management guide, 560 – Chignecto Ridges. Department of Natural Resources, Kentville. Internal report. 15pp.

Dunster, J. and K., Dunster. 1996. Dictionary of natural resource management. UBC Press. 363 pp.

Fenow, B.E. 1912. Forest Conditions of Nova Scotia. 93 pp.

Forman, R.T.T. 2004. Road ecology's promise: what's around the bend? Environment 46(4):8-21.

Forman, R.T.T. and R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (USA) suburban highway. Conservation Biology 14: 36-46.

Forman, R.T.T. 1999. Spatial models as an emerging foundation of road system ecology, and a handle for transportation planning and policy. In Proceeding of the Third International Conference on Wildlife Ecology and Transportation, edited by G.L.Evink, P.Garrett, and D.Zeigler, 118-123. Tallahassee, Florida: Florida DOT.

Lindenmayer, D. B. and J. F. Franklin. 2002. Conserving forest biodiversity: a comprehensive multi-scaled approach. Island Press. ISBN 1-55963-935-0. 351 pp.

Methven, I. and M. Kendrick. 1995. A Disturbance History Analysis of the Fundy Model Forest Area. 16pp.

Mailman, G. E. 1975. Tobeatic Resource Management Area Land Inventory. Nova Scotia Department of Natural Resources.

Neily, P. and E. Quigley. 2005. Natural disturbance ecology in the forests of Nova Scotia. Ecosystem Management Group, Department of Natural Resources, Truro. Unpublished report.

Neily, P., E. Quigley, L. Benjamin, B. Stewart, and T. Duke. 2003. Ecological land classification for Nova Scotia. Vol. 1 - mapping Nova Scotia's terrestrial ecosystems. Nova Scotia Dept. of Natural Resources, Forestry Division, Truro. 83 pp.

Nova Scotia Department of Natural Resources. 2006. Guidelines for the development of long range management frameworks. Nova Scotia Department of Natural Resources, Regional Services, Halifax. 33 pp.

Nova Scotia Department of Natural Resources. 2002. Wildlife Habitat and Watercourses Protection Regulations. Section 40 of the Forests Act R.S.N.S. 1989, c. 179 O.I.C. 2001-528 (November 15, 2001, effective January 14, 2002), N.S. Reg. 138/2001 as amended by O.I.C. 2002-609 (December 20, 2002), N.S. Reg. 166/2002 http://www.gov.ns.ca/natr/wildlife/habitats/protection/

Reed, R.A., J.Johnson-Barnard, and W.L. Baker. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. Conservation Biology 10:1098-1106.

Seymour, R. S. and M. L. Hunter, Jr. 1999. Principles of Forest Ecology. Chapter 2. In: M.L. Hunter Jr. Ed. Maintaining Biodiversity in Forest Ecosystems. 698 pp.

Spellerberg, I.F. 1998. Ecological effects of roads and traffic: a literature review. Global Ecology & Biogeography Letters 7, 317-333.

Stewart, B. and P. Neily. 2008. A procedural guide for ecological landscape analysis. Department of Natural Resources, Truro. Report for 2008-2.

Strang, R. M. 1972. Ecology and land use of barrens of Western Nova Scotia. Canadian Journal of Forest Resources. 2(3): 276-290.

USDA Forest Service.1999. Roads analysis: informing decisions about managing the national forest transportation system. Misc. Rep FS-643. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 222 p.