Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS INVERNESS LOWLANDS ECODISTRICT 320

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2015-320

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 320: Inverness Lowlands

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

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (1997-1999) – 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 2015-320

Table of Contents – Part 3

Theme Maps Available on Website

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

This in-depth Ecological Landscape Analysis (ELA) report is a lightly edited version of the original ELA produced by the 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 seven distinctive elements in the Inverness Lowlands Ecodistrict – six patches and a corridor. A matrix is the dominant element, but in this ecodistrict there was not an obvious matrix. Inverness Lowlands is basically a valley-driven landscape with isolated areas from one end to the other. The main connection is through other ecodistricts, such as the adjoining Cape Breton Hills 310. 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 Fir Hills and Hemlocks is the largest patch element, representing 42% of the ecodistrict. The forests are dominated by black spruce, white spruce, and balsam fir.

Tolerant Hardwood Hills, representing nearly 35% of the ecodistrict, is the second largest patch element. Shade-tolerant hardwood species typical of the Acadian Forest, such as sugar maple, yellow birch and beech, dominate.

The **Floodplain** element, representing 5% of the ecodistrict, is associated with the major rivers. Alluvial deposits occur due to flooding.

The other patch elements, in order of size, are **Wetlands**, **Salt Marsh**, and **Coastal Beach**.

Valley Corridors is a linear element associated with major watercourses in the ecodistrict.

Flow – Element Interactions (Appendix 1; Map 2)

Flow phenomena are the features that move across and through landscapes. They can be energy or material, living or non-living. Diaz and Apostol (1992) suggest that the most relevant flows for landscape analysis may include water, wind, fire, animals, plants, and humans. The following flows were considered in the analysis of this ecodistrict and are described in Appendix 1: deer, humans, anadromous fish, aquatic furbearers, and migratory birds.

There is a natural percolation or movement throughout the ecodistrict, but more specific locations of the flow phenomena are shown in Map 2. One of the more well-defined flows is humans.

River corridors promote connectivity.

The main purpose in describing flows, and their relationship to the elements, is to provide insight into the

role of each element. This will inform understanding of each element's contribution to overall landscape function.

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

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

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

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.

Initiatives to improve connectivity could include:

- Mitigating the potentially negative barrier effects of concentrated land use in the valley corridors by sustaining and restoring natural communities in key areas such as those identified during the landscape analysis.
- Enhancing connectivity between conservation areas by applying appropriate medium and high biodiversity emphasis standards when managing areas with natural linkage potential.
- Improving ecoregional connectivity by sustaining and restoring natural conditions at important linkage points among ecodistricts.

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

Most of the landscape flows identified (Appendix 1) are also linkages to adjacent areas or ecodistricts (Map 2).

Future management activities will recognize significant links to neighbouring ecodistricts and manage the 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%

In Inverness Lowlands, frequent and gap are the two most common natural disturbance regimes.

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 Inverness Lowlands

Element	Seral Stage					
	Early	%*	Middle	%	Late	%
Spruce Fir Hills and Hummocks	IH4, SH8, SP8, SP10	29.0	SH10, SP6	33.0	SP4, SP5, SP7	27.0
Tolerant Hardwood Hills	IH5, IH6, IH7, MW5	14.0	MW4, TH8	39.0	TH1, TH2, TH3, TH4, TH5	38.0
Floodplain	OF1, OF2, OF4, OF5, FP4	27.0	FP3, FP6	33.0	FP1	33.0
Salt Marsh	Grasslands of Spartina spp.					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	FP3, WC1, WC2, WC6, WC7, WD1, WD2, WD3, WD5, WD6, WD7, 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.

In the Inverness Lowlands Ecodistrict, the overall EEI is 47 to 52 (Appendices 12a and 12b). This range suggests that the intensity of land use may be of concern as far as its impact on biodiversity.

About 56% of the land falls in the extensive EEC. This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

About 31% of the ecodistrict has been converted. This is land that has been changed to an unnatural state for human use, mostly settlements, farms, urban development, and transportation and utility corridors.

The reserve class accounts for 2% of the area and is divided into two categories: legal reserves and policy reserves. The legal reserves are those areas that have legal status under in IUCN (The International Union for the Conservation of Nature and Natural Resources) codes of I, II, or III such as wilderness areas, protected beaches, and designated provincial parks. The second type of reserves is those set aside under various provincial policies, such as the Old Forest Policy.

About 1% of the ecodistrict falls in the intensive class, representing lands managed intensively to optimize resource production from sites maintained in a native forested state. Management may eliminate or reduce the duration of some development processes, particularly old forest stages, and may include exotic species, old field spruce and monoculture plantations. Despite intensive practices, these lands are an important component of landscape structure and composition.

The remaining 10% is unclassified.

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.

Inverness Lowlands has an overall Road Index value of 11 (Appendix 7, Table 3), which falls within the Forest Resource Index range of 7 to 15, accounting for 35% of the ecodistrict (Appendix 7, Table 2). Mixed Rural is the largest class at 40%. Nearly 18% of the ecodistrict has a Remote Index.

The highest road densities occur around settlements and the major transportation systems. The Coastal Beach element, with an RI of 31, and the Salt Marsh element, with an RI of 28, have the highest road indices.

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 was 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).*

Species at risk listed under the NSESA that occur within the Inverness Lowlands Ecodistrict include eight endangered, three threatened, and two vulnerable species.

Endangered species found within the ecodistrict include Canada lynx (Lynx canadensis) and little brown bat (*Myotis lucifugus*) as well as five bird species: Bicknell's thrush (*Catharus bicknelli*), piping plover (*Charadrius melodus melodus*), rusty blackbird (*Euphagus carolinus*), barn swallow (*Hirundo rustica*), and Canada warbler (*Wilsonia Canadensis*). One endangered plant, sage willow (*Salix candida*), is also found within the ecodistict. Common nighthawk (*Chordeiles minor*), olive-sided flycatcher (*Contopus cooperi*), and black ash (*Fraximus nigra*) are listed as threatened. Both the eastern wood peewee (*Contopus virens*) and the bobolink (*Dolichonyx oryzivorus*) are listed as vulnerable under the NSESA.

Although not yet listed under the NSESA, several COSEWIC (Committee of the Status of Endangered Wildlife in Canada)-listed species are found in the Inverness Lowlands Ecodistrict, including bank swallow (*Riparia riparia*; threatened), Atlantic salmon – Eastern Cape Breton population (*Samlo salar*; endangered) and Atlantic salmon – Gaspé - Southern Gulf of St. Lawrence population (*Salmo salar*; special concern).

In addition to the listed species, the national General Status process also identifies two red-status species, 46 orange-status species, 72 yellow-status species, 33 green-status species, and 11 undetermined species for a total of for a total of 164 other species of conservation concern in this ecodistrict (some green species are included because of their Atlantic Canada Conservation Data

Centre rank). These species include four mammals, one amphibian, 22 species of birds, four mosses, one mollusk, nine butterflies, four dragonflies, 15 ferns, 65 dicots, and 45 monocots.

Wildlife Habitat

Inverness Lowlands is a small, irregularly-shaped ecodistrict along the river valleys of seven of the main rivers in Inverness County as well as along the shores of Lake Ainslie.

The rivers include the Skye, Mabou, Southwest Mabou, Hays, Southwest Margaree, Northeast Margaree, and Middle. The Mabou, Southwest Mabou, and both Margaree rivers drain northwesterly into the Gulf of St. Lawrence. Hays River drains northwesterly into Lake Ainslie and both the Skye and Middle rivers drain southerly into Bras d'Or Lake.

The fertile soils along the county waterways led to early occupation by the pioneer settlers. The area was heavily farmed by these early pioneers who established communities at Margaree, Mabou, Whycocomagh, and Middle River. Many of these farms have since been abandoned. Currently, 54% of the area is forested and 12% is in agriculture.

Spruce Fir Hills and Hemlocks is the largest patch element, representing 42% of the ecodistrict. The forests are dominated by black spruce, white spruce, and balsam fir. Tolerant Hardwood Hills, representing 35% of the ecodistrict, is the second largest patch element. Shade-tolerant hardwood species typical of the Acadian Forest, such as sugar maple, yellow birch and beech, dominate.

Mammals

The mammal fauna of Cape Breton Island is somewhat less diverse than that of mainland Nova Scotia. Species common on the mainland but not present on Cape Breton Island include striped skunk (*Mephitis mephitis*), woodchuck (*Marmota monax*), and porcupine (*Erethizon dorsatum*). Raccoons (*Procyon lotor*) are a relatively more recent addition to the mammal fauna, having been recorded as not present in Cape Breton at least up until the late 1950s and probably later.

In 2002, the first fisher (*Martes pennanti*) was trapped in the Margaree area. Fishers have since spread out across the northern section of the island.

The eastern coyote (*Canis latrans*), the most recent addition to Nova Scotia's mammal fauna, was first recorded for Cape Breton in the early 1980s.

Moose (*Alces alces*) was an abundant and dominate animal in the region prior to the arrival of the first European settlers. By 1825, as a result of over-harvesting for commercial and subsistence purposes, the population was in serious decline. Moose appeared to have disappeared from Cape Breton by the early 20th century. In 1928 and 1929, seven mainland moose were introduced into the Highlands but this introduction was unsuccessful.

From 1947 to 1948, 18 moose from Elk Island National Park in Alberta were released in the Cape Breton National Park. This introduction was successful. The population showed a slow increase until the late 1970s and the early 1980s. At this, time a severe spruce budworm (*Choristoneura*

fumiferana) outbreak changed the habitat by killing a large percentage of the mature balsam fir. The resulting increase in regeneration provided an abundance of food for the moose and the population exploded.

Moose presently number in the thousands, direct descendants of the last reintroduction. Currently, moose are common in the northern areas of the ecodistrict around Chéticamp, Margaree, and the Middle River Valley. There has been a licensed lottery hunt for the moose in Inverness and Victoria counties since 1986. In recent years, 345 licenses have been issued with the overall success rate around 90%. There is also a First Nations harvest that has been going on for a number of years.

White-tailed deer (*Odocoileus virginianus*) can carry a nematode (*Parelaphostrongylus tenuis*) that is commonly known as brainworm. This worm has no apparent effect on the deer, but when ingested by moose it can travel to the spinal cord and brain causing significant neurological problems and even death. This may restrict moose numbers in the lowland areas where deer numbers are greatest.

White-tailed deer were once very abundant in this ecodistrict. During the 1960s, 1970s, and 1980s, it was not unusual to see 50 to 60 deer in fields on an evening drive through the area. Since 1990, deer numbers have severely declined. A period of long cold winters, reduction of winter cover and arrival of the coyote have all contributed to the decline in deer numbers and are responsible in part for keeping the recovery slower than in other parts of the province.

There are five deer wintering areas that are partly in the ecodistrict and the surrounding hills that form the boundary of the ecodistrict. These areas are found at Big Intervale, Rankinville, North Ainslie, Trout Brook, and Egypt Road. Special management practices for deer wintering areas are in place to help maintain these areas of important deer cover.

Black bear (*Ursus americanus*) have increased in number over the past decade. They are common in most areas of the ecodistrict, yet black bear are rarely seen by residents. In the spring, however, some young bears will venture close to humans searching for food after their hibernation. Bear can be legally harvested by snaring or hunting in a season that runs for approximately three months.

Canada lynx (*Lynx canadensis*) is a red-listed species and is listed as endangered under the NSESA. Lynx formerly occurred in areas of suitable habitat across mainland Nova Scotia and Cape Breton Island. Although lynx may be found from time to time almost anywhere on Cape Breton Island, the animal reaches its highest densities in the Cape Breton Highlands. The current population is very small.

Because snowshoe hare (*Lepus americanus*) are primary prey of the lynx, numbers of lynx fluctuate over time, roughly tracking density of hare. As hare populations in the highlands decline, lynx may disperse into adjoining lowland areas, including Inverness Lowlands, in search of prey. Historic and current threats to lynx include forest harvesting, competition from bobcats and coyotes, habitat loss to development, disease, and climate change.

American marten (*Martes americanus*) is a small carnivore of temperate and boreal forests that feeds primarily on red squirrel (*Sciurus vulgaris*), small mammals such as mice and voles, as well snowshoe hare. Marten are listed as endangered. The Cape Breton population of marten is very small and there has been extensive loss and degradation of suitable habitat.

Marten were trapped extensively throughout Nova Scotia since the 1700s until the season was closed in the early 1900s due to low numbers. The species was thought to have been extirpated from the mainland and several re-introductions were attempted in the past. There have been recent records of marten in Southwest Nova Scotia. However, the status of the marten on the mainland is considered "data deficient."

Historically known in Cape Breton only from the highlands, a marten population augmentation program was conducted between 2007 and 2010 when 135 marten from New Brunswick were released into Cape Breton. If the population responds as expected, marten should become more common throughout lowland Cape Breton.

Birds

Since all the lands of Inverness Lowlands are in close proximity to water, it would be expected that birds that rely on water for their food or nesting would be common.

The bald eagle (*Haliaeetus leucocephalus*) is found in good numbers throughout this ecodistrict. Because eagles in Cape Breton feed mostly on fish during the nesting season, nests are found along all the river systems as well as along the shores of Lake Ainslie. Nests are typically situated in large "super-canopy" trees, often along steep valleys and often associated with a stream.

White pine is the most common tree species used by eagles for nesting although other species of either coniferous tree (e.g. hemlock) or deciduous tree (e.g. aspen) are also used. Although a nest may be abandoned over time as individual trees become decadent, the nesting pair will usually re-locate to an adjacent tree when the old nest becomes unusable.

Eagles tend to return to the same forest stands to nest year after year as long as suitable nest trees and other habitat requisites are met.

While nesting eagles are sensitive to forest harvesting and other disturbance during the nesting season, they will tolerate significant disturbance as long as it is part of the normal cadence of activity in the area. New or unusual activity, however, may cause a nest to be abandoned. The dependence of eagles on suitable stands of nest trees may be locally limiting to nesting eagles in the Inverness lowlands as forest harvesting and land clearing for agriculture occur. Bald eagles are protected under the Nova Scotia Wildlife Act.

Other common forest nesting raptors in the Inverness Lowlands Ecodistrict include ospreys, hawks, and owls. Ospreys (*Pandion haliaetus*), which feed almost exclusively on fish, nest in softwood trees along the shoreline of Lake Ainslie and along the many rivers of the district. Ospreys may be encountered during eagle surveys and nests are incidentally recorded. The osprey is Nova Scotia's official bird.

The common loon (*Gavia immer* – NS orange) is an expert swimmer and diver. The loon's feet are located far back on the body, resulting in restricted mobility on land. The loon builds its nest along the shore close to water or on a floating mass of vegetation attached to reeds. Loons can be found nesting at Lake Ainslie near Black River and Trout Brook as well as on the lakes at the Lake O'Laws. Their haunting cry is thought by many to be a sign of true wilderness.

Several large beaches in the ecodistrict are home to many shorebirds. Piping plover (*Charadrius melodus*) is a small shorebird that is listed as endangered both federally and provincially. It is protected under the Federal Species at Risk Act and NSESA. Over the last several years, one to three pair nested on the beach at West Mabou Harbour. Recently, an unconfirmed report had a pair of plovers with chicks on the beach at Inverness.

In Nova Scotia, only about 50 breeding pairs of piping plovers remain. These birds are dispersed around the province on about 20 sand beaches. Despite concerted conservation efforts here and elsewhere in North America, the numbers of this species remain low. The main reasons for this include deterioration of marginal nesting habitat due to natural events (storms, vegetation succession), human alteration of beach habitat, human disturbance during nesting, and predation by birds and mammals on eggs and young.

The beaches are also act as staging areas for many migrating shorebirds. Groups of semipalmated plover (*Charadrius semipalmatus*), sanderlings (*Calidris alba*), and semipalmated sandpipers (*Calidris pusilla*) may be seen travelling the beaches for food in the fall as they make their way south.

Chéticamp Island is the home to a number of bird colonies. Black-legged kittiwakes *(Rissa tridactyla*) and great cormorants (*Phalacrocorax carbo*), both Nova Scotia yellow-listed species, nest on the cliffs of the island. Bank swallows (*Riparia riparia*), which are listed by COSEWIC as threatened, makes their nests by burrowing into the soil at the top edge of the cliffs. They are also seen at Inverness and West Mabou Harbour.

Black quillemot (*Cepphus grille*) nest along the rocky coast of the island. Terns, both arctic tern (*Sterna paradisaea*) and common tern (*Sterna hirundo* – yellow-listed NSESA), are found on the points at both ends of the island. Terns are also found at Margaree Harbour and Mabou Harbour.

Chéticamp Island is listed as an important bird area because of the number of birds that nest there. Great blue heron (*Ardea herodias*) have colonies in the area around Whycocomagh, Margaree, and Chéticamp. The herons can be seen feeding along the Margaree River and the shoreline of Lake Ainslie.

Insectivores, such as chimney swift (*Chaetura pelagica* – endangered NSESA) and barn swallow (*Hirunda rustica* – endangered NSESA), are reported in the Margaree and Chéticamp areas. Populations of these insectivores are generally declining across their range. The general cause of the decline is thought to be changes in the food supply and climate change.

Amphibians and Reptiles

Wood turtle (*Glyptemys insculpta*) is listed as endangered under NSESA. Turtles have been found nesting along the Skye River in Inverness Lowlands. Larger populations of this turtle are along the River Denys and River Inhabitants in Bras d'Or Lowlands Ecodistrict 510. Painted turtle (*Chrysemys picta*) has been reported in several ponds in the Margaree area; however, these are believed to be turtles that have escape captivity. Four-toed salamander (*Hemidactylium scutatum)* was once listed as yellow in the province but because of a number of new records, this salamander is now is listed as green. The four-toed salamander has been recorded at Hays River.

Fish

Atlantic salmon (*Salmo salar*) is of great importance to the local area. Salmon start their life as an egg in their home river. These fish spend from one to eight years in the river. Salmon begin a process called smoltification when ready to head to sea. This process of change gets them ready for their life in salt water. Salmon spend several years at sea. When large enough, salmon return to their natal rivers, as grilse, to spawn.

The Northeast Margaree River and the Southwest Margaree River are renowned for their Atlantic salmon angling. This recreational fishery adds a great deal to the local economy. Salmon can also be found in all the other main rivers in the ecodistrict but in much smaller numbers.

Salmon are designated in this area into two units. The Gaspé-Southern Gulf of St. Lawrence population, with rivers draining into the Gulf of St. Lawrence, has salmon designated as endangered by COSEWIC. The Eastern Cape Breton population, with rivers draining into the area from Meat Cove to Canso, has salmon designated as special concern by COSEWIC.

Rainbow trout (*Oncorhynchus mykiss*), although not indigenous to the area, can be caught in both the Middle River and Skye River. Speckled trout (*Salvelinus fontinalis*) are found in all the rivers and streams of the ecodistrict and provide another important recreational fishery.

Striped bass (*Morone saxatilis*) are common in the Mabou and Southwest Mabou rivers. Reports now indicate that bass are spreading throughout Bras d'Or Lake as well.

Alewife (*Alosa pseudoharengus*), locally known as gaspereau, are commercially fished in the Northeast and Southwest Margaree rivers. Fishermen use weirs to trap the fish as they migrate up the rivers to their main spawning area in Lake Ainslie. Most of the fish are packed in vats and pails for export.

Freshwater Mussels

Among the five species of freshwater mussels found in Inverness Lowlands, eastern lampmussel (*Lampsilis radiata*) is listed as yellow by DNR. The lampmussel and the alewife floater (*Anodonta implicata*) occur in the Northeast Margaree River, Southeast Margaree River, and Hays River at Lake Ainslie. The distribution of the alewife floater is controlled by its host fish, the alewife. The eastern floater (*Margaritifera margaritifera*), eastern elliptio (*Elliptio complanata*),

and eastern pearlshell (*Margaritifera margaritifera*) can be found at many sites throughout the area. All three mussels can be found in the Northeast and Southwest Margaree rivers. Muskrats find these mussels a tasty treat.

Dragonflies and Damselflies

A considerable amount of data has been amassed on dragonflies and damselflies (collectively Odonates) for Cape Breton Island, largely by the efforts of a few very dedicated collectors. The most extensive Odonate collections for Cape Breton are available from Inverness and Victoria counties, including Inverness Lowlands.

Of the species collected, brook snaketail (*Ophiogomphus aspersus*) and forcipate emerald (*Somatochlora forcipata*) are listed as may be at risk (orange) in the provincial general status. Brook snaketail is a species usually found near clear, cool, rapid streams. Brook snaketail has been collected on the Southwest Margaree River. The forcipate emerald is a beautiful dragonfly with bright green eyes and is found in small, spring-fed boggy streams. This emerald has been collected at MacDonalds Brook in Middle River.

Two other dragonflies of conservation concern have been recorded in the ecodistrict. Northern pigmy clubtail (*Lanthus parvulus*) and riffle snaketail (*Ophiogomphus carolus*) are listed as uncommon by DNR. Both species are found in the Margaree area.

Butterflies

The Maritime Butterfly Atlas has been ongoing since 2010 and the last year of data collection was 2014. These efforts have provided a considerable amount of information on butterflies in all areas of the Maritimes. Currently there are 71 species of butterflies in Nova Scotia, many of which occur in Cape Breton.

In the Inverness Lowlands Ecodistrict, there are nine species that are listed as species of conservation concern. Salt marsh copper (*Lycaena dospassosi*) is one of only five butterfly species that is endemic to Canada and is listed as at risk (red) provincially. This species can be found in the drier parts of salt marshes where its host plant, Eged's silverweed (*Argentina egedii*), can be found. Salt marsh copper has been recorded at West Mabou Harbour. Short-tailed swallowtail (*Papilio brevicauda*) is listed as at risk (red) and is found in coastal areas and headlands where its host plant scotch lovage (*Ligusticum scoticum*) is found; records show it has been recorded at Belle Côte, Margaree Forks and on Chéticamp Island.

Dorcas copper (*Lycaena Dorcas*) has been recorded at five sites on Cape Breton, one of which is at the Black River bog International Biological Preserve (IBP) site in the Inverness Lowlands; its status has not been assessed as the species is new to the province and only has several records. Dorcas copper's host plant is shrubby cinquefoil (*Dasiphora fruitcosa*). Another bog species, arctic jutta (*Oenies jutta*), listed as may be at risk (orange), was collected on a bog at Centreville. Two species, mustard white (*Pieris oleracea*) and northern cloudywing (*Thorybes pylades*) are listed as sensitive (yellow). Mustard white is common around Lake Ainslie and Chéticamp. Northern cloudywing can be seen in Middle River.

As the Maritime Butterfly Atlas project comes to an end in 2014 and the data is processed, more information on species distribution and abundance can be expected for the Inverness Lowlands Ecodistrict.

Plants

There are two species of plants that are listed as species at risk. Black ash (*Fraximus nigra*) is listed as threatened and sage willow (*Salix candida*) is listed as endangered. Black ash is a tree of open wet areas and is shade intolerant. Black ash has long been a staple in basket weaving and prized by the First Nations community. Records show black ash occurring in the Margaree Valley, near Margaree Forks and along the Mabou River. Sage willow is a rare plant of limestone-based bogs and thickets. Sage willow occurs at Black River bog in the IBP site.

A total of 38 Nova Scotia orange-listed, 50 Nova Scotia yellow-listed, and five undetermined (insufficient data to define status) plants are known from Inverness Lowlands.

As well there are 28 species that are listed as S3 uncommon. There are several sites that have notable concentrations of plant species of conservation concern but many areas have not been surveyed in recent years.

The area around the Black River bog site is a very important site for rare plants. The Black River bog is an alkaline bog and is afforded protection as an IBP. The bog has a number of species of conservation concern including nine orange-listed species: brook lobelia (*Lobelia kalmii*), greenish sedge (*Carex viridula*), slender beakrush (*Rhynchospora gracilenta*), sticky false asphodel (*Triantha glutinosa*), showy lady's slipper (*Cypripedium reginae*), few-flowered spikerush (*Eleocharis quinqueflora*), southern twayblade (*Listera australis*), cuckoo flower (*Cardamine pratensis*), and northern bog sedge (*Carex gynocrates*).

Six yellow-listed plants are found in this bog area; Labrador bedstraw (*Galium labradoricum*), alder-leaved buckthorn (*Rhamnus alnifolia*), bog birch (*Betula pumila*), blunt-leaved pondweed (*Potamogeton obtusifolius*), water beggarticks (*Megalodonta beckii*), and flat-stemmed pondweed (*Potamogetan zosteriformis*). Swamp milkweed (*Asclepias incarnate ssp. pulchra*) is an undetermined species found at this site. Undetermined means there is not sufficient data to determine its provincial status.

In the vicinity of Chéticamp, Canada anemone (*Anemone canadensis*), sticky false asphodel, and showy lady's slipper can be found. All three species are listed as may be at risk (orange). As well, three yellow-listed and three S3 uncommon species are found in the area. Whorled water milfoil (*Myriophyllum verticillatum*), dudley's rush (*Juncus dudleyi*), and showy lady's slipper are recorded in the gypsum areas of Belle-Marche.

Several other plants whose status have yet to be determined can be found at Chéticamp; large purple fringed orchid (*Rhamnus alnifolia*), narrow false oats (*Trisetum spicatum*), and bulblet bladder fern (*Cystpteris bulbifera*). Three-leaved pondweed *(Stuckenia filiformis*), an undetermined species, is recorded on Chéticamp Island.

Near Cheticamp Harbour, there are spurred gentian (*Halenia deflexa ssp. brentoniana*); status undetermined.

Margaree Valley hosts northern blueberry (*Vaccinium boreale*), which is listed as orange in the province. Several yellow-listed species, such as short-awned foxtail (*Alopecurus aequalis*), yellow marsh marigold (*Caltha palustris*), and false mermaidweed (*Floerkea proserpinacoides*), grow in the valley along the Northeast Margaree River.

Along the Southwest Margaree River, heading to Lake Ainslie, a number of rare plants are recorded. Clustered sanicle (*Sanicula odorata*), an orange-listed species, is found there. In the same area, several yellow-listed plants occur, such as short-awned foxtail, false mermaidweed, and Canada lily (*Lilium canadense*).

Around the shore of Lake Ainslie, other species include yellow-listed southern twaybalde and S3 uncommon loesel's twayblade (*Liparis loselii*) at Hays River. At Kenloch, near the north end of the lake, orange-listed slender blue flag (*Iris prismatica*) and an uncommon species, swamp milkweed, are recorded. At the east end of the lake, orange-listed porcupine sedge (*Carex hytericina*) is found.

The area along the Mabou River near Rankinville has yielded a number of plant records. Among them are the orange-listed species smooth sweet cicely (*Osmorhiza longistylis*), as well as the yellow-listed species pale jewelweed (*Impatiens pallida*) and orange-listed fruited tinker's weed (*Triosteum aurantiacum)*. Northern bog violet (*Viola nephrophylla*), yellow listed, is recorded near Glenora.

In the area along the Middle River, south of the Lake O'Laws, there are several interesting plant records. Near Goldbrook, records show the orange-listed northern blueberry, as well as yellow-listed Canada lily and wood anemone (*Anemone quinquefolia*). Wood anemone is also found further south along the river at Upper Middle River. Yellow listed orange-fruited tinker's weed is found near "the churches" in Middle River.

Investigations in the Inverness Lowlands have documented four yellow-listed mosses.

Restricted and Limited Use Lands

Among areas identified in the Restricted and Limited Use Lands Database there are portions three First Nations reserves within the Inverness Lowlands Ecodistrict – small portions of two large reserves in Waycobah and Wagmatcook as well as a small reserve along the Margaree River near Margaree Forks.

Karst topography can be seen in Belle-Marche and Margaree Centre. These areas have large gypsum concentrations. As well, there are several gypsum caves of note along the river in Margaree Centre.

Two provincial wilderness areas (Margaree and Sugarloaf) fall partly within the boundaries of Inverness Lowlands Ecodistrict 320. Four provincial parks (West Mabou Beach, Southwest Margaree, Lake O'Law, and Mabou) are found in this ecodistrict as well as seven non-designated parks. There are three protected beaches (Margaree, Southwest Margaree, and Inverness) located in whole or in part in the Inverness Lowlands.

There is an IBP site located at the Black River bog on the north end of Lake Ainslie. The bog is an alkaline bog with many rare plant species.

A small section of Eastern Joint Venture lands is located at Loch Ban at the northern end of Lake Ainslie. Chéticamp Island is listed as an important bird area and is noted for many colonial nesting seabirds.

The 120-kilometre-long Margaree-Lake Ainslie system drains a watershed of nearly 120,000 hectares, from the plateau of the Cape Breton Highlands, to rich forested floodplains and farmland and, finally, the Gulf of St. Lawrence.

The Southwest Margaree originates in the largest natural lake in Nova Scotia – Lake Ainslie – and merges with the swifter Northeast Margaree at Margaree Forks. Both branches are renowned for their natural beauty and deep salmon pools. The clear waters of the upper reaches of the river system provide excellent spawning areas for Atlantic salmon and trout.

In 1998, the Margaree River system and Lake Ainslie, along with their watersheds, was designated as a Canadian Heritage River, following a comprehensive community consultation process that culminated in publication of Margaree-Lake Ainslie Canadian Heritage River Partnership Strategy. This strategy, which serves as the management document for the Margaree-Lake Ainslie Heritage River, is being implemented by the Margaree-Lake Ainslie Canadian Heritage River Society in cooperation with Nova Scotia Environment.

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

The Ecological Land Classification (ELC) 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.

Within the Inverness Lowlands Ecodistrict, there are eight ecosections (ICHO, IFSM, WCSM, WFDS, WFRD, WMDS, XXCB, and XXMS) that each comprise 2% or less of the ecodistrict area. These eight ecosections combined represent 2,677 hectares, or 5.5% of the ecodistrict.

Opportunities to address fine filter conservation issues include:

- Identifying uncommon forest species for which genetic viability may be threatened as indicated by DNR's General Status of Wildlife rating system – yellow and red listed

species. Many of these species are also listed under the provincial NSESA or the federal SARA and many of these have recovery plans in place to direct conservation actions.

- Identifying fine filter management opportunities related to conservation of significant habitats.
- Recognizing uncommon community conditions (e.g. old age, large live and dead trees and species associations).

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

320 Inverness Lowlands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Spruce Fir Hills and Hummocks (Patch)	ICHO IFHO IMHO WCHO	Frequent	black spruce (bS), balsam Fir (bF)
Tolerant Hardwood Hills (Patch)	WCKK WFDS WFHO WFKK WFRD WMDS WMHO WMKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Floodplain (Patch)	ICSM IFSM IMSM WCSM	Gap	sM, white Ash (wA), Elm (aE)
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Salt Marsh (Patch)	XXMS	Open Seral (Tidal Flooding)	Cordgrass
Coastal Beach (Patch)	XXCB	N/A	N/A
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. sands) **M** – Medium-textured soils (e.g. loams) **F** – Fine-textured soils (e.g. clays)

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

Ecological Representivity (Appendices 4, 5)

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

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

The IUCN is The World Conservation Union (formerly the International Union for the Conservation of Nature) which developed a standard 10-class international system for categorizing and reporting on the world's protected areas. Provincial parks, wilderness areas, and protected beaches are the legal reserves under the IUCN I, II or III accounting for 225 hectares (Appendix 4). The Provincial Old Growth Policy protects another 205 hectares of old forest on Crown land under policy reserves (Appendix 5). Combined with other reserve lands, 602 hectares of Crown lands receive legal reserve or policy reserve protection (Appendix 4).

ELA Summary

Element Interpretation (All appendices and maps)

Inverness Lowlands 320 is one of the smallest ecodistricts in the province with a total area of 48,833 hectares. The ecodistrict stretches from Chéticamp in the north to Mull River and Whycocomagh Bay in the south and includes the fault valleys of the Margaree and Middle rivers. The ecodistrict represents 5% of the Nova Scotia Uplands Ecoregion.

The area tends to be somewhat sheltered by the surrounding uplands (Cape Breton Hills 310 and Cape Breton Highlands 210), with the exception of the Chéticamp area where a combination of topography and temperature create a unique phenomenon, locally known as "*les suetes*."

A *suete* begins with winds blowing in off the Atlantic Ocean. When conditions are right, the swirling air molecules slide up the eastern slope of the Cape Breton Highlands, then begin the steep downward descent on the western side, gathering speed as they go. The strongest *suete* recorded, which struck on March 13, 1993, was officially clocked at 233 km/h.

The Margaree Valley is known for having some of the coldest temperatures and shortest recorded frost-free periods in the province.

The underlying geology comprises volcanic rocks, coal, sandstone, shale, gypsum, and limestone. The terrain comprises gently undulating to rolling low-lying areas and is suitable for farming.

North of the sandy ridges, Lake Ainslie lies in a basin among the hills and is the largest true (not created by hydro dams) lake in Nova Scotia. Another significant portion of the ecodistrict comprises freshwater wetlands, salt marshes, and coastal beaches.

Between Mabou and Inverness, erosion has created wide valleys, with steep slopes and gorges.

The first Europeans came to the area in the 1750s to establish fishing stations along the coast. Actual settlement began about 30 years later, with French emigrants settling in Chéticamp and United Empire Loyalists settling in Mabou.

Coal and gypsum have been mined at several locations.

Due to heavy settlement in this area, most of the original forest has been severely disturbed, especially on the intervale lands which account for almost 10% of the ecodistrict. On this intervale land, sugar maple, white ash, balsam poplar, and American elm formed the climax forest.

Extensive areas of black spruce forest are found on the moist soils of this ecodistrict. Where sheltered growing conditions are provided by the hills and uplands and where the soils are well-drained on slopes, tolerant hardwood forests of sugar maple, yellow birch, and beech will occur. Old field white spruce forests are common where agricultural land has been abandoned.

The softwood forests are susceptible to spruce budworm and bark beetles and these two insects have had a significant influence on forest composition in this ecodistrict. Blowdown of the shallow-rooted spruce forests, on the moist soils, is common throughout the ecodistrict. Fire would only be expected in the softwood forests that occur on the larger areas of the Middle and Margaree river valleys.

The hardwood forests have also experienced significant mortality with individual species succumbing to pathogens. The birch dieback was widespread in eastern Canada, occurring from about 1932 to 1955, with the exact cause never determined but a series of climatic events (drought and freeze/thaw) that eventually caused enough stress, followed by secondary agents such as fungi to cause tree mortality, are suspected. The beech canker, introduced to the province in the 1890s, has reduced the once dominant beech to a lower canopy species.

Other insects and diseases that cause individual tree mortality in hardwood species include the maple borer, cinder conk in yellow birch, and Dutch elm disease.

Wounds in trees caused by ice storms and subsequent breakage provide avenues for a variety of fungi to enter and weaken trees for subsequent breakage and blowdown.

Spruce Fir Hills and Hummocks

(Patch) (ICHO, IFHO, IMHO and WCHO ecosections) (17,845 ha)

This is a patch landscape element occurring on well to imperfectly drained hummocky terrain underlain by soils that range from coarse gravelly glacial fluvial outwash deposits to finer textured soils (clay loams). The forests tend to be dominated by black spruce with white spruce and balsam

fir. With progressively poorer drainage, black spruce, tamarack, and red maple dominate the forest vegetation and wetlands are embedded throughout the element.

Early successional forests tend to have a higher component of aspen, tamarack, and balsam fir but overall regenerating forests from stand-level harvesting will also include red maple, white birch, grey birch, and pin cherry. The dominant natural disturbances are frequent and result in primarily even-aged forests. Natural disturbances agents include fire, windthrow, and insects such as the spruce budworm if forests have a high component of balsam fir or white spruce.

Much of this element has a linear feature occurring along most of the major rivers and watercourses where the floodplain forest will be found embedded on the better well-drained alluvial soils (e.g. Broad Cove, Mull and Skye rivers).

Where the soils are glacial fluvial deposits with a high gravel content, the forest on the better sites will be tolerant hardwood, especially on sites closer to the lower slopes of the Cape Breton Hills.

Where periodic flooding occurs, floodplain forests are possible, especially on the wide glacial fluvial deposits along the Southwest and Northeast Margaree rivers. Elsewhere, black spruce with scattered white pine dominates on sites where deep, coarse-textured gravelly soils are inherently less fertile.

Another unique feature of this element is the karst landform that is associated with sites of fine-textured soils. Many rare and endangered plants, such as showy lady slipper, yellow lady slipper, and black ash, are found where gypsum is exposed on the surface. Areas underlain by gypsum can also support occurrences of these rare plants. Good examples are found along the shores of Lake Ainslie.

Flows

Humans (transportation, forest harvesting, aggregate, outdoor recreation, hunting, fishing, trapping, recreational off-highway vehicles (OHV)); deer (habitat, travelways, wintering areas, foraging); anadromous fish – salmon (water quality maintenance, riparian habitat); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Composition of Spruce Fir Hills and Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	36%	21%	43% (25 Mat + 18 OF)	18%
Seral Stage	Early	Mid	Late	Unclassified
	29%	33%	27%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	51%	13%	28%	8%

Desired Condition

Maintain a range of late seral softwood dominated stands to provide the habitat and forest structure associated with forests that are frequently disturbed by windthrow and forest insects (spruce budworm). There should be a variety of development classes and seral stages consistent with the natural disturbance regime (NDR).

Issues

This element has been desired for other land uses such as settlement, agriculture, and transportation corridors with about 23% altered to other land uses.

- Less than 2% of this element is in the reserve class.
- The desired level of mature, multi-aged and old forest is close to target levels.
- Approximately 25% of the well-drained gravelly coarse-textured soils associated with the outwash plains of the Margaree and Middle rivers has been converted to other land uses.
- Land use has fragmented the ecological connectivity of the element.
- Rare karst habitat is vulnerable to other land uses and endangered plants may be threatened.
- Imperfectly drained soils limit forest management options to clear cut harvesting.

Tolerant Hardwood Hills

(Patch) (WCKK, WFDS, WFHO, WFKK, WFRD, WMDS, WMHO and WMKK ecosections) (14,561 ha)

The low hills and hummocks that border the rivers and watercourses support a patch forest element comprising mid to late successional shade-tolerant hardwood forests typical of the Acadian Forest. Representative species include sugar maple, beech, yellow birch, and white ash, with ironwoodon the richer sites. Natural stand-level disturbances are rare and stands will usually maintain themselves through gap replacement leading to an uneven-aged climax forests and the opportunity to develop old forest characteristics.

Natural disturbance agents include hurricanes, ice storms, disease, and insects. This element occurs primarily on hilly topography and slopes underlain with well-drained soils of variable textures but generally of medium to rich fertility.

Seepage areas are common on the slopes and provide an important habitat for biodiversity. Under these closed canopy forests, the shrub layer consists of regenerating trees and shrubs such as fly honeysuckle and beaked hazelnut. These forests also have an abundant cover of ferns and club mosses.

The forests of this element currently reflect two province-wide disturbance events: the beech bark canker introduction around 1900 and the birch dieback of the 1940s. Beech is now primarily an understory species and yellow birch is gaining abundance.

Early Scottish settlers converted significant areas to farmland which, when abandoned, reforested naturally to white spruce.

Flows

Humans (transportation, forest harvesting, aggregate, outdoor recreation, hunting, fishing, trapping, recreational OHV); deer (habitat, travelways, wintering areas, foraging); anadromous fish – salmon (water quality maintenance, riparian habitat); aquatic furbearers (denning, travel, foraging); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	27%	27%	46% (31 Mat + 15 OF)	15%
Seral Stage	Early	Mid	Late	Unclassified
	14%	39%	38%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	43%	20%	33%	4%

Desired Condition

The desired condition of this element is to maintain a tolerant hardwood forest of late seral species such as sugar maple, yellow birch, and white ash with a component of red maple. Most of this forest should be in the mature, multi-aged, and old forest development class to maintain landscape level ecological functionality.

Issues

This element has historically been highly desirable for other land uses such as settlement, agriculture, and transportation corridors with about 30% currently altered to other land uses.

- Less than 2% of this element is in the reserve class.
- The desired level of mature, multi-age, and old forest significantly below target levels.
- Almost 43% of the element is in softwood forests, mostly old field white spruce, occurring on abandoned farmland.
- Land use has fragmented the ecological connectivity of the element.

Floodplain

(Patch) (ICSM, IFSM, IMSM and WCSM, ecosections) (2,151 ha)

The Floodplain element in this ecodistrict is associated with smooth, level terrain along the major rivers such as the Middle, Southwest Margaree, Northeast Margaree, and Skye as well as along larger streams. Alluvial deposits of sediment occur along these watercourses due to annual or periodic flooding.

These are linear, small patch-level areas with soils that range from coarse sandy loams to finer textured silt and clay loams that can be well to imperfectly drained.

The soils are usually stone free. The climax forest for this element, occurring on the better-drained alluvial soils, is the shade-tolerant hardwood forest of sugar maple, white ash, and elm (although this species has been almost eliminated due to the Dutch elm disease).

Small gap disturbances in this climax forest maintain a canopy that provides important functions along these watercourses. Earlier successional forests include balsam poplar, white ash, red maple, and white spruce.

The imperfectly drained soils support a forest comprised of black spruce that is subjected to frequent stand-level disturbances such as flooding and windthrow. As the soils get progressively wetter tamarack, red maple, willows, and alders become more abundant. Where soils could be farmed they have been converted to agriculture use, and when abandoned tend to reforest to white spruce and tamarack. Abandoned pastures on the imperfectly drained soils tend to regenerate with alders.

Floodplain forests can also be found embedded within the Spruce Fir Hills and Hummocks element along major watercourses, including the Broad Cove, Mull, Southwest Mabou and Mabou rivers. Rare and uncommon floodplain plants such as bloodroot, wild coffee, Canada lily, slender cliff brake as well as black ash are found in this element.

Flows

Humans (transportation, forest harvesting, aggregate, outdoor recreation, hunting, fishing, trapping, recreational OHV); deer (habitat, travelways, wintering areas, foraging); anadromous fish – salmon (water quality maintenance, riparian habitat); aquatic furbearers (denning, travel, foraging); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Floodplain

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	26%	17%	57% (36 Mat + 21 OF)	21%

Seral Stage	Early	Mid	Late	Unclassified
	27%	33%	33%	7%

Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	40%	22%	32%	6%

Desired Condition

Forests of floodplain species such as sugar maple, white ash, black cherry, red maple, and balsam poplar in a range of development classes and seral stages is desired to restore ecological functionality of this important linear feature of the ecodistrict.

Issues

This element has historically been highly desirable for the fertile lands associated with the floodplains and as such has been extensively cleared for agricultural use. Currently 28% is in other land uses. Mature natural forest is rare and existing floodplain forest is concentrated in narrow bands along some portions of the major rivers of the ecodistrict.

- Less than 2% of this element is in the reserve class.
- The desired level of mature, multi-age and old forest is below target levels although not so significantly that movement of young forest in the next few years should not be able to reach desired levels.
- Many rare and endangered plants are associated with all development classes of the floodplain forest and are sensitive to forest management and other land use practices.
- Land use has fragmented the ecological connectivity of the element.

Wetlands

(Patch) (WTLD ecosection) (1,056 ha)

The Wetlands element is a patch ecosystem and comprising freshwater bogs, fens, swamps, and poorly drained areas. This element may occur as a large wetland complex associated with rivers, as narrow linear communities associated with flow accumulations and small streams, as a community of hydrophytic vegetation (sedges, sphagnum moss, false holly and winterberry) associated with level terrain where drainage is impeded, or as a depression in the landscape where excess water remains year round.

The Black River wetlands are some of the most significant wetlands on Cape Breton Island with alkaline bogs and rare and endangered plant species, such as Virginia chain fern. A similar wetland also occurs along the Hays River and both the Hays and the Black rivers flow into Lake Ainslie.

Smaller disjoint wetlands are often embedded within other elements, especially the Floodplain element. Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple.

For the most part, sites are underlain by poorly drained mineral soils derived from sandstone tills or organic soils derived from peat (sphagnum mosses) or sedges. On the higher ground, with better-drained soils, softwood forests of white and black spruce will occur. This element plays a critical role in water collection, filtering, and groundwater recharge.

Flows

Humans (outdoor recreation, hunting, fishing, trapping); deer (travelways, fawning areas); anadromous fish – salmon (water quality maintenance); aquatic furbearers (denning, e.g. muskrat, travel, foraging, e.g. beavers); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006) **Wetlands**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	22%	21%	57% (36 Mat + 21 OF)	21%
Seral Stage	Early	Mid	Late	Unclassified
	11%	34%	44%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	59%	11%	26%	4%

Desired Condition

A series of intact, undisturbed wetlands and wetland complexes interconnected to the major hydrological systems, i.e. Margaree, Middle, Broad Cove, Mabou, and Skye rivers. These wetlands would be protected from off source pollutants such as sediment and agricultural run-offs.

Issues

The Wetlands patch element is found dispersed across the ecodistrict and is usually associated with the linear features of the major river valleys. The very nature of the wetlands raises issues around road development, infilling, and drainage. Currently 3% of the wetland area is under reserve status.

Indiscriminate OHV can be one of the most significant impacts affecting the ecological integrity of wetlands and has been shown to be a major contributor to harming many sensitive wetland complexes. The challenge will be to educate the public as to the vitality of these wetlands and their ecological value to the ecosystem as a whole. Developing sound ecosystem-based management techniques will be a challenge as well to ensure the conservation of this element.

Salt Marsh

(Patch) (XXMS ecosection) (188 ha)

Several large salt marshes have been formed due to the periodic flooding by the tide such as those at the estuaries of the Southwest Mabou, Mabou, Margaree, and Chéticamp rivers and at Chéticamp Harbour. These marshes are underlain by reddish brown sediments of silty clay loam texture.

The soil contains semi-decomposed grass and sedges trapped in the accumulating sediment and show a layering effect due to periodic deposition of the fine material. There are no stones in this material and the salt content is relatively high.

The dominant natural vegetation is *Spartina* grasses. Most of the Inverness salt marshes are dominated by salt-water cordgrass, *S. alternifolia*, 1 to 1.5 metres high, which occupies the wetter

lower marsh. Salt meadow cordgrass (salt hay grass), *S. patens*, 30 to 60 centimetres high, is found on the drier and higher marsh microsite which is flooded less frequently. Clasping-leaf pondweed is a rare plant found in this element.

The salt marshes of the Inverness Lowlands are too wet for agricultural use although some of the drier ones may have been cut for forage or used as pasture.

Flows

Humans (outdoor recreation, e.g. hunting); deer (travelways, foraging); anadromous fish – salmon (foraging, e.g. prey species); aquatic furbearers (breeding, rearing, foraging, e.g. otters); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Salt Marsh

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	11%	33%	56% (40 Mat + 16 OF)	16%
Seral Stage	Early	Mid	Late	Unclassified
	20%	28%	51%	1%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	40%	28%	32%	0%

Desired Condition

Naturally functioning salt marshes where the movement of tidal waters and sediment are not impeded by other land uses.

Issues

This element makes up only a tiny portion of the ecodistrict and, as such, is a very important contributor to ecological diversity. Issues are common to all wetlands, including indiscriminate OHV use and human development, and are potentially major impacts on salt marshes. Channel dredging, infills, and general land development are challenges for the future management of this element. Only 7% of salt marshes are in reserves, however, legislation and regulations are in place to protect salt marshes from in-filling and alteration.

Coastal Beach
(Patch) (XXCB ecosection) (87 ha)

Coastal beaches are wave-dominated deposits composed of a mixture of sand, gravel, and other sizes of sediments. The deposit of sand, gravel, and larger particles, such as boulders and cobbles, occurs under a variety of circumstances leading to several types of beach landforms.

Sand dunes are often associated with beaches and, depending on size, distance, and age, support a variety of vegetation including beach grass, bayberry, and white spruce. Sand dunes are found at West Mabou Beach Provincial Park.

The beaches along the Gulf of St. Lawrence coast are examples of barrier beaches that have formed as a result of rising sea level and the erosion of adjacent headlands forcing a landward retreat of the beach. The adjacent headlands anchor the extremities of the barrier beach with good examples of this at Inverness and Belle Côte beaches. At Point Cross, a barrier beach and the remnants of an eroded coarse-textured headland connect Chéticamp Island to the mainland.

Vegetation tends to be beach grass and associates near the high-water mark with a progressing development of woody shrubs and white spruce occurring as the soil stabilizes and incorporates organic content and water-retaining capabilities.

Many coastal beaches are too small to map and have been left as inclusions in other elements, such as glacial fluvial deposits on hummocky terrain, where rivers empty into the Gulf of St. Lawrence, with Pleasant Bay as an example.

Flows

Humans (outdoor recreation, e.g. swimming, hunting); deer (travelways, foraging); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Coastal Beach

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	0%	78%	22% (13 Mat + 9 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	0%	13%	87%	0%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	100%	0%	0%	0%

Desired Condition

Natural beach systems with a minimum of human intervention.

Issues

The Coastal Beach element has many issues associated with development of beach complexes, extraction of beach aggregate for construction, and indiscriminate OHV use on dune systems resulting in destruction of wildlife habitat and sensitive beach grass communities.

Piping plover can be found on a few of these coastal beaches and their nesting habitat is at risk from human traffic. The challenge will be to maintain and enhance the integrity of these coastal beaches through proactive ecosystem-based management. Currently 60% of the coastal beach identified in this analysis is under protection.

Valley Corridors

(Corridor) (Various ecosections) (6,255 ha)

The most evident linear features within this ecodistrict are faults and folds associated with watercourses. A total of 6,255 hectares of the most prominent of these features have been identified for this analysis.

Many of the corridors have significant levels of land use which have resulted in settlements, agricultural fields, power lines, roads, and railways. These land use changes reduce the connective function of the corridor for some species and may also increase the barrier effect of the corridors for species that must move through them.

Flows

Humans (transportation, fishing, hunting); deer (travelways); aquatic furbearers (travelways, denning, foraging); migratory birds (breeding, nesting, foraging).

Composition

Inverness Lowlands Ecodistrict 320 (based on statistics up to 2006)
Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	18%	14%	68% (45 Mat + 23 OF)	23%
Seral Stage	Early	Mid	Late	Unclassified
	33%	35%	26%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	27%	30%	5%

Desired Condition

Series of well-connected slopes and riparian zones in a natural forest condition with some altered land use features. Barriers to movement by wildlife are minimal.

Issues

The Valley Corridors element in this ecodistrict has significant issues associated with human development, including impacts from clearing of land for farming, gravel removal from alluvial deposits along the major rivers, transportation corridors, and access for recreational pursuits including salmon fishing and cottages.

Land clearing has resulted in some of the natural forest being changed over to fields and when these fields are abandoned they revert to old field white spruce. Fragmentation and human-caused barriers have created significant issues for the flow of biodiversity through the ecodistrict and to other adjoining ecodistricts. Ecosystem-based management techniques will be required to restore the ecological functionality in many areas of this ecodistrict.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Inverness Lowlands 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).

The linear and riparian structure of this ecodistrict, as it follows the major rivers winding through the adjacent Cape Breton Hills, has attracted both settlement and land use patterns that have negatively influenced the ecological functionality. Barriers have been created that restrict or limit the flow of wildlife within the ecodistrict and between adjoining ecodistricts such as the Cape Breton Hills, Cape Breton Highlands, and the Bras d'Or Lowlands.

The EEI ranges from 47 to 52 for this ecodistrict, indicating a significant impact on natural ecological structures. With only 5% of the Inverness Lowlands Ecodistrict in Crown ownership opportunities for further protected areas, parks, and areas for wildlife habitat management are limited. Presently only 2% of the ecodistrict is in reserves and protected areas.

Management of the forest resource in this ecodistrict should focus on restoring natural forest ecosystems and improving the connectivity within and between ecodistricts. Actions taken towards this approach could consider:

- Sixteen percent of the Tolerant Hardwood Hills element is in old field white spruce forests and another 31% of the element has been converted to other land uses. Agricultural land abandonment continues providing opportunity to restore natural forest conditions.
- Establishment and young forest development classes as well as the early and mid-seral stages in the Tolerant Hardwood Hills exceeds the target limits for this type of forest. Forest management practices such as thinning and partial harvesting can be used to enhance older forest and late seral features such as species, size, coarse woody debris, etc.
- The Margaree River is a Canadian Heritage River and is still highly prized for its Atlantic salmon. Currently the Floodplain element has 12% conversion to old field white spruce forest and another 28% converted to other land uses. Connectivity can be improved by restoring natural forests and maintaining older forests which contain many endangered plants.
- Coastal Beach and Salt Marsh elements have significant road density approaching suburban conditions. Mitigative measures can be used to maintain and enhance these valuable biodiversity habitats.

- Aggregate extraction on the floodplains and the potential for limestone quarrying should be aware of habitat fragmentation and impacts on rare and endangered plants on these deposits.
- Further exploration for fossil fuel reserves should be aware of wildlife habitat. Practices that mitigate the impact on habitat, restore damaged habitat, and deactivate access roads can be used.

Appendix 1: Flow - Element Interactions

Element	Deer	Humans	Anadromous Fish	Aquatic Furbearers	Migratory Birds
Tolerant Hardwood Hills	Primary habitat, travelways wintering areas, foraging	Forestry, Woods roads, OHVs, Outdoor recreation (Hunting, fishing, trapping, etc.)	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Denning, travel, Foraging (beavers)	Breeding, nesting, foraging
Spruce Fir Hills and Hummocks	Primary habitat, travelways wintering areas, foraging	Forestry, Woods roads, OHVs, Outdoor recreation (Hunting, fishing, trapping, etc.)	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	_____	Breeding, nesting, foraging
Floodplain	Primary habitat, travelways wintering areas, foraging	Forestry, Woods roads, OHVs, Outdoor recreation (Hunting, fishing, trapping, etc.)	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Denning, travel, Foraging	Breeding, nesting, foraging
Wetlands	Travelways, fawning areas	Outdoor recreation (e.g. hunting)	Water quality maintenance	Denning (e.g. muskrat), travel, Foraging	Breeding, nesting, foraging
Salt Marsh	Travelways, foraging	Outdoor recreation (e.g. hunting)	Foraging (prey species)	Breeding, foraging (e.g. otter), rearing	Breeding, nesting, foraging
Coastal Beach	Travelways, foraging	Hunting, Outdoor recreation (e.g. Swimming)	_____	_____	Breeding, nesting, foraging
Valley Corridors	Travelways	Transportation, fishing, hunting	_____	Travelways, denning, foraging	Breeding, nesting, foraging

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
Tolerant Hardwood Hills	Patch	High	Hummocky terrain and gently rolling foothills arranged linearly along major rivers, e.g. Scotsville to Southwest Margaree. Occasionally sinkholes where soils underlain by limestone and gypsum, e.g. Gillisdale.	Landscape wide. Supportive – connects settlements and transportation corridors. Connective – provides linkage of lowlands and riparian zones to uplands.	Gap	Tolerant hardwood forests of sugar maple, yellow birch, white ash, and red maple.	Small tributaries flowing from the uplands to the rivers through steep-sided dissections (ravines). Floodplains of the major rivers.	Landownership and land use, primarily farming and settlement. Most transportation corridors are located on the toe slopes creating a barrier between upland and lowland (riparian) ecosystems.	Land use and fragmentation. Habitat loss due to land use. Important deer wintering habitat.	Manage forests using a gap disturbance-based strategy. Minimize barriers and recognize key corridors between uplands and lowlands.
Spruce Fir Hills and Hummocks	Patch	Moderate	Spruce and fir forests on well to imperfectly drained soils of low fertility. Areas of exposed gypsum (karst) are common, expect rare plants, e.g. Mabou Harbour.	Landscape wide. Connective – provides linkage of lowlands and riparian zones to uplands.	Frequent	Black spruce and tamarack on moist to wet sites progressing to balsam fir, white spruce, and black spruce on drier sites.	Floodplain forests. Fields on floodplains.	Fragmentation of connectivity by land use and travel corridors.	Land use and fragmentation. Habitat loss due to land use. Important deer wintering habitat.	Maintain functional amount of mature cover for habitat and connectivity. Create stand-level disturbances using harvesting that mimic natural patch size.

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
Floodplain	Patch	High	Linear floodplain forests following major rivers such as the Skye, Southwest Margaree, Northeast Margaree, Broad Cove, and Middle. Also includes outwash plains and floodplains of major rivers flowing from the Highlands, e.g. Chéticamp, Grande Anse.	Landscape wide. Provides significant linkage between adjacent ecodistricts, e.g. Cape Breton Hills, Bras d'Or Lowlands, Cape Breton Highlands.	Gap with inclusions of Frequent.	Early successional forests of balsam poplar and white spruce and scattered late successional forests of sugar maple, yellow birch, and ironwood. Expect occurrences of black ash.	Inclusions of wetland forests of red maple, black spruce, and tamarack.	Extensive conversion to agriculture and other land uses.	Annual flooding with occasional severe flooding with potential for significant land loss/erosion.	Employ land use practices to reduce erosional loss of land base. Conserve remaining natural floodplain forests. Restore floodplain forests.
Wetlands	Patch	Moderate	Black River wetlands, alkaline habitat for rare plants.	Local. Areas of open and treed wetland.	Open Seral with significant inclusions of Frequent (treed wetlands)	Shrub wetlands with inclusions of black spruce, red maple, and tamarack.	Floodplain forests. Spruce Fir Hills and Hummocks.	Disjunctive patches. Wet soils.	Offsite pollution (sedimentation, agricultural inputs). Wet soils.	Seasonal access for harvesting to reduce site impacts. Maintain appropriate riparian and machine exclusion zone.

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
Salt Marsh	Patch	High	Notable at the estuaries of the Margaree, Chéticamp, Mabou, and Southwest Mabou.	Isolated local patches of unique habitat.	Open Seral (tidal)	Saltwater cordgrass	Coastal beach. Wetlands.	Water flow obstructions (alter or change freshwater and saltwater contact), alteration of marshland and adjoining habitat, sedimentation.	Infilling and loss. Degradation due to upstream land use.	Conserve and ensure protection from offsite pollutants.
Coastal Beach	Patch	High	West Mabou (including dunes), Belle Côte, Point Cross, Inverness	Local but large barrier type beaches.	N/A	Beach grass and associates on young or active beach with bayberry and white spruce on inactive beach/dunes	Headlands and salt marshes with brackish and/or freshwater ponds and lagoons.	Recreational use and OHV impacts. Sand removal.	Loss of wildlife habitat for certain endangered seabirds.	Conserve and protect.
Valley Corridors	Corridor	High	Includes both branches of the Margaree and Mabou rivers as well as the Middle, Skye, and Broad Cove.	Dominant feature of landscape providing linkage within and between ecodistricts.	Frequent with inclusions of Gap and Open Seral.	Riparian forests, wetland forests, and upland forests of spruce-fir and occasionally tolerant hardwood.	Lower slopes of the Cape Breton Hills and Cape Breton Highlands.	Fragmentation due to land use such as agriculture, settlement, and transportation	Loss of mature forest cover.	Maintain appropriate riparian and machine exclusion zones. Reduce road access. Recognize key "choke points" in corridors and maintain functionality.

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 320)

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
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Bank Swallow	*Riparia riparia*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
Sage Willow	*Salix candida*	Endangered	N/A	N/A
FISH				
Atlantic Salmon - Eastern C.B. population	*Salmo salar*	N/A	N/A	Endangered
Atlantic Salmon - Gaspé - S. Gulf of St. Lawrence population	*Salmo salar*	N/A	N/A	Special Concern
LICHENS	-			
Frosted Glass-whiskers Lichen - N.S. population	*Sclerophora peronella (N.S. pop.)*	N/A	Special Concern	Special Concern
MAMMALS	-			
Canadian Lynx	*Lynx canadensis*	Endangered	N/A	Not at Risk
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Long-tailed Shrew	*Sorex dispar*	N/A	Special Concern	Not at Risk

Appendix 3: Special Occurrences (Ecodistrict 320)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
AMPHIBIANS			
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS			
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3M
Black Guillemot	*Cepphus grylle*	Secure (Green)	S3S4
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
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
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Common Loon	*Gavia immer*	May Be At Risk	S3B,S4N
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	(Orange) Sensitive	S3M
Fox Sparrow	*Passerella iliaca*	(Yellow) Secure (Green)	S3S4B
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3S4
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3B
Great Cormorant	*Phalacrocorax carbo*	Sensitive (Yellow)	S3
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
American Three-toed Woodpecker	*Picoides dorsalis*	Undetermined	S1S2
Pine Grosbeak	*Pinicola enucleator*	May Be At Risk (Orange)	S3?B,S5N
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3
Black-legged Kittiwake	*Rissa tridactyla*	Sensitive (Yellow)	S2B,S4S5N
Common Tern	*Sterna hirundo*	Sensitive (Yellow)	S3B S2S3B
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	
BRYOPHYTES			
a Feather Moss	*Hylocomiastrum pyrenaicum*	Sensitive (Yellow)	S2S3
a Moss	*Leucodon andrewsianus*	Sensitive (Yellow)	S2S3
a Moss	*Limprichtia revolvens*	Sensitive (Yellow)	S2S3
Hooked Scorpion Moss	*Scorpidium scorpioides*	Sensitive (Yellow)	S2?
DICOTS			
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Fernald's Serviceberry	*Amelanchier fernaldii*	Undetermined	S2?
Canada Anemone	*Anemone canadensis*	May Be At Risk (Orange)	S2

Appendix 3: Special Occurrences (Ecodistrict 320)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
Cut-leaved Anemone	*Anemone multifida*	May Be At Risk (Orange)	S1
Small-flowered Anemone	*Anemone parviflora*	May Be At Risk (Orange)	S1
Wood Anemone	*Anemone quinquefolia*	Sensitive (Yellow)	S2
Virginia Anemone	*Anemone virginiana*	May Be At Risk (Orange)	S2
Virginia Anemone	*Anemone virginiana var.*	Sensitive (Yellow)	S1S2
Purple-stemmed Angelica	*alba Angelica atropurpurea*	Secure (Green)	S3S4
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3
Swamp Milkweed	*Asclepias incarnata ssp. pulchra*	Undetermined	S2S3
Bog Birch	*Betula pumila*	Sensitive (Yellow)	S2S3
Estuary Beggarticks	*Bidens hyperborea*	May Be At Risk (Orange)	S1
Yellow Marsh Marigold	*Caltha palustris*	Sensitive (Yellow)	S2
Cuckoo Flower	*Cardamine pratensis var. angustifolia*	May Be At Risk	S1
Cuckoo Flower Blue	*Cardamine pratensis var. pratensis*	(Orange) May Be At	S1
Cohosh Seaside	*Caulophyllum thalictroides*	Risk (Orange) May Be	S2
Spurge Swamp	*Chamaesyce polygonifolia*	At Risk (Orange) Secure	S3
Loosestrife	*Decodon verticillatus*	(Green) Sensitive	S3
Rock Whitlow-Grass Rock	*Draba arabisans*	(Yellow) Sensitive	S2
Whitlow-Grass	*Draba glabella*	(Yellow)	S1
Hornemann's Willowherb	*Epilobium hornemannii*	May Be At Risk (Orange)	S3
Downy Willowherb	*Epilobium strictum*	Sensitive (Yellow)	S3
Hyssop-leaved Fleabane	*Erigeron hyssopifolius*	Sensitive (Yellow)	S3
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
False Mermaidweed	*Floerkea proserpinacoides*	Sensitive (Yellow)	S2
Northern Wild Licorice	*Galium kamtschaticum*	Sensitive (Yellow)	S3
Labrador Bedstraw	*Galium labradoricum*	Secure (Green)	S2
Spurred Gentian	*Halenia deflexa ssp. brentoniana*	Sensitive (Yellow)	S1?
Robinson's Hawkweed	*Hieracium robinsonii*	Undetermined	S2
Pale Jewelweed	*Impatiens pallida*	Sensitive (Yellow)	S2
Canada Wood Nettle	*Laportea canadensis*	Sensitive (Yellow)	S3
Southern Mudwort	*Limosella australis*	Sensitive (Yellow)	S3
Brook Lobelia	*Lobelia kalmii*	Sensitive (Yellow)	S1
Water Beggarticks	*Megalodonta beckii*	May Be At Risk	S3
Siberian Water Milfoil	*Myriophyllum sibiricum*	(Orange) Sensitive	S3S4
Whorled Water Milfoil	*Myriophyllum verticillatum*	(Yellow) Secure (Green)	S2
Narrow-leaved Evening Primrose	*Oenothera fruticosa ssp. glauca*	Sensitive (Yellow)	S2
Smooth Sweet Cicely	*Osmorhiza longistylis*	Undetermined	S2
		May Be At Risk (Orange)	

Appendix 3: Special Occurrences (Ecodistrict 320)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
Field Locoweed	*Oxytropis campestris var. johannensis*	May Be At Risk (Orange)	S1
Balsam Groundsel	*Packera paupercula*	Secure (Green)	S3
Marsh Grass-of-Parnassus	*Parnassia palustris var. parviflora*	May Be At Risk (Orange)	S2
Common Butterwort	*Pinguicula vulgaris*	May Be At Risk (Orange)	S1
Pennsylvania Smartweed	*Polygonum pensylvanicum*	Secure (Green)	S3
Sharp-fruited Knotweed	*Polygonum raii*	Undetermined	S2S3
Stout Smartweed	*Polygonum robustius*	Secure (Green)	S3S4
Mistassini Primrose	*Primula mistassinica*	Sensitive (Yellow)	S2
Marsh Mermaidweed	*Proserpinaca palustris*	Secure (Green)	S3
Pink Pyrola	*Pyrola asarifolia*	Secure (Green)	S3
Lesser Pyrola	*Pyrola minor*	Sensitive (Yellow)	S2
Gmelin's Water Buttercup	*Ranunculus gmelinii*	Secure (Green)	S3
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow)	S3
Bog Willow	*Salix pedicellaris*	Sensitive (Yellow)	S2
Bloodroot	*Sanguinaria canadensis*	Secure (Green)	S3S4
Clustered Sanicle	*Sanicula odorata*	May Be At Risk (Orange)	S1
White Mountain Saxifrage	*Saxifraga paniculata ssp. neogaea*	Sensitive (Yellow)	S2
Soapberry	*Shepherdia canadensis*	Sensitive (Yellow)	S2
Multi-rayed Goldenrod	*Solidago multiradiata*	May Be At Risk (Orange)	S1S2
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow)	S2
Northern Blueberry	*Vaccinium boreale*	May Be At Risk (Orange)	S2
Thyme-Leaved Speedwell	*Veronica serpyllifolia ssp. humifusa*	Sensitive (Yellow)	S2S3
Squashberry Canada	*Viburnum edule*	Sensitive (Yellow)	S3
Violet Northern Bog	*Viola canadensis*	Extirpated	S1
Violet	*Viola nephrophylla*	Sensitive (Yellow)	S2
FERNS AND THEIR ALLIES			
Maidenhair Spleenwort	*Asplenium trichomanes*	Sensitive (Yellow)	S2
Green Spleenwort	*Asplenium trichomanes-ramosum*	Sensitive (Yellow)	S2
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive (Yellow)	S2S3
Steller's Rockbrake	*Cryptogramma stelleri*	May Be At Risk (Orange)	S1
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Laurentian Bladder Fern	*Cystopteris laurentiana*	May Be At Risk (Orange)	S1
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Marsh Horsetail	*Equisetum palustre*	May Be At Risk (Orange)	S1
Meadow Horsetail	*Equisetum pratense*	Sensitive (Yellow)	S2
Dwarf Scouring-Rush	*Equisetum scirpoides*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 320)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
Variegated Horsetail	*Equisetum variegatum*	Secure (Green)	S3
Appalachian Fir-Clubmoss	*Huperzia appalachiana*	Undetermined	S1S3
Northern Firmoss	*Huperzia selago*	Undetermined	S1S3
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?
Sitka Clubmoss	*Lycopodium sitchense*	Secure (Green)	S3?
INSECTS			
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Dorcas Copper	*Lycaena dorcas*	Not Assessed	S1
Salt Marsh Copper	*Lycaena dospassosi*	At Risk (Red)	S2
Jutta Arctic	*Oeneis jutta*	May Be At Risk	S1
Brook Snaketail	*Ophiogomphus aspersus*	(Orange) May Be At	S1
Riffle Snaketail	*Ophiogomphus carolus*	Risk (Orange) Secure	S3
Short-tailed Swallowtail	*Papilio brevicauda*	(Green) Sensitive	S1S2
Short-tailed Swallowtail	*Papilio brevicauda bretonensis*	(Yellow)	S1S2
Mustard White	*Pieris oleracea*	At Risk (Red)	S2
Question Mark	*Polygonia interrogationis*	Sensitive (Yellow)	S3B
Forcipate Emerald	*Somatochlora forcipata*	Secure (Green)	S2
Northern Cloudywing	*Thorybes pylades*	May Be At Risk (Orange) Sensitive (Yellow)	S2
MAMMALS			
Long-finned Pilot Whale	*Globicephala melas*	N/A	S2S3
Rock Vole	*Microtus chrotorrhinus*	Secure (Green)	S2
Fisher	*Pekania pennanti*	Sensitive (Yellow)	S2
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
MOLLUSKS			
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
MONOCOTS			
Short-awned Foxtail	*Alopecurus aequalis*	Sensitive (Yellow)	S2S3
Red Bulrush	*Blysmus rufus*	May Be At Risk (Orange)	S1
Silvery-flowered Sedge	*Carex argyrantha*	Secure (Green)	S3S4
Scabrous Black Sedge	*Carex atratiformis*	Sensitive (Yellow)	S2
Bebb's Sedge	*Carex bebbii*	May Be At Risk (Orange)	S1S2
Bearded Sedge	*Carex comosa*	Sensitive (Yellow)	S2
Northern Bog Sedge	*Carex gynocrates*	May Be At Risk (Orange)	S1
Pubescent Sedge	*Carex hirtifolia*	Sensitive (Yellow)	S2S3
Porcupine Sedge	*Carex hystericina*	May Be At Risk (Orange)	S2
Rosy Sedge	*Carex rosea*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 320)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
Scirpuslike Sedge	*Carex scirpoidea*	Sensitive (Yellow)	S2
Greenish Sedge	*Carex viridula var. elatior*	May Be At Risk (Orange)	S1
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Few-flowered Spikerush	*Eleocharis quinqueflora*	May Be At Risk (Orange)	S2
Canada Waterweed	*Elodea canadensis*	Secure (Green)	S3?
Wiegand's Wild Rye	*Elymus wiegandii*	May Be At Risk (Orange)	S1
Menzies' Rattlesnake-plantain	*Goodyera oblongifolia*	Sensitive (Yellow)	S3
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Slender Blue Flag	*Iris prismatica*	May Be At Risk (Orange)	S1
Sharp-Fruit Rush	*Juncus acuminatus*	Sensitive (Yellow)	S3S4
Richardson's Rush	*Juncus alpinoarticulatus ssp. nodulosus*	May Be At Risk (Orange)	S1S2
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Highland Rush	*Juncus trifidus*	Sensitive (Yellow)	S2
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Small-flowered Woodrush	*Luzula parviflora*	Secure (Green)	S3S4
Alpine Timothy	*Phleum alpinum*	May Be At Risk (Orange)	S1
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Glaucous Blue Grass	*Poa glauca*	Sensitive (Yellow)	S2S3
Fries' Pondweed	*Potamogeton friesii*	May Be At Risk (Orange)	S2
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	Sensitive (Yellow)	S2S3
White-stemmed Pondweed	*Potamogeton praelongus*	Sensitive (Yellow)	S3?
Richardson's Pondweed	*Potamogeton richardsonii*	May Be At Risk (Orange)	S2S3
Flat-stemmed Pondweed	*Potamogeton zosteriformis*	Sensitive (Yellow)	S2S3
Slender Beakrush	*Rhynchospora capillacea*	May Be At Risk (Orange)	S1
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Northern Burreed	*Sparganium hyperboreum*	Sensitive (Yellow)	S1S2
Small Burreed	*Sparganium natans*	Secure (Green)	S3
Shining Ladies'-Tresses	*Spiranthes lucida*	May Be At Risk (Orange)	S2
Thread-leaved Pondweed	*Stuckenia filiformis ssp. alpina*	Undetermined	S2S3
Sticky False-Asphodel	*Triantha glutinosa*	May Be At Risk (Orange)	S1
Purple False Oats	*Trisetum melicoides*	May Be At Risk (Orange)	S1
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

*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 320)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Deer wintering areas (DWA)	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	
Caves	Caves and mine adits	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database; Atlantic Canada Conservation Data Centre database	
Loon nesting lakes	Freshwater lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Eagle nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Osprey nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Hawk and owl nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Waterfowl breeding, staging and wintering areas	Freshwater wetlands, aalt marshes and coastal waters	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Seabird nesting Colonies	Coastal headlands, cliffs, and islands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Shorebird breeding and staging areas	Beaches, salt marshes, and mudflats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Piping plover nesting areas	Beaches and dunes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act; Nova Scotia Endangered Species Act
Great blue heron rookeries	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Wood turtle habitat	Rivers, streams, and riparian habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act; Nova Scotia Endangered Species Act
Fish habitat areas	Rivers, streams, and lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation	Canada Fisheries Act
Dragonfly, damselfly, and butterfly habitats	Upland and wetland habitats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act

Appendix 3: Special Occurrences (Ecodistrict 320)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Freshwater mussel habitat	Rivers, streams, and lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act
Rare plant habitat	Upland and wetland habitats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act
NSDNR Old Forest Reserves	Old forest habitat	Old Forest Database	Policy reserve
Eastern Habitat Joint Venture Lands	Habitat	DNR Restricted Land Use Database	Legal Agreement
Operational/Non-Designated Parks and Reserves	Ecosystem / recreation	DNR Restricted Land Use Database	Nova Scotia Parks Act
Karst areas	Upland and wetland sites	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	N/A
Protected Beaches	Ecosystem	DNR Restricted Land Use Database	Nova Scotia Beaches Protection Act
Nature Reserves	Ecosystem	DNR Restricted Land Use Database	Nova Scotia Special Places Protection Act
Wilderness Areas	Ecosystem / recreation	DNR Restricted Land Use Database	Nova Scotia Wilderness Areas Protection Act
Provincial Parks	Ecosystem / recreation	DNR Restricted Land Use Database	Nova Scotia Parks Act
Black River Bog IBP Site	International Biological Program Site	DNR Restricted Land Use Database	N/A

Appendix 3: Special Occurrences (Ecodistrict 320)
Table 1d – Heritage Features

Feature	Type	Information Source
Heritage River - Margaree River	Heritage	Canadian Heritage River System
Native Burial Grounds	Cultural/Community Heritage	Aboriginal Traditional Knowledge
Native Artifacts	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge NSDNR Database
Abandoned Mines	Geological and Cultural Heritage	NS Abandoned Mines Database
First Nations Reserve Lands – e.g. Margaree, Waycobah, Wagmatcook	Cultural	NSDNR Restricted Land Use Database

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS	625	1.3	11,413	23.4	51 to 62	8.2	33,783	3.5	93,638	9.6	57 to 69	3.9
ICSM	aE sM wA	1,636	3.4	4,545	9.3	39 to 43	30.8	8,333	0.9	11,114	1.1	53 to 58	16.4
IFHO	bS wS	6,768	13.9	6,768	13.9	40 to 45	24.3	29,016	3.0	10,139	1.0	52 to 60	11.5
IFSM	bS bF	80	0.2	373	0.8	34 to 35	17.6	509	0.1	34,675	3.6	51 to 54	12.9
IMHO	bS	5,373	11.0	11,413	23.4	46 to 51	22.8	119,475	12.3	93,638	9.6	61 to 69	3.4
IMSM	aE sM wA	2,931	6.0	4,545	9.3	41 to 43	31.2	9,635	1.0	11,114	1.1	50 to 55	17.4
WCHO	bS	7,480	15.3	11,413	23.4	45 to 49	25.5	70,165	7.2	93,638	9.6	57 to 65	8.5
WCKK	sM yB Be	1,678	3.4	13,038	26.7	35 to 40	25.3	184,987	19.1	392,460	40.4	55 to 64	7.7
WCSM	aE sM wA	122	0.2	4,545	9.3	39 to 45	37.7	122	0.0	11,114	1.1	39 to 45	37.7
WFDS	sM yB Be	108	0.2	13,038	26.7	63 to 64	10.3	232	0.0	392,460	40.4	64 to 65	17.4
WFHO	sM yB Be	4,210	8.6	13,038	26.7	38 to 41	31.8	19,090	2.0	392,460	40.4	49 to 57	14.0
WFKK	sM yB Be	1,374	2.8	13,038	26.7	36 to 39	25.0	75,802	7.8	392,460	40.4	49 to 57	12.3

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

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	%		
WFRD	sMyB Be	972	2.0	13,038	26.7	40 to 46	23.3	972	0.1	392,460	40.4	40 to 46	23.3
WMDS	sMyB Be	246	0.5	13,038	26.7	52 to 55	19.1	51,684	5.3	392,460	40.4	62 to 65	4.0
WMHO	sMyB Be	3,914	8.0	13,038	26.7	32 to 34	37.2	78,601	8.1	392,460	40.4	55 to 65	5.5
WMKK	sMyB Be	2,354	4.8	13,038	26.7	29 to 33	28.7	166,912	17.2	392,460	40.4	57 to 65	6.6
WTLD	wetlands	1,737	3.6	0	0.0	53 to 55	11.4	6,067	0.6	0	0.0	60 to 64	6.7

*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)
WCHO	bS	7,480	8.5	37	1	143	0	179	2.4	1	0.0	180	2.4
IFHO	bS wS	6,768	9.4	0	1	81	0	81	1.2	1	0.0	83	1.2
IMHO	bS	5,373	7.5	8	0	0	0	8	0.2	0	0.0	8	0.2
WFHO	sMyB Be	4,210	3.9	65	6	47	0	112	2.7	6	0.1	118	2.8
WMHO	sMyB Be	3,914	1.0	0	2	0	0	0	0.0	2	0.1	2	0.1
IMSM	aEsMwA	2,931	2.5	34	0	2	0	36	1.2	0	0.0	36	1.2
WMKK	sMyB Be	2,354	3.1	0	0	7	0	7	0.3	0	0.0	7	0.3
WTLD	wetlands	1,737	13.8	48	0	49	0	97	5.6	0	0.0	97	5.6
WCKK	sMyB Be	1,678	2.1	0	0	29	0	29	1.7	0	0.0	29	1.7
ICSM	aEsMwA	1,636	4.0	0	1	3	0	3	0.2	1	0.1	4	0.3
WFKK	sMyB Be	1,374	2.5	2	1	17	0	19	1.4	1	0.1	20	1.4
WFRD	sMyB Be	972	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICHO	bS	625	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
XXMS	salt marsh	437	1.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMDS	sMyB Be	246	1.8	0	0	0	0	0	0.0	0	0.0	0	0.0
WCSM	aEsMwA	122	5.3	0	0	0	0	0	0.0	0	0.0	0	0.0
WFDS	sMyB Be	108	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
XXCB	coastal beach	86	36.9	31	19	0	0	31	36.1	19	21.5	50	57.6
IFSM	bS bF	80	0.7	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**42,132**		**225**	**31**	**377**	**0**	**602**		**31**		**633**	

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)
National Parks and Adjuncts	159	0	Operational Non Designated Parks and Reserves	231	0
Designated Provincial Parks and Park Reserves	98	0	Old Forest	205	0
Wilderness Areas	79	0	Designated Provincial Parks and Park Reserves	8	0
Sites of Ecological Significance Under Moratorium	51	0			
Protected Beaches	7	30			
Areas under the Special Places Act	0	0.4			

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, areas without roads and/or few roads 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 ELA 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	539
Utility corridors	3	61
Gravel Roads and active railways	6	557
Paved streets and roads collectors	10	304
Highways	15	N/A

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	8,676	17.8
Forest Resource	7 to 15	17,182	35.2
Mixed Rural	16 to 24	19,729	40.4
Agriculture Suburban	25 to 39	3,253	6.7
Urban	40 to 100	0	0.0
Total		**48,840**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Hills	14,561	10
Valley Corridors	6,255	19
Coastal Beach	87	31
Floodplain	2,151	17
Salt Marsh	188	28
Spruce Fir Hills and Hummocks	17,845	9
Wetlands	1,056	13
Total	**42,143**	**11**

*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

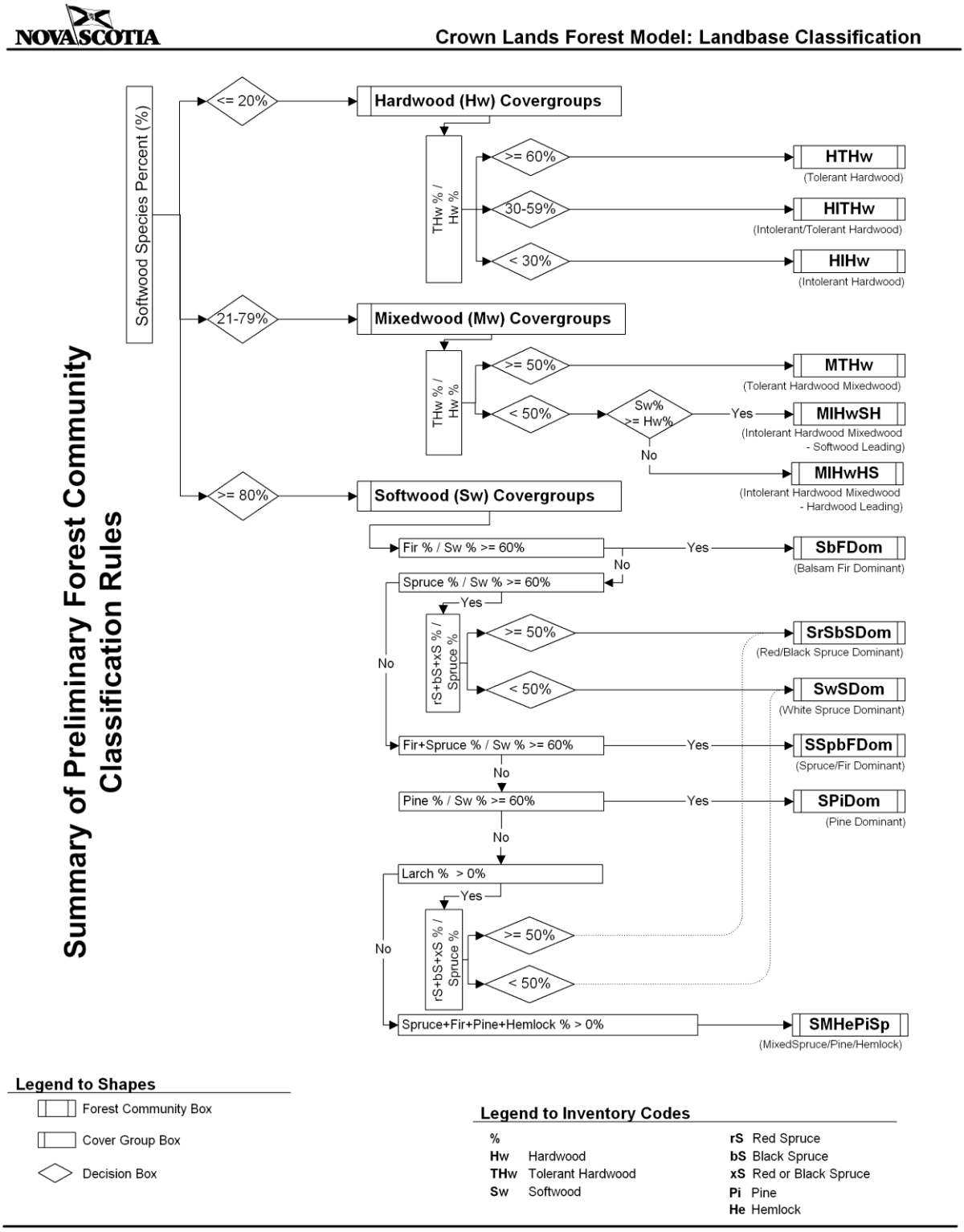
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed productionby forbs and shrubs • approximate age 0 to 25 years	Early Seral Species (Score 10 to 23) • new growth dominated by pioneertree species or unclassified regeneration Mid Seral Species (Score 24 to 37) • regeneration composed of a mixture of pioneer, mid-climax, and climaxspecies 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 treespecies Mid Seral Species (Score 24 to 37) • canopy composed of a mixture ofpioneer, mid-climax, and climaxspecies Late Seral Species (Score 38 to 50) • canopy dominated by climaxspecies
3. Mature Forest (Height > 11 m) • stands dominated by upper canopy with full differentiation into dominance classes • self-thinning processreduced • tree seed production prominent andregular • individual tree mortality creates canopy gaps that are soon closed by neighbouring treegrowth • increased light initiates regenerationand early understory development • approximate age 40 to 125 years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneerspecies • over maturity initiates canopybreakup 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 climaxspecies • 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 recruitmentto 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 dynamicprocesses

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

Species		Ecodistrict																																						
Code	**Name**	**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**	**920**
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&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 1 to 5 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 - 23 early, 24 - 37 mid and 38 - 50 late.

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Inverness Lowlands 320)

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 Hardwood Hills	WFHO (28.3%) WMHO (26.0%) WMKK (16.0%) WCKK (11.4%) WFKK (9.4%) WFRD (6.6%) WMDS (1.7%) WFDS (0.6%)	Softwood	bS	Gap	1,774; 12.2	Early	103	109	49	87	347	3,898; 42.5	EARLY	1,272; 13.9
						Mid	62	193	147	216	618			
						Late	465	999	670	358	2,492			
						Uncl	442	0	0	0	442			
		Mixedwood				Early	175	105	67	38	385	3,018; 32.9	MID	3,589; 39.1
						Mid	295	620	599	459	1,972			
						Late	99	93	211	140	542			
						Uncl	119	0	0	0	119			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	12,787; 87.8	Early	142	120	57	20	338	1,828; 19.9	LATE	3,497; 38.1
						Mid	149	176	602	73	999			
						Late	5	26	408	25	463			
						Uncl	28	0	0	0	28			
		Unclassified				Early	189	3	10	0	202	433; 4.7	UNCL	820; 8.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	232	0	0	0	232			
Total					**14,561***	**# ha**	**2,502**	**2,442**	**2,819**	**1,414**	**9,178**			
						%	**27.3%**	**26.6%**	**30.7%**	**15.4%**	**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 (Inverness Lowlands 320)

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	IMSM (26.2%) IMHO (17.0%) WCHO (16.9%) ICSM (15.0%) WTLD (10.9%) ICHO (2.5%) IFHO (2.1%) WMHO (2.1%) WFHO (1.4%)	Softwood	bS bS bF bS wS	Gap Frequent	2,144; 34.3	Early	27	59	36	19	141	1,078; 38.0	EARLY	920; 32.5
						Mid	28	79	101	151	358			
						Late	47	76	248	124	496			
						Uncl	83	0	0	0	83			
		Mixedwood				Early	66	54	60	79	259	852; 30.0	MID	1,005; 35.4
						Mid	57	46	216	142	460			
						Late	0	8	65	30	102			
						Uncl	30	0	0	0	30			
		Hardwood	sM yB Be aE sM wA eH wP sM yB Be	Gap Frequent	3,397; 54.3	Early	28	54	305	52	439	757; 26.7	LATE	724; 25.5
						Mid	0	20	129	38	187			
						Late	0	0	118	8	126			
						Uncl	4	0	0	0	4			
		Unclassified				Early	81	0	0	0	81	149; 5.3	UNCL	186; 6.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	68	0	0	0	68			
Total					**6,255***	**# ha**	**520**	**395**	**1,277**	**643**	**2,836**			
						%	**18.4%**	**13.9%**	**45.0%**	**22.7%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Inverness Lowlands 320)

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 Fir Hills and Hummocks	IFHO (37.2%) WCHO (36.0%) IMHO (24.2%) ICHO (2.6%)	Softwood	bS bS wS	Frequent	13,981; 78.3	Early	412	448	271	220	1,351	6,275; 50.5	EARLY	3,654; 29.4
						Mid	392	425	300	579	1,697			
						Late	450	704	765	608	2,527			
						Uncl	701	0	0	0	701			
		Mixedwood				Early	516	439	190	203	1,347	3,518; 28.3	MID	4,079; 32.8
						Mid	506	339	548	372	1,766			
						Late	12	65	94	121	291			
						Uncl	114	0	0	0	114			
		Hardwood	sM yB Be eH wP	Frequent	3,865; 21.7	Early	150	100	115	37	403	1,577; 12.7	LATE	3,337; 26.9
						Mid	64	76	424	53	616			
						Late	3	46	439	31	519			
						Uncl	39	0	0	0	39			
		Unclassified				Early	536	5	12	0	553	1,051; 8.5	UNCL	1,351; 10.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	498	0	0	0	498			
Total					**17,845***	**# ha**	**4,393**	**2,647**	**3,157**	**2,224**	**12,421**			
						Early	**35.3%**	**21.3%**	**25.4%**	**18%**	**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 (Inverness Lowlands 320)

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)				
Floodplain	IMSM (60.2%) ICSM (32.4%) WCSM (3.9%) IFSM (3.5%)	Softwood	bS bF bS	Gap	222; 10.3	Early	28	26	23	12	89	509; 39.7	EARLY	342; 26.7
						Mid	22	24	16	38	100			
						Late	48	52	84	85	268			
						Uncl	53	0	0	0	53			
		Mixedwood				Early	34	36	29	14	112	413; 32.2	MID	427; 33.3
						Mid	30	45	64	88	227			
						Late	5	8	39	10	62			
						Uncl	12	0	0	0	12			
		Hardwood	aE sM wA (89.7%)	Gap	1,929; 89.7	Early	21	17	39	15	91	282; 22.0	LATE	420; 32.7
						Mid	7	7	74	12	100			
						Late	0	0	87	2	90			
						Uncl	1	0	0	0	1			
		Unclassified				Early	51	0	0	0	51	79; 6.2	UNCL	94; 7.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	29	0	0	0	29			
Total					**2,151***	**# ha**	**339**	**213**	**455**	**275**	**1,283**			
						%	**26.4%**	**16.6%**	**35.5%**	**21.5%**	**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 (Inverness Lowlands 320)

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 (100.0%)	Softwood	bS		422; 40.0	Early	5	8	2	0	14	290; 58.8	EARLY	56; 11.4
						Mid	3	10	26	34	74			
						Late	25	35	88	34	181			
						Uncl	21	0	0	0	21			
		Mixedwood				Early	0	17	1	4	22	128; 25.9	MID	169; 34.3
						Mid	10	16	22	24	72			
						Late	0	5	15	5	25			
						Uncl	9	0	0	0	9			
		Hardwood	aEsMwA		106; 10.0	Early	13	3	3	2	20	57; 11.5	LATE	216; 43.9
						Mid	0	0	20	3	24			
						Late	0	8	2	0	11			
						Uncl	2	0	0	0	2			
		Unclassified				Early	0	0	0	0	0	19; 3.9	UNCL	51; 10.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	19	0	0	0	19			
Total					**1,056***	**# ha**	**107**	**103**	**178**	**106**	**493**			
						%	**21.6%**	**20.8%**	**36.1%**	**21.4%**	**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 (Inverness Lowlands 320)

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)				
Salt Marsh	XXMS (100.0%)	Softwood				Early	0	5	0	0	5	28; 39.8	EARLY	14; 20.3
						Mid	0	1	0	0	1			
						Late	3	6	10	3	21			
						Uncl	1	0	0	0	1			
		Mixedwood				Early	0	0	0	0	0	23; 31.8	MID	20; 27.7
						Mid	1	6	4	3	13			
						Late	1	5	3	0	9			
						Uncl	0	0	0	0	0			
		Hardwood				Early	2	1	4	3	9	20; 28.4	LATE	37; 51.3
						Mid	1	0	1	3	6			
						Late	0	0	6	0	6			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.0	UNCL	1; 0.8
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**188***	**# ha**	**8**	**24**	**28**	**12**	**71**			
						%	**11.3%**	**32.9%**	**39.5%**	**16.3%**	**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 (Inverness Lowlands 320)

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)				
Coastal Beach	XXCB (100)	Softwood				Early	0	0	0	0	0	3; 100.0	EARLY	
						Mid	0	0	0.4	0	0.4			
						Late	0	2.6	0	0.3	3			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	0	0	0	0		MID	0.4; 12.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	0	0	0		LATE	3; 87.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0		UNCL	
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**87***	**# ha**	**0**	**3**	**0.4**	**0.3**	**3**			
						%	**0.0%**	**78.8%**	**12.1%**	**9.1%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Inverness Lowlands 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 Hardwood Hills	WCKK WFDS WFHO WFKK WFRD WMDS WMHO WMKK	Gap	sM yB Be	S	SwSDom	2,309	26.4%	E	**Well-Drained** Early - tA,wB, rM, pCh Mid - rM,yB, (rO) Late - sM,yB,Be, wA **Moist** Early/Mid - wB, tA Late - wS, bF, bS, (wP) **Exposed** Early/Mid - wB, tA Late - bF, wS, bS
				S	SrSbSDom	1,037	11.9%	L	
				S	SbFDom	345	3.9%	E	
				S	SSpbFDom	203	2.3%	M	
				S	SPiDom	3	0.0%	M	
				M	MIHwSH	1,471	16.8%	M	
				M	MIHwHS	1,181	13.5%	M	
				M	MTHw	366	4.2%	L	
				H	HIHw	1,004	11.5%	M	
				H	HTHw	516	5.9%	L	
				H	HITHw	309	3.5%	M	
Total						**8,744**	**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 Inverness Lowlands 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 IFHO IFSM IMHO IMSM WCHO WCKK WCSM WFDS WFHO WFKK WFRD WMHO WMKK WTLD XXMS XXWA	Frequent Gap Frequent Gap Frequent Gap Frequent Gap Frequent Gap Gap Gap Gap Gap Gap Gap Gap Gap None None None	bS aE sM wA bS wS bS bF bS aE sM wA bS sM yB Be aE sM wA sM yB Be sM yB Be sM yB Be sM yB Be sM yB Be sM yB Be saltmarsh None	S	SrSbSDom	424	15.8%	L	Various
				S	SwSDom	418	15.6%	E	
				S	SSpbFDom	166	6.2%	M	
				S	SbFDom	69	2.6%	E	
				M	MIHwHS	388	14.4%	M	
				M	MIHwSH	360	13.4%	M	
				M	MTHw	104	3.9%	L	
				H	HIHw	556	20.7%	M	
				H	HTHw	141	5.2%	L	
				H	HITHw	61	2.3%	M	
Total						**2,686**	**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 Inverness Lowlands 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 Fir Hills and Hummocks	ICHO IFHO IMHO WCHO	Frequent	bS bS wS sM yB B eH wP	S	SrSbSDom	2,817	24.8%	L	**Well** Early - tA, wB, rM, wB Mid - rM, yB, (rO) Late - sM, yB, Be, wA **Moist** Early - wB,tA Mid - wB,tA Late - wS, bF, bS,(wP) **Riparian** Early - wS, willow, tA, bP, cCH Mid - Wa, rM, wB,rM Late - aE, sM, yB, Be, (Ir)
				S	SwSDom	1,792	15.8%	E	
				S	SSpbFDom	892	7.8%	M	
				S	SbFDom	772	6.8%	E	
				S	SPiDom	3	0.0%	L	
				M	MIHwSH	1,661	14.6%	M	
				M	MIHwHS	1,442	12.7%	M	
				M	MTHw	415	3.7%	L	
				H	HIHw	789	6.9%	M	
				H	HTHw	550	4.8%	L	
				H	HITHw	239	2.1%	M	
Total						**11,370**	**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 Inverness Lowlands 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
Floodplain	ICSM IFSM IMSM WCSM	Gap	bS aE sM wA bS bF	S	SwSDom	249	20.7%	E	**Well-Drained** Early - Ws, willow, tA, bP, cCH Mid - wA, rM, wB, rM Late - Ae, Sm, yB, Be, (Ir) **Moist** Early/Mid - wB, tA Late - wS, bF, bS, (wP)
				S	SrSbSDom	146	12.1%	L	
				S	SSpbFDom	60	4.9%	M	
				S	SbFDom	54	4.5%	E	
				M	MIHwSH	185	15.4%	M	
				M	MIHwHS	179	14.9%	M	
				M	MTHw	48	4.0%	L	
				H	HIHw	134	11.1%	M	
				H	HTHw	92	7.6%	L	
				H	HITHw	57	4.7%	M	
Total						**1,204**	**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 Inverness Lowlands 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	WTLD	None		S	SwSDom	173	36.5%	E	Wetlands with patches of bS, tL, rM, bF, alders
				S	SrSbSDom	104	21.8%	L	
				S	SbFDom	9	1.9%	E	
				S	SSpbFDom	5	1.0%	M	
				M	MIHwSH	81	17.0%	M	
				M	MIHwHS	32	6.8%	M	
				M	MTHw	15	3.1%	L	
				H	HIHw	42	8.8%	M	
				H	HTHw	11	2.3%	L	
				H	HITHw	4	0.8%	M	
Total						**474**	**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 Inverness Lowlands 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
Salt Marsh	XXMS	None	saltmarsh	S	SwSDom	22	30.3%	E	Open seral
				S	SbFDom	4	5.9%	E	
				S	SrSbSDom	3	3.6%	L	
				M	MIHwHS	13	18.1%	M	
				M	MIHwSH	7	9.3%	M	
				M	MTHw	3	4.3%	L	
				H	HIHw	13	18.4%	M	
				H	HTHw	6	8.1%	L	
				H	HITHw	1	2.0%	M	
Total						**71**	**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 Inverness Lowlands 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
Coastal Beach	XXCB	None	coastal beach	S	SwSDom	3	100		
Total						**3**	**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
sM yB Be	13,038	26.7%	392,460	40.4%
bS	11,413	23.4%	93,638	9.6%
bS wS	6,768	13.9%	10,139	1.0%
sM yB Be eH wP	4,604	9.4%	5,520	0.6%
aE sM wA	4,545	9.3%	11,114	1.1%
bS bF	373	0.8%	34,675	3.6%
Total	**40,741**	**83.4%***	**547,545**	**56.4%****

*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 ForestPolicy).
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 standconversion.
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 Fir Hills and Hummocks	15,810	240	9,263	224	4,094	1,989	7,740 to 8,735	49 to 55
Tolerant Hardwood Hills	11,847	237	5,960	195	4,447	1,009	5,008 to 5,512	42 to 47
Valley Corridors	5,776	190	3,548	32	1719	287	2,931 to 3,075	51 to 53
Floodplain	1,809	31	1,008	18	609	143	827 to 898	46 to 50
Wetlands	850	34	590	3	170	52	491 to 517	58 to 61
Salt Marsh	155	13	96	0	46	1	85	55
Coastal Beach	86	52	29	0	6	0	73	84
Total	**36,334**	**796**	**20,493**	**472**	**11,091**	**3481**	**17,155 to 18,895**	**47 to 52**

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	566	0	382	0	51	133	320 to 386	56 to 68
ICSM	1,444	4	786	19	504	130	631 to 696	44 to 48
IFHO	5,797	83	3,147	149	1,642	776	2,674 to 3,062	46 to 53
IFSM	51	0	35	0	14	2	27 to 28	52 to 54
IMHO	4,939	8	3,054	50	1,224	603	2,462 to 2,764	50 to 56
IMSM	2,588	36	1,536	8	914	95	1,213 to 1,260	47 to 49
WCHO	6,808	185	4,022	46	1,906	650	3,375 to ,3700	50 to 54
WCKK	1,340	29	659	52	425	175	580 to 667	43 to 50
WCSM	119	0	60	0	46	13	48 to 55	48 to 55
WFDS	104	0	91	0	11	2	68 to 69	68 to 69
WFHO	3,596	118	1,871	33	1,338	236	1,588 to 1,706	44 to 47
WFKK	1,063	20	593	6	343	102	491 to 542	46 to 51
WFRD	828	0	477	1	226	123	389 to 450	47 to 54
WMDS	228	0	169	0	47	12	129 to 136	57 to 60
WMHO	3,263	117	1,458	70	1,456	163	1,268 to 1,350	39 to 41
WMKK	1,734	7	811	36	675	206	675 to 778	39 to 45
WTLD	1,453	97	1,085	4	198	68	929 to 963	64 to 66
XXCB	86	52	29	0	6	0	73	85
XXMS	402	45	280	0	77	0	255	63
Total	**36,407**	**800**	**20,542**	**473**	**11,104**	**3,489**	**17,197 to 18,941**	**47 to 52**

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 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.