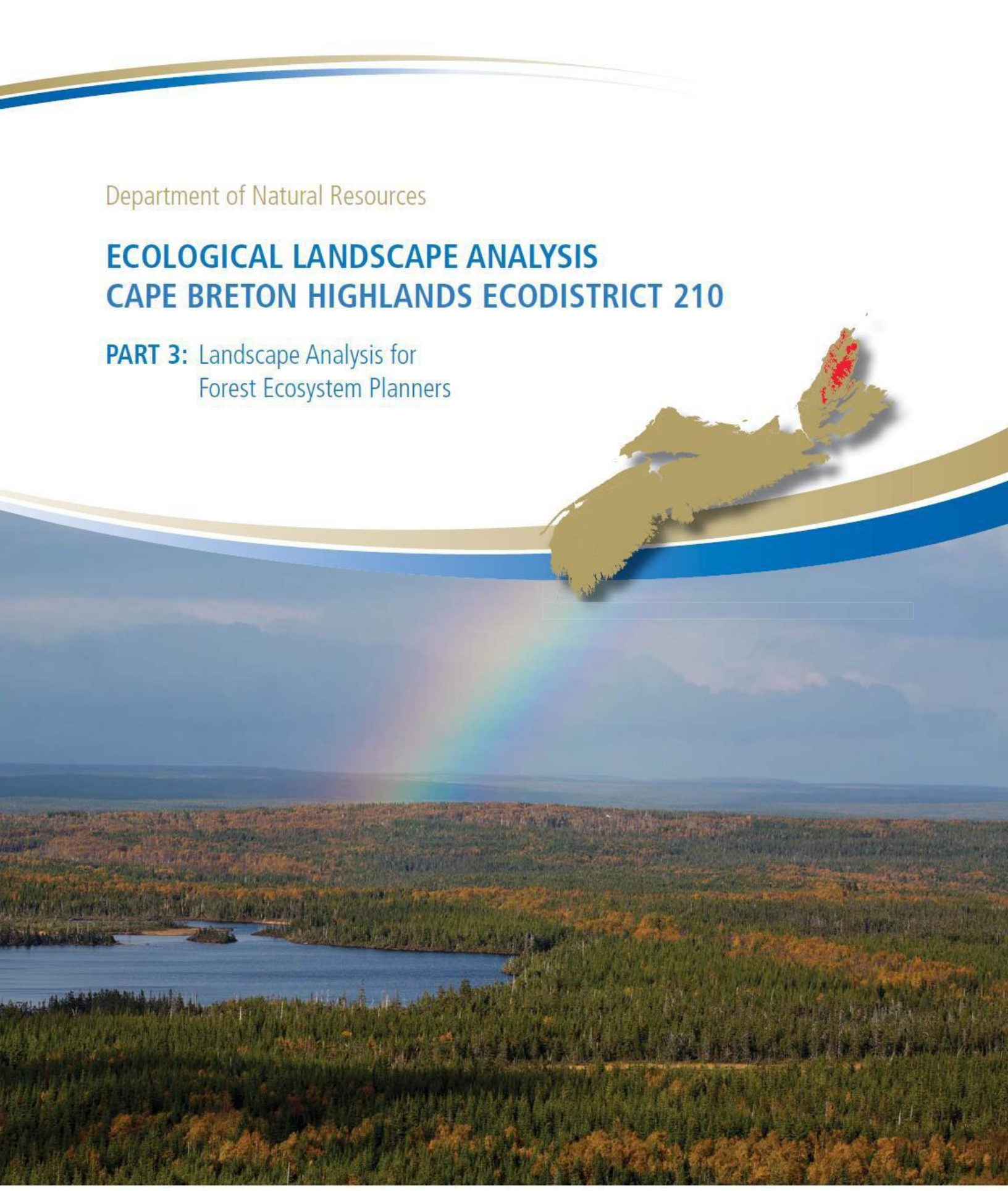
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CAPE BRETON HIGHLANDS ECODISTRICT 210

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2015-210

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 210: Cape Breton Highlands

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ISBN 978-1-55457-573-2

This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Cape Breton Highlands 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 to 1999) – stand volume, species composition
- 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 2015-210

Table of Contents – Part 3

Tables

Appendices

Theme Maps Available on Website

Part 3: Landscape Analysis of Cape Breton Highlands – *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, DNR will continue to develop landscape planning approaches and introduce additional tools to support sustainable management and biodiversity conservation. The Department is working with stakeholders to explore novel planning approaches using these methods.

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

Understanding the Landscape as an Ecological System
- Elements Within Landscapes
- Flow-Element Interactions
- Landscape Connectivity

Landscape Indicators
- Forest Composition Indicators
- Land Use Indicators

Fine Scale Features
- Priority Species and Other Special Occurrences
- Rare Ecosections
- Ecological Representivity

ELA Summary
- Element Interpretation
- Ecosystem Issues and Opportunities

Understanding the Landscape as an Ecological System

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

Landscapes are large areas that function as ecological systems and respond to a variety of influences. Landscapes are composed of smaller ecosystems, known as elements, which were interpreted through analysis using the ecosection layer of the Ecological Land Classification (ELC) for Nova Scotia. Elements are described by their potential vegetation (e.g. climax forest type) and physical features (e.g. soil, landform). These characteristics help determine historical vegetation patterns and promote an understanding of present distributions and potential habitat

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

Elements Within Landscapes (Map 2)

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

Highland Fir Spruce, representing 77% of the ecodistrict area, is the matrix element. This is primarily a boreal softwood forest dominated by balsam fir, with scattered black spruce and white spruce. The element also includes a transitional mixedwood forest of yellow birch and balsam fir, which occurs where the hardwood forests of the slopes meet the softwood forests of the plateau.

This ecodistrict includes an unusual patch element, known as **Rockland**, consisting of extensive areas of exposed bedrock, mainly on the eastern side of the ecodistrict. The main tree species here are slow-growing balsam fir, black spruce, larch, and white birch.

The other patch elements are **Highland Mixedwood,** a mixedwood forest of balsam fir and white birch with scattered white spruce and red maple, **Highland Barrens**, which commonly comprises stunted forests along with heath barrens, and **Wetlands**, usually located near headwaters of brooks and rivers. **Valley Corridors** is a linear element associated with major watercourses.

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: moose, water, humans, marten, lynx, and deer.

There is a natural percolation or movement throughout the ecodistrict and management activities need to take into account these flows.

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

River corridors promote connectivity.

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

Connectivity refers to the ease or difficulty that resources, such as water, animals, or even events – such as fires – can move within an area. As a basic ecological requirement, the ability to

move without excessive risk is of critical importance for maintaining biodiversity at all levels, including genetic, individual, species, population, community, and ecosystem.

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

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

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

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

Overall, Cape Breton Highlands is dominated by a forest that has a fairly natural structure and representation of forest communities. As such the connective structure of the ecodistrict, and the movement it supports, are in relatively good shape to sustain most connective functions necessary for biodiversity.

Localized areas such as the Wreck Cove hydroelectric project and settlement communities have significantly altered the natural landscape to the point where the connective function of corridors has been reduced for some species and barriers exist to the movement of other species. Connectivity still continues around these areas but is reduced within these areas. Within the large forest management areas of the Stora Enso (*now Port Hawkesbury Paper*) lease, the landscape has been fragmented by forest access roads. However, the overall structure of the matrix ecosystems has remained intact.

An additional concern inherent in all ecological planning is the maintenance of connectivity among conservation areas, including wilderness areas, old growth stands, provincial parks, federal park land, and ecological reserves. At the landscape scale of planning, connectivity among these areas in the Cape Breton Highlands is supported by the dominant forest structure and the identified corridors.

Current resource planning identifies and utilizes natural corridor connectivity to help ensure sustainable movement of selected species – such as the marten – across the landscape by

connecting the conservation areas. Connectivity will be sustained by applying the natural disturbance regime guidelines for landscape composition (Table 7) and recognizing natural linkage opportunities.

Connectivity opportunities in the ecodistrict could include:

- Enhancing connectivity among 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)

The major landscape flows, such as animals, water, and humans, provide linkages to adjacent ecodistricts.

As much of the ecodistrict exists on an elevated peneplain, the watercourses that find their headwaters in the wetlands and raised bogs near its central axis flow outwards eventually into neighbouring ecodistricts.

Moose flow in and out of the Cape Breton Highlands Ecodistrict. While the ecodistrict would represent the major habitat area for the moose herd, the animals frequent the surrounding ecodistricts, especially in winter when weather conditions cause them to seek sheltered locations at lower elevations. The same pattern also holds for deer.

Humans provide a link among neighbouring ecodistricts and Cape Breton Highlands through transportation, recreation, development, settlements, and forest management. The Cabot Trail provides the main link through the settled areas and is recognized nationally as a tourism route and destination. In the central portions of the ecodistrict, humans provide a link to adjacent ecodistricts through forest management activities and the wide variety of recreation pursuits. The Highland Road and Whycocomagh Mountain Road transportation corridors provide the human linkage to neighbouring ecodistricts for these activities.

Current operational planning recognizes the importance of these linkages and flows and incorporates them into decision making processes.

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 (see http://novascotia.ca/natr/library/forestry/reports/NDRreport3.pdf).

Table 7 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)

Natural Disturbance Regime	Development Class			
	Forest Establishment	Young Competing Forest	Mature Forest (including multi-aged and old forest)	Multi-aged and Old Forest
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5 - 20%	>60% most in mid and late seral stages	>16%
Gap Replacement	0 - 15%	0 - 15%	>70% most in late seral stage	>24%

Forest Vegetation Types for Seral Stages in Each Element

Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)*** (http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp) is helpful in identifying forest plant communities. Table 8 presents a description of the vegetation types likely to be found within elements, along with the current percentage of each seral stage.

Table 8 – Forest Vegetation Types[1] Within Elements in Cape Breton Highlands

Element	Seral Stage			
	Early - Middle	%	Late	%
Highland Barrens	OW2, SP6, SP7	30.0	**HL1,** SP5	49.0
Highland Fir Spruce	HL1a, HL2	27.0	**HL1,** HL3, HL4	58.0
Highland Mixedwood	MW4, MW5, HL1a	22.0	**HL1,** HL3, HL4	57.0
Rockland	OW1, OW2, OW3, OW6			
Wetlands	WC1, WC2, WC6, WC7, WD2, WD3, WD6, SP7			

View forest groups and vegetation types at http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp

To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by DNR are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (KA), Mixedwood (MW), Old Field (OF), Open Woodland (OW), Spruce Hemlock (SH), Spruce Pine (SP), Tolerant Hardwood (TH), Wet Coniferous (WC), Wet Deciduous (WD)

Bolded vegetation types indicate typical late successional community

[1] Forest Ecosystem Classification for Nova Scotia (2010)

*Percentage of element in each successional stage. Percentages may not total 100 due to unclassified lands (such as clearcuts and regenerating stands) not being included.

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

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

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

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

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

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

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

The overall EEI for Cape Breton Highlands is 75 to 81 (Appendices 12a and 12b), a relatively high index that is likely the result of the large amount of protected land (40%) in the ecodistrict.

Nearly 49% of the land falls in the extensive ecological emphasis class. This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

About 0.5% 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 35% 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 the 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 5% 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 about 11% of land 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.

Due to the high percentage of areas without roads and remote protected lands, the Cape Breton Highlands Ecodistrict has a low overall RI value of 0.6 (Appendix 7 Table 3) that falls within the Remote Index range of 0 to 6, which is considered to represent relatively unpopulated areas with few roads and trails. Seventy-two percent of the ecodistrict falls within this range (Appendix 7, Table 2).

Twenty-seven percent, or 50,457 hectares, of the ecodistrict has a Forest Resource RI value of between 7 and 15 (Appendix 7, Table 2). The majority of this area is located within the forest management areas of Stora Enso (*now Port Hawkesbury Paper*) on provincial Crown land.

Less than 1% of the area has road indexes greater than 16 (Appendix 7, Table 2) and these areas are located mainly around rural settlements and along the Cabot Trail.

At first glance, these values would indicate a very low rate of habitat fragmentation due to roads. However, a relatively high percentage of the ecodistrict is located in remote protected areas that contain no or very few road corridors (the Cabot Trail through the Cape Breton Highlands National being the main exception). In the more developed forest resource areas and settlement areas, potential habitat fragmentation may occur if more roads or access trails are developed without considering the requirements of indicator species, such as lynx or marten.

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 needs 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.

As of 2013, in the Cape Breton Highlands Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: six endangered, one threatened, and none vulnerable.

Endangered species found in the ecodistrict include: three mammal species, American marten (*Martes americana*), Canada lynx (*Lynx canadensis*), little brown bat (*Myotis lucifugus*); and three bird species, rusty blackbird (*Passerella iliaca*), Canada warbler (*Wilsonia canadaensis*), and Bicknell's thrush (*Catharus bicknelli*).

Olive-sided flycatcher (*Contopus cooperi*) is listed as threatened. As well, striped bass – southern Gulf of St. Lawrence population (*Morone saxatilis*) and Atlantic salmon – eastern Cape Breton population (*Salmo salar*) are ranked as endangered under COSEWIC. Atlantic salmon – Gaspé-Southern Gulf of St. Lawrence population is listed as special concern. Long-tailed shrew (*Sorex dispar*) is listed as threatened federally.

In addition to the listed species, the national General Status process also identifies 54 orange-listed species, 73 yellow-listed species, and 33-listed green species for a total of 160 other species of conservation concern in this district (some green-listed species are included because of their Atlantic Canada Conservation Data Centre rank of </= S3). As well there are 10 species that are ranked as undetermined, generally for a lack of information.

Wildlife and Wildlife Habitat

The Cape Breton Highlands Ecodistrict is one of the coldest and highest areas of the province. Fog is common and annual precipitation averages from 1,400 millimetres to 1,600 millimetres, with 400 centimetres of snowfall.

This ecodistrict holds the headwaters of the many of the main rivers in Inverness and Victoria Counties. The rivers include the middle, Baddeck, North, Chéticamp, Northeast Margaree, Ingonish, and the three Aspy rivers: Middle, North, and South. The Northeast Margaree and Chéticamp rivers drain northwesterly into the Gulf of St. Lawrence. The Ingonish, Aspy, and North rivers flow easterly into the Atlantic Ocean. The Middle and Baddeck rivers flow into Bras d'Or Lake.

The highland plateau had very little in the way of human settlement. Forestry and insect attacks have help shape the forest as it stands today. Balsam Fir is one of the dominant trees of the natural forest. A large portion of the ecodistrict is protected either as a national park or wilderness area.

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. Since then the fisher has been sighted 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. Fisher and the coyote are now common in Cape Breton Hills.

Moose (*Alces alces*) were an abundant and dominant 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 appears 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. In 1947 and 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.

Presently, moose are common throughout the ecodistrict except in the area south of the Bras d'Or Lake. Moose wintering areas are found along the edge of the highland plateau and in areas where softwood cover is still heavy. In severe winters, moose will drop down off the highland plateau to winter in the adjacent hills region. There has been a licensed lottery hunt for the moose in Inverness and Victoria counties since 1986. At present, 345 licenses are issued and the overall success rate has been around 90 %. There is also a First Nations harvest which has been going on over a number of years.

White-tailed deer (*Odocoileus virginianus*) can carry a nematode (*Parelaphostrongylus tenuis*) 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 uncommon to see 40 to 50 deer in a field on an evening drive through the area. Since 1990, deer have severely declined and are now found only in very low numbers. A period of long cold winters, reduction of winter cover caused by the budworm and resulting forestry activity, 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.

Black bear (*Ursus americanus*) have increased in number over the past decade. They are most common in most areas of the ecodistrict north of Bras d'Or Lake but less common in Cape Breton and Richmond counties. Black bear, due to their secretive nature, are rarely seen by residents. In the spring, bear sometimes become a nuisance as they check out garbage looking for food. Bear can be legally harvested by snaring or hunting in a season that runs for approximately three months.

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 (*Lepus americanus*). Marten are listed as endangered in Nova Scotia. 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 trapping 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. A special management practice (SMP) (see http://novascotia.ca/natr/wildlife/habitats/terrestrial/) is in place to help maintain suitable marten habitat on the highlands.

A number of marten habitat patches of 500 hectares or greater have been identified across the ecodistrict. These patches contain mature softwood or softwood-dominated mixedwood which is the marten's preferred habitat. The recent number of sighting and reports are an indication that the population may be on the increase.

Canada lynx (*Lynx canadensis*) is listed as endangered under the NSESA. Lynx formerly were found 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, it reaches its highest densities in the Cape Breton highlands. The current population is very small. Because snowshoe hare are its primary prey, numbers of lynx fluctuate over time roughly tracking density of hare. As hare populations in the highlands decline, lynx may disperse to lower elevations in search of prey. Historic and current threats to lynx include forest harvesting, competition from bobcats, coyote and fisher, habitat loss to development, disease, and climate change.

Birds

Bald eagles (*Haliaeetus leucocephalus*) are found in good numbers throughout this ecodistrict during the fall moose hunt due to the presence of a ready food supply. However, 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 Bras d'Or Lake and the shores of Lake Ainslie. There are, however, no known nests in Cape Breton Highlands. Bald eagles are protected under the Nova Scotia Wildlife Act.

Other common forest nesting raptors in the Cape Breton Highlands include hawks and owls. Ospreys (*Pandion haliaetus*), which feed almost exclusively on fish, have been noted nesting near Ingonish, Wreck Cove, and Trout Brook in the ecodistrict. Ospreys may be encountered during eagle surveys and nests are incidentally recorded. The osprey is Nova Scotia's provincial bird. Northern harrier (*Circus cyaneus*) can be found patrolling open wetlands and grassy areas. Sharp-shinned hawk (*Accipiter striatus*) and merlin (*Falco columbarius*) feed on the numerous songbirds found in the ecodistrict. Great horned owls (*Bubo virginianus*) nest in cavities, in trees, or on the ground and have been known to take over other raptor nests, such as those of eagles or goshawks. Some of the small owl species like northern saw-whet owl (*Aegolius acadicus*) and boreal owl (*Aegolius funereus*) have been noted in the area. Northern goshawk (*Accipiter gentilis*) is a bird of the mature hardwood or hardwood-dominated mixedwood forests.

Nova Scotia has guidelines for forest harvesting in place to help protect forest raptors and their nesting habitat. These general guidelines are intended for large forested areas where management for a wide variety of forest conditions may provide habitat features suitable for most woodland raptors.

The common loon (*Gavia immer*) is an expert swimmer and diver. Its 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 a number of the lakes in this ecodistrict including Timber Lake, Round Lake, and Chéticamp Lake.

Bicknell's thrush, listed as endangered in Nova Scotia, breeds in the stunted softwood forests at higher elevations generally above 300 metres. Little is known about this reclusive bird. Bird Studies Canada – a national bird conservation organization – is studying the decline of Bicknell's thrush over most of its range. This bird is found in many sites within the ecodistrict. A set of guidelines has been developed to help protect the bird's nests and nesting habitat during forest harvesting.

Insectivores like chimney swift (*Chaetura pelagica*; endangered NSESA) and barn swallow (*Hirunda rustica*; endangered NSESA) are reported in the Wreck Cove and Ingonish River 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.

Rusty blackbird (*Euphagus carolinus*) is one of North America's most rapidly declining species and is listed as endangered in Nova Scotia. The rusty blackbird is a bird of the wetlands and wet boreal forest. It has been found in the Belle Côte, Keppoch, and Baddeck Lake areas and several other locations in the ecodistrict.

Greater yellowlegs (*Tringa melanoleuca*) and spotted sandpiper (*Actitis macularius*) have been noted in the Baddeck Lake area and certain wetlands. Both of these birds have a sensitive status.

Black-legged kittiwakes (*Rissa tridactyla*: yellow), great cormorants (*Phalacrocorax carbo*; yellow), and black guillemot (*Cepphus grille*) are reported from St. Paul Island. All these species nest on cliffs and rocky shorelines.

Amphibians and Reptiles

Amphibians are quite common in all the wetlands area within the ecodistrict. Wood turtle (*Glyptemys insculpta*) is listed as endangered under NSESA. There is one record of a wood turtle sighting near the juncture of the North Aspy and Grande Anse rivers in the Cape Breton Highlands National Park. Larger populations of this turtle are along the River Denys and River Inhabitants in the Bras d'Or Lowlands Ecodistrict 510. A small pond in the ecodistrict is noted for its large concentration of yellow spotted salamanders (*Ambystoma maculatum*).

Fish

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

The Northeast Margaree River is renowned for Atlantic salmon angling. The Baddeck, Middle, North, and the Aspy rivers all have salmon runs during the year. The headwaters of all these rivers originate in the Cape Breton Highlands Ecodistrict. This recreational fishery adds a great deal to the local economy. Tributaries to all the main salmon rivers flow from this ecodistrict. 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. Gaspé – Southern Gulf of St. Lawrence population, including rivers draining into the Gulf of St. Lawrence (e.g. Northeast Margaree and Chéticamp rivers) has salmon designated as endangered by COSEWIC. The Eastern Cape Breton population, including rivers draining into the area from Meat Cove to Canso (e.g. North, Baddeck, Middle, and Aspy rivers) has salmon designated as special concern by COSEWIC.

Speckled trout (*Salvelinus fontinalis*) are found in all the rivers, streams, and lakes of the ecodistrict and provide another important recreational fishery.

Striped bass (*Morone saxatilis*) are common in the North and Middle Aspy rivers.

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 Cape Breton Highlands.

Of the species collected, forcipate emerald (*Somatochlora forcipata*), ringed emerald (*Somatochlora albicincta*), Quebec emerald (*Somatochlora brevicincta*), Canada whiteface (*Leucorrhinia patricia*), and subarctic bluet (*Coenagrion interrogatum*) are listed as may be at risk in the provincial general status.

All the Somatochlorids are beautiful dragonflies with bright green eyes hence the name emerald. Subarctic bluet is known from only one fen along the Bell Lake road in the ecodistrict. Two species are listed as sensitive. These are spot-winged glider (*Pantala hymenaea*) and black meadowhawk (*Sympetrum danae*). Spot-winged glider was recorded at Gold Brook barrens and black meadowhawk from the Everlasting Barrens.

Odonates are all associated with water. As a result, wildlife guidelines which require buffers on streams and wetlands help protect their habitat.

Butterflies

The Maritime Butterfly Atlas has been ongoing since 2010 and the last year of data collection will be 2015. 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 on Cape Breton. In the Cape Breton Highlands, there are four species that are listed as species of conservation concern, including short-tailed swallowtail (*Papilio brevicauda*) found in coastal areas and headlands where its host plant scotch lovage (*Ligusticum scoticum*) is found. Records show it has been recorded on St. Paul Island.

Another bog species, arctic jutta (*Oenies jutta*), listed as possibly at risk, was collected on bogs at North Mountain and the Everlasting Barrens. Two species, mustard white (*Pieris oleracea*) and arctic fritillary (*Boloria chariclea*) are listed as sensitive. Mustard white was recorded in several areas, including Cape Smokey. Arctic fritillary was found near an airport on the highlands.

As the Maritime Butterfly Atlas comes to an end in 2015 and the data is processed, more information on species distribution and abundance can be expected for the Cape Breton Highlands Ecodistrict.

Plants

A total of 44 Nova Scotia orange-listed, 53 Nova Scotia yellow-listed, and 9 undetermined (insufficient data to define status) plants are known from the Cape Breton Highlands. As well there are 22 species that are listed as S3 uncommon. There are several sites which harbour notable concentrations of plant species of conservation concern but many areas have not been surveyed in recent years.

The Egypt Mountain area in in the ecodistrict has a number of plants that are listed as species at risk. Three yellow-listed plants – Downy willowherb (*Epilobium strictum*), fragrant woodfern (*Dryopteris fragrans*), and horneman's willowherb (*Epilobium hornemanii*) – are found in this area. Downy willowherb is found in some of the bogs and wet areas while horneman's willowherb grows on damp rocks and the margin of rills. Fragrant woodfern is a small distinctive fern with fragrant fronds that grows on overhanging cliffs or in crevices along streams in the area.

Dwarf bilberry (*Vaccinium caespitosum*), a yellow-listed species, can be found commonly growing in this area. These plants grow on acidic soils and have a white flower that produces a blue berry.

Gisborne Flowage is a lake area in the central highlands produced by damming for hydroelectric power. Chestnut sedge (*Carex castanea*), an orange-listed species, can be found growing in swamps and wet meadows in this area. A little farther north is Chéticamp Lake, another large lake formed by the same hydroelectric project. Glandular birch (*Betula glandulosa*) grows in peat or sphagnum bogs just to the north of the lake. It is listed as orange and may be at risk. Two yellow-listed plants, alpine bilberry (*Vaccinium uliginosum*) and pink crowberry (*Empetrum eamesii*) are found near the lake as well. Pink crowberry can be found on rocky outcrops to the south of the lake.

On French Mountain area, within the Cape Breton Highlands National Park, there are a number of listed species found. Northern birch (*Betula borealis*), bog birch (*Betula pumila*), northern burred (*Sparganium hyperboreum*), and moor rush (*Juncus stygius*) are all yellow-listed plants found in this area. Bog birch is a small plant which grows in bogs or wet meadows. Two orange-listed plants, low spikegrass (*Selaginella selaginoides*) and Richardson's rush (*Juncus alpinoarticulatus*), are also recorded. Richardson's rush is found growing in a bog in this area.

Least Moonwort (*Botrychium simplex*: yellow) is a grape-fern that grows along mossy covered stream banks. It can be found growing at North Mountain. The Polletts Cove – Aspy Fault Wilderness Area, located north of the national park, hosts a number of interesting species. Just north of that site in North Mountain, in the Fox Back Lake area, several listed plants are found. Squashberry (*Viburnum edule*: yellow) and wiegand's sedge (*Carex wiegandii*: orange) can be found here. Bog Birch (*Betula pumila*; yellow) and northern birch (*Betula borealis*: yellow) are recorded along the shores of Fox Back Lake. Diapensia (*Diapensia lapponica*: orange) is a small evergreen shrub that blooms white flowers in June and July. One of the few places in the province that it is found is near Lockhart Brook in the wilderness area. Northern blueberry (*Vaccinium boreale*) is another orange-listed species that is found in the same area, along with several yellow-listed species. Alpine bilberry, glaucous blue grass (*Poa glauca*), and scirpuslike sedge (*Juncus scirpoidea*) grow here.

The Money Point area is near the tip of Cape Breton and is another site where northern blueberry grows. Dwarf birch (*Betula minor*; yellow), squashberry (*Viburnum edule*: yellow), and highland rush (*Juncus trifidus*: yellow) are also found at this site. Squashberry (also known as mooseberry) is a small bush with edible red fruit. It grows in cold woods and is indicative of a climax forest. Highland rush grows in dry cliff crevices and north-facing slopes from June to August.

St. Paul Island is located approximately 24 kilometres off the northern tip of Money Point. The island is about three miles long and one mile wide, and peaks at a height of 147 metres on Crogan Mountain. The island is surrounded by a rockface cliff and is covered with stunted spruce and fir trees. Access to the island is very limited. St. Paul Island was the site of a manned lighthouse for many years but the lighthouse has been decommissioned. There are no reports of land animals on the island but it is the site of many birds and rare plant species. Records indicate at least nine orange-listed and seven yellow-listed plant species on the island. The orange-listed species include

narrow-leafed beaked sedge (*Carex rostrate*), common butterwort (*Pinquicula vulgaris*), northern bog sedge (*Carex gynocrates*), field locoweed (*Oxytropis campestris),* alpine azalea (*loiseleuria procumbens*), moss campion (*Silene acaulis*), and multirayed goldenrod (*Solidago multiradiata*). Two species of orange-listed species are of willow are also found on the island: gray willow (*Salix glauca*) and bearberry willow (*Salix uva-ursi*). The latter willow is a sub-arctic species that is only found on two sites in Nova Scotia – the barrens on St. Paul Island and Corney Brook gorge in the Cape Breton Highlands National Park. Also reported on the island are the yellow-listed species lesser rattlesnake plantain (*Goodyera repens*), alpine bilberry, bog birch, spurred gentian (*Halenia deflexa*), Swedish bunchberry (*Cornus suecica*), northern commandra (*Geocaulon lividum*), and pink crowberry.

Investigations in the Cape Breton Highlands have documented two lichen of conservation concern, yellow-listed crinkled snow lichen (*Flavocetraria nivalis*) and orange-listed rockmoss rosette lichen (*Massalongia carnosa*).

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

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

Landscape elements were identified by combining ecosections with similar characteristics. Table 9 provides explanations of ecosections and their relationship to elements.

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

Appendix 3, Table 2 identifies those rare (less than 2% of ecodistrict and ecoregion area) ecosystems. Within the Cape Breton Highlands, seven ecosections – IMRD, IMSM, WCHO, WCDS, WCRD, WMRD, and WTLD – each comprise less than 2% of the ecodistrict area. Six of these – IMRD, IMSM, WCDS, WCRD, WMRD, and WTLD – comprise less than 2% of the ecoregion area (Map 7).

Only one ecosection – WCHO with 6% converted – currently shows any significant alteration from land use pressures within the ecodistrict. The majority of these alterations have occurred around Pleasant Bay, Inverness County, from human settlement activities and from the Wreck Cove hydroelectric project associated with infrastructure development of roads, dams, canals, and quarries. Much of the remainder of the WCHO ecosection is contained within protected areas.

The percentage of conversion of the remaining ecosections would not be considered significant at the ecodistrict level.

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

210 Cape Breton Highlands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Highland Fir Spruce (Matrix)	IMHO IMRD WMHO WMKK	Frequent	balsam Fir (bF), white Spruce (wS)
Rockland (Patch)	WCKK WCRD	Open Seral	black Spruce (bS), bF
Highland Mixedwood (Patch)	WCDS WCHO WMRD	Frequent	red Maple (rM), white Birch (wB), yellow Birch (yB), bF
Highland Barrens (Patch)	IMKK	Frequent	bS, bF, tamarack (tL)
Wetlands (Patch)	IMSM WTLD	Open Seral (Frequent)	bS, tL, rM
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

At the ecoregion scale, analysis indicates that conversion at any significant levels has only occurred on ecosections IMSM at 8% and WCHO at 14%.

The IMKK ecosection, with a climax community of barren type plants, is mainly located in two areas of the ecodistrict: in and around Pembroke Lake and at the headwaters of the Ingonish River. Except for access roads through these areas (1% of area) there has been no conversion of the ecosection.

The black spruce climax community type associated with ecosection IMRD is found mainly in two locations in the ecodistrict: at the confluence of the headwaters of the Humes River and Trout Brook watersheds on imperfectly drained sites and also on poorly drained sites between lakes in the Wreck Cove area and French River Lakes. Access roads account for the low conversion rate of less than 1% of the area.

A second black spruce climax community type located in ecosection IMSM is found on scattered poorly drained sites throughout the ecodistrict. Access roads account for the small conversion rate of less than 1% of the area.

A climax community type associated with the WCRD ecosection in the Rockland element is located mainly within protected areas.

The wetlands climax community type found in ecosection WTLD is located on a number of raised bogs and wetlands throughout the ecodistrict. Only 0.1% of the area is considered converted, mainly by road access construction.

Opportunities for future management are to implement existing policies and develop additional, effective practices to address fine filter conservation issues such as:

- Uncommon forest species for which genetic viability may be threatened as indicated by DNR's Endangered Species Rating System of yellow-listed and red-listed species.
- Fine filter management opportunities related to conservation of significant habitats.
- Uncommon community conditions (e.g. old age, large live and dead trees and species associations).

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 Forest 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 Integrated Resource Management (IRM) classification to include old forest, Eastern Habitat Joint Venture Sites, non-designated provincial park reserves, and non-designated sites of ecological significance.

Protected and Limited Use Lands

The Cape Breton Highlands Ecodistrict includes 73,143 hectares of designated provincial and federal protected areas, or nearly 40% of the ecodistrict. Provincial protected areas, representing 38,851 hectares, include all or portions of several wilderness areas and Cape Smokey Provincial Park.

Federal protected areas of 34,292 hectares include a major part of the Cape Breton Highlands National Park. The park was established in 1936 and protects a large area of the highland plateau.

Among the protected areas identified in a provincial lands database, several provincial wilderness areas fall partly within the boundaries of Cape Breton Highlands. These are Polletts Cove - Aspy Fault, Margaree River, Jim Campbells Barren, French River, North River, Middle River, and

Trout Brook. Three International Biological Program (IBP) sites are found within the boundaries of the ecodistrict at French River, Second Fork Brook, and the Lake O'Laws.

Considerations in improving representation could focus on:

- Ecosections that form less than 2% – IMRD, IMSM, WCDS, WCHO, WCRD, WMRD and WTLD.
- Connectivity among protected areas and river corridors.

ELA Summary

Element Interpretation (All appendices and maps)

The Cape Breton Highlands Ecodistrict is mainly the forested region of northern Cape Breton Island and generally includes the plateau and its rolling topography of hummocks and hills. Here the country is covered by an almost unbroken forest of balsam fir, spruce, and paper birch. The ecodistrict also includes the shoulder of the plateau where the hardwood forested steep slopes meet the balsam fir forests of the plateau.

Barrens and wetlands are dispersed throughout and the headwaters of the island's major rivers start their descent down the escarpment through steep ravines.

The Cape Breton Highlands Ecodistrict includes a transition zone, an informal term used to describe the area where forest conditions blend between the climatic climax Acadian Forest hardwood slopes and the climatic climax balsam fir plateau.

When viewed from a distance, the top of the highlands looks almost perfectly flat. However, once on top the topography becomes more evident. Underlain with old erosion-resistant rocks, the plateau is gently rolling with knolls, small hills or hummocks, and gently sloping valleys.

Residuum and bedrock are partially covered with a thin discontinuous veneer of moderately coarse-textured stony till, one to four metres thick. Extensive areas of exposed bedrock with thick carpets of reindeer mosses and dwarf woody shrubs occupy much of the eastern plateau.

The ecodistrict has cold, late springs and snow cover lasts into May. Heavy snowfalls of about 350 centimetres are typical and the highlands are subjected to some of the highest winds in the province.

The soils of the highlands have not been extensively surveyed aside from the few agricultural areas on the lower elevations and most are mapped as "rough mountain land" and described as well-drained, moderately coarse-textured soils. The parent material is a thin veneer of moderately coarse-textured stony till over bedrock, with variable permeability.

The majority of the plateau is covered in a boreal-like fir spruce forest. The dominant species is balsam fir mixed with black spruce and scattered white spruce and white birch. Black spruce and eastern larch occupy the wetter areas with high populations of *Sphagnum* mosses and *Carex* species (sedges).

Repeated attacks by the spruce budworm have been the major disturbance to the fir dominated forests of the Cape Breton Highlands Ecodistrict. The mortality caused by the budworm during the last outbreak in the late 1970s has been replaced with the re-establishment of the balsam fir forest, much of which is being intensively managed in an effort to reduce the impact of the next outbreak on the wood supply.

In the 1830s settlement and land clearing moved into the mountains surrounding Middle River. However, by the late 1950s much of this farmland was abandoned and today areas such as Crowdis, Gairloch and Gillanders mountains have regenerated to old field white spruce.

Highland Spruce Fir

(Matrix) (IMHO, IMRD, WMHO and WMKK ecosections) (139,618 ha)

The current softwood matrix element of the Cape Breton Highlands Ecodistrict has been influenced by frequent stand-initiating disturbances, predominantly the widespread insect infestation of the eastern spruce budworm of the 1970s. Forest management prior to and subsequent to this infestation strongly influences the southern half of the ecodistrict.

Presently, the matrix is dominated by late seral softwood stands of balsam fir on well-drained medium-textured soils. This softwood type accounts for 70% of the element. On the imperfectly drained sites, black spruce dominates.

Black spruce can be found on moist riparian soils and shallow stony soils over bedrock. White birch follows stand-level disturbances and a few remain as remnants in mature stands of fir. Occasionally a few large mountain ash will make it into the canopy.

Due to the significant influence of climate, this element can be quite variable in terms of stand quality and site conditions. Typically, Highland Spruce Fir occurs on well to imperfectly drained medium-textured soils derived from glacial tills. The cool, moist climate also slows decomposition rates resulting in sites with unusually thick duff layers.

Coarse woody debris loads are among the highest for any forested element in Nova Scotia due to the frequent stand-level disturbances and slow decomposition. Wind and exposure significantly limit tree growth with most stands less than 15 metres in height.

White spruce is second in importance in this element but only approaches the balsam fir in abundance on steeper slopes. Here seedbed conditions seem to favour establishment of white spruce with stands having similarities with those established on abandoned farmlands.

A significant transitional forest occurs in this element where forest conditions blend between Acadian Forest hardwood slopes and the balsam fir plateau. On the perimeter of the plateau a mixedwood forest of yellow birch and balsam fir occurs on well-drained, nutrient medium to rich loams and sandy loams. In this forest, two development classes are usually present, an older yellow birch cohort and a younger balsam fir cohort. The longevity of the fir is dependent on the spruce budworm cycle and the yellow birch can achieve old growth age. On similar sites a white birch-yellow birch hardwood forest may also develop.

This element is an even-aged late successional community. The main stand-level disturbance agents are either spruce budworm defoliation or harvesting. In the absence of defoliation or harvesting events, the lifespan of balsam fir in this ecosystem is about 75 years, after which tree senescence initiates renewal through advanced regeneration. In sheltered areas, balsam fir can be expected to reach 125 years of age.

Clearcut harvesting or, less commonly, fire may initiate an earlier successional stage dominated by pin cherry, white birch, raspberry, mountain ash, and other woody shrubs but these are usually quickly overtaken by balsam fir regeneration. Heavy browsing of young fir and hardwood saplings by moose, following the last spruce budworm epidemic, is influencing successional patterns by creating open grasslands with stunted regeneration.

Moose were successfully re-introduced to the Cape Breton Highlands National Park in the 1940s and since then have become well established over most of northern Cape Breton.

Embedded in this element are the Highland Barrens and Rockland elements which increase in prominence on the higher elevations.

Flows

Humans (forestry, hunting, fishing, off-highway vehicle (OHV), mineral exploration); deer (summer range); moose (habitat); marten (primary habitat); lynx (habitat); water (catchment, filter, groundwater).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006)
Composition of Highland Spruce Fir

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	59%	17%	24% (17 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	12%	15%	58%	15%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	56%	10%	19%	15%

Desired condition

Late seral and balsam fir-dominated stands in a variety of patch sizes, development stages, and seral classes. Improved connectivity among reserves, wetlands, and river corridors. Mixture of tolerant and intolerant hardwoods throughout the stands.

Issues

- This element is vulnerable to a spruce budworm which may cause widespread mortality of balsam fir.

- Wood supply for the paper mill at Port Hawkesbury relies heavily on this element.
- A significant portion of the element is required to enhance the survival of the endangered Canada lynx and American marten.
- Intensive forest management to mitigate spruce budworm impacts may reduce the amount of older fir forest on the landscape (Note: impact on endangered species may be mitigated by recovery plans).

Rockland

(Patch) (WCKK and WCRD ecosections) (29,584 ha)

An extensive area of exposed rock outcrops and well-drained, shallow soils over bedrock. Late seral stage stands growing in open conditions. Over a large part of the eastern plateau the bedrock is covered by a thin soil and a noticeable reduction of the Highland Fir Spruce forests.

Denuded hilltops with exposed granite, diorite and gabbro bedrock and large boulders define a rugged landscape. Woody heath-like shrubs are the prevailing vegetation. Lichens and various reindeer mosses are conspicuous. Sedges, grasses, shrubs, and severely stunted trees are less prominent.

The Rockland element is a large patch area within the ecodistrict but given its localized extent and prominence it has matrix level landscape characteristics. The Highland Barrens element is well represented within this complex and extensive areas of dwarf shrubs, stunted spruce, and krummholz are prominent.

Forest productivity in this element is extremely low and very few areas would have forests of commercial quality. Wildlife habitat values are likely to be more noteworthy and at one time included the now extirpated woodland caribou.

Flows

Humans (hunting, mineral exploration); moose (travel, food, limited winter cover); water (catchment, filter, recharge).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006)

Composition of Rockland

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	53%	28%	19% (13 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	9%	19%	43%	29%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	13%	20%	29%

Desired Condition

Late seral stage softwood stands comprised mainly of balsam fir and black spruce. A mixture of tolerant and intolerant hardwoods should be maintained throughout the stands.

Issues

- Operable stands are scattered making accessibility for harvesting expensive.
- Shallow soils and bedrock exposure make road building difficult.
- Impact of off-site movement of sediment due to road building and access trails.
- OHV access that is unplanned can have negative impacts which will be difficult to mitigate especially if trails cause erosion of soils into watercourses.

Highland Barrens
(Patch) (IMKK ecosection) (4,708 ha)

This element consists of open and treed barrens. Late seral stage softwood stands with a mixture of intolerant hardwoods are common. The soils are typically well-drained and shallow with exposed rock outcrops.

The Highlands Barren element is extensive in the adjacent Northern Plateau Ecodistrict but two notable patches of Highland Barrens have been included in this ecodistrict. One is located near Pembroke Lake and the other south of the Chéticamp Flowage. This element is best described as a complex of well-drained and poorly drained upland sites with bogs and swamps interspersed.

Where medium-textured soils are deep, forests of fir and spruce occur. Elsewhere, shallow soils over bedrock give rise to sparsely forested woodlands and/or rocklands covered with heath-like shrubs, stunted trees, and reindeer moss.

Wetlands, which tend to be treeless and covered with short woody shrubs, are associated with depressions and small streams slowly wandering over gentle terrain before cascading off the highlands. This element near Pembroke Lake is a mottled landscape of fir forests, barrens, and wetlands.

South of the Chéticamp Flowage, rockland and barrens predominate with fir and spruce forests found where soils are deeper and the sites are somewhat sheltered. The element is also embedded within the Highland Mixedwood, Rockland, and Wetlands elements.

Fir forests are susceptible to frequent stand-level disturbances caused by the spruce budworm or natural senescence. Since this element occurs at higher elevations than most of the Highland Fir Spruce forest, wind and exposure significantly limit tree growth. Fire has possibly been a disturbance where soils are rapidly drained and dry during the summer and fall.

Flows

Humans (recreational travel, mineral exploration); moose (travel, food); water (catchment).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006) **Composition of Highland Barrens**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	64%	12%	24% (20 Mat + 4 OF)	4%
Seral Stage	Early	Mid	Late	Unclassified
	8%	22%	49%	21%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	46%	10%	23%	21%

Desired Condition:

Late seral stage softwoods growing in open barren conditions.

Issues

- Most softwood stands in this element are of low volume and therefore inoperable due to isolation and cost associated with road building.
- Sites have an inherent low productivity and are basically unsuitable for forest management.
- OHV access that is unplanned can have negative impacts on both sensitive site features (e.g. wet soils, organic soils, shallow soils) and habitat use by moose and other wildlife.

Wetlands

(Patch) (IMSM and WTLD ecosections) (3,956 ha)

This element includes late seral stage black spruce stands on the treed bogs. Open bogs are mainly raised and found at the headwaters of the river corridors. These wetlands patches are important to the storage and discharge of water into the river corridors.

The Wetlands element comprises freshwater bogs, fens, swamps, and poorly drained areas. It occurs as a large wetland complex associated with small lakes, 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 water remains in excess year round.

The type of wetlands is quite varied and can include well-drained swamps such as would occur along the shorelines of lakes. However, most of the wetlands are poorly drained and include several species of sphagnum mosses and sedges.

Wetlands are generally treeless, sparsely forested woodlands of stunted black spruce or poorly drained forests mostly of black spruce with red maple and tamarack and an understory of alder and typical swamp species such as cinnamon fern and sphagnum mosses.

Riparian zones associated with the headwater streams of the major rivers have black spruce forests and occasionally small balsam poplar-alder floodplain forests.

Raised bogs are common with one of the best examples being the Big Barren located along the Highland Road south of the Fielding Road junction. As a bog, it is unique because it is higher toward the centre than at the margin, giving it a look that has been described as an inverted saucer. Small ponds can be frequently encountered on these raised bogs. The vegetation on raised bogs is primarily sphagnum mosses which form the basis of the mass. The most prominent plants are low ericaceous shrubs and sedges. Raised bogs can be roughly categorized as bog meadows (sedges and grasses), wet bogs (sedges, leather leaf, bog rosemary and cranberry), and dry bogs (black crowberry, teaberry, blueberry, and bake apple).

For the most part, sites are underlain by poorly drained mineral soils derived from glacial tills or organic soils derived from peat (sphagnum mosses) or sedges. The plateau wetlands are the headwaters of many of Cape Breton's notable rivers, including the Northeast Margaree, Middle, North, French, Barachois, Indian Brook, and Baddeck. This element plays a critical role in water collection, filtering, and groundwater recharge.

Flows

Humans (hunting, fishing, mineral exploration); moose (travel, food); lynx (travel, food); water (catchment, storage, filter, recharge).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006)
Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	49%	24%	37% (11 Mat + 16 OF)	16%
Seral Stage	Early	Mid	Late	Unclassified
	5%	3%	77%	15%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	78%	2%	4%	16%

Desired Condition

Late seral stage black spruce stands on imperfectly drained soils. Open wetlands. Maintain current conditions and provide connectively where possible.

Issues

- These wetlands provide the water for many of the larger rivers on Cape Breton Island which are important watercourses for the endangered Atlantic salmon.
- OHV access that is unplanned can have negative impacts which will be difficult to mitigate especially if trails access the raised bogs that are a significant feature of this element.

- Wetlands are significant habitat for the moose during the hot summers.

Highland Mixedwood

(Patch) (WCDS, WCHO and WMRD ecosections) (2,732 ha)

This is a localized small patch element with variable forest cover responding to microclimate, slope, topography, and soils.

On the steep slopes red maple and white birch take over from the Acadian hardwood forest which has followed these ravines up from the lowlands until climatic conditions have become too cold for their continuation.

On the plateau, white birch and yellow birch mix with balsam fir and white spruce on hummocky and ridged terrain that has coarse-textured, well-drained soils of medium to rich nutrient levels.

However, the dominant condition is a mixedwood forest of balsam fir and white birch with scattered white spruce and red maple. Similar species follow after stand-level disturbances with balsam fir usually already established in the understory.

Natural disturbances are frequent except on the sheltered hardwood slopes where small gaps or patches are created in the hardwood canopy by individual tree mortality or windthrow. Spruce budworm is the most significant stand-level disturbance that will eliminate the fir component of all stands during an outbreak but residual hardwoods will remain.

Flows

Humans (OHV, mineral exploration); deer (habitat, travel corridors); moose (habitat, winter cover); marten (travel corridors); lynx (travel corridors), water (catchment, filter).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006)
Composition of Highland Mixedwood

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	34%	24%	42% (35 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	7%	15%	57%	21%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	40%	24%	17%	19%

Desired Condition

Late seral stage hardwood stands. A mixture of late seral stage softwoods to be found scattered throughout the stands.

Issues

- Hardwood content has low economic value and contributes to the cost of accessing the more desired softwood volume.
- Much of this element is associated with steep slopes and therefore not accessible for harvesting.
- The element has habitat value due to its composition, limited extent, and association with steep ravines in the ecodistrict.

Valley Corridors

(Corridor) (Various ecosections) (1,460 ha)

A mixture of late seral stage hardwood and softwood stands. Typically the hardwood stands are located on the steeper slopes while the softwood stands are found more toward the headwaters of the patches.

These corridor patches typically are located along the major watercourses of the ecodistrict and are an important component for travel for many species.

Current conditions of the corridors have been influenced by past insect and disease outbreaks. Eastern spruce budworm, birch dieback, and beech canker have been the main influences over the past two rotations and have resulted in a mainly gap disturbance regime.

Flows

Humans (hunting, fishing, OHV, mineral exploration); deer (winter cover); moose (habitat), marten (travel corridors); lynx (travel corridors); water (filter, recharge, discharge).

Composition

Cape Breton Highlands 210 (based on statistics up to 2006)

Composition of Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	28%	27%	45% (41 Mat + 4 OF)	4%
Seral Stage	Early	Mid	Late	Unclassified
	25%	30%	33%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	28%	16%	44%	12%

Desired Condition

Late seral stage hardwood stands with a mixture of late seral softwoods throughout the stands.

Issues

- Corridors follow the headwater streams which connect to the major Cape Breton rivers through steep ravines leaving the plateau. Fragmentation of the corridors is unlikely due to the low wood volume associated with the riparian forests.
- Road crossings can create barriers to flow if culverts are poorly installed or bridges do not allow for easy and/or obscured travel by wildlife (moose, lynx, and marten) in the corridor when they are crossed by road infrastructure.

Ecosystem Issues and Opportunities (All appendices and maps)

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

- The ecodistrict currently maintains a balanced degree of biodiversity and overall balanced land use intensity with over one-third of the ecodistrict protected as reserve lands. There are still large tracts of undeveloped areas which may be considered for future development or protection. As a whole, the biodiversity is well represented within the current reserve areas.
- At the same time, the ecodistrict is an important and major source of fibre for eastern Nova Scotia. It will be important to maintain and improve upon current silvicultural practices to provide a sustainable supply of forest products.
- Balsam fir is the dominant softwood species in the working portion of the forest landscape. While this species is an excellent commercial softwood species and well adapted to the ecodistrict, balsam fir is to susceptible reoccurring insect infestations. Future challenges will in part centre on the management of this species for forest product production within the parameters of reoccurring and diverse insect infestations.
- Further challenges revolve around the relatively high recreational use, both planned and unplanned. All season OHV use is increasing in various parts of the ecodistrict. As a result there is increasing concern of negative impacts to watercourses, wetlands, and barrens. Future land use planning must consider these unique challenges and develop methods for mitigating the negative impacts of OHV use.
- The ecodistrict also contains opportunities for further resource development, primarily with mineral and wind energy resources. Future land use planning must provide for the potential development of these opportunities while maintaining the biodiversity of the ecodistrict.

Appendix 1: Flow - Element Interactions

Element	Moose	Water	Humans	Marten	Lynx	Deer
Matrix Highland Fir Spruce	Travel, cover (winter / summer) Regeneration for food, calving, breeding	Catchment, filter ground water	Forestry, hunting, fishing, ATVs / snowmobiles, silviculture in regeneration, mineral / petroleum / aggregate exploration and development	Primary habitat, prey primary range, mature and course woody debris, food, home range, denning, breeding, regenerating stands provide potential habitat	Breeding, denning, Travel, food (in regenerating areas)	Summer range cover, food (especially regeneration stands)
Patches Highland Mixedwood	Food, winter cover, travel	Catchment, filter	ATVs/snowmobiles, mineral/petroleum/ aggregate exploration and development	Travel, cover, food	Travel	Food, travel, some winter cover
Rockland	Food, travel, limited winter cover	Catchment, filter, recharge	Hunting, mineral/aggregate exploration and development		Barriers to dispersion and travel	---
Wetlands	Food, travel	Catchment, storage, filter, recharge river systems	Hunting, fishing, rare plants, mineral/ petroleum/aggregate exploration and development	Some barriers to travel, food along edges	Travel, food	---
Highland Barrens	Travel, food	Catchment	Recreational travel, mineral/petroleum /aggregate exploration and development	Barriers to dispersion	Barriers to dispersion and travel	---
Corridor Valley Corridors Drainages - Chéticamp River, Aspy River, Margaree River, North River, Baddeck River, Indian Brook, Clyburn Brook, Black Brook, Trout Brook	Food, travel, winter cover, some barrier to travel	Filter, recharge, discharge	ATVs/Snowmobiles, fishing hunting, some barriers to travel, mineral /petroleum /aggregate exploration and development	Travel, some barriers to dispersion	Travel, some barriers to dispersion	Some provide winter cover, barriers to travel north/south

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
Highland Spruce Fir	Matrix	High	IMHO IMRD WMHO WMKK	Landscape	Frequent	- Even-aged Late successional softwood community - Current forest balsam fir, white spruce, pockets of black spruce, yellow birch	- All elements	- Condition in the Matrix - Interior conditions (patch sizes), change in species composition	- Spruce budworm outbreaks - Overabundance of moose (browse of balsam fir)	- Ecological restoration
Rockland	Patch	Moderate	WCKK WCRD	Landscape	Open Seral	- Woody heath-like shrubs are dominant vegetation - Lichens and various reindeer mosses common	- Matrix - Dissections - Highland barrens	---------	-------	-------
Highland Mixedwood	Patch	High	WCDS WCHO WMRD	Local	Frequent	- On steep slopes, red maple and white birch - On plateau white birch and yellow birch with balsam fir and white spruce	WMKK WFKK WFHO WMHO	- Conditions in the matrix - Interior conditions (patch sizes), change in species composition	- Spruce budworm outbreaks - Overabundance of moose (browse of balsam fir)	- Ecological restoration

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
Highland Barrens	Patch	Moderate	IMKK	Landscape	Open Seral	- Open and treed barrens Limited spruce fir stands (stunted) or heath-like shrubs	- All elements	Infilling by natural regeneration	Moose abundance Fire suppression	----------
Wetlands	Patch	Low	IMSM WTLD	Landscape	Open Seral	- Bogs, fens, swamps and marshes. Includes black spruce stands.	- Matrix - Dissections	- Susceptible to blowdown from harvesting in adjacent ecosections Aquatic connectivity can be affected by improper road construction	- Conversion - Infilling	- Seasonal access for harvesting to reduce site impacts. Maintain appropriate riparian and machine exclusion zone
Valley Corridors	Patch	Moderate	Various	Local	Various	- Late seral stage hardwood and softwood stands on steep slopes, red maple, and white birch - On plateau white birch and yellow birch with balsam fir and white spruce	WMKK WFKK WFHO WMHO	- Conditions in the matrix - Interior conditions (patch sizes), change in species composition	- Spruce budworm outbreaks - Overabundance of moose (browse of balsam fir)	- Ecological restoration

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 natural disturbance regime (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 210)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS				
Bicknell's Thrush	*Catharus bicknelli*	Endangered	Special Concern	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
FISH				
Striped Bass (Southern Gulf of St. Lawrence population)	*Morone saxatilis*	N/A	N/A	Endangered
Atlantic Salmon (Eastern Cape Breton and Southern Gulf population)	*Salmo salar*	N/A	N/A	Endangered
LICHENS				
Eastern Waterfan	*Peltigera hydrothyria*	N/A	N/A	Threatened
Frosted Glass-whiskers Lichen - Nova Scotia population	*Sclerophora peronella (Nova Scotia pop.)*	N/A	Special Concern	Special Concern
MAMMALS				
Canadian Lynx	*Lynx canadensis*	Endangered	N/A	N/A
American Marten	*Martes americana*	Endangered	N/A	N/A
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Long-tailed Shrew	*Sorex dispar*	N/A	Special Concern	N/A

Appendix 3: Special Occurrences (Ecodistrict 210)

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***
BIRDS			
Northern Goshawk	*Accipiter gentilis*	Secure (Green)	S3S4
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Black Guillemot	*Cepphus grylle*	Secure (Green)	S3S4
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Blackpoll Warbler	*Dendroica striata*	Sensitive (Yellow)	S3S4B
Yellow-bellied Flycatcher	*Empidonaxflaviventris*	Sensitive (Yellow)	S3S4B
Willow Flycatcher	*Empidonax traillii*	Sensitive (Yellow)	S2B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Fox Sparrow	*Passerella iliaca*	Secure (Green)	S3S4B
Gray Jay	*Perisoreuscanadensis*	Sensitive (Yellow)	S3S4
Great Cormorant	*Phalacrocorax carbo*	Sensitive (Yellow)	S3
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
Arctic Tern	*Sterna paradisaea*	May Be At Risk (Orange)	S3B
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S3B,S5M
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	S3S4B
DICOTS			
Fernald's Serviceberry	*Amelanchier fernaldii*	Undetermined	S2?
Running Serviceberry	*Amelanchierstolonifera*	Secure (Green)	S3?
Cut-leaved Anemone	*Anemone multifida*	May Be At Risk (Orange)	S1
Small-flowered Anemone	*Anemone parviflora*	May Be At Risk (Orange)	S1
Virginia Anemone	*Anemone virginiana var. alba*	Sensitive (Yellow)	S1S2
Purple-stemmed Angelica	*Angelica atropurpurea*	Secure (Green)	S3S4
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Western Hairy Rockcress	*Arabis hirsuta var. pycnocarpa*	May Be At Risk (Orange)	S1S2
Northern Arnica	*Arnica lonchophylla*	May Be At Risk (Orange)	S1
Field Wormwood	*Artemisia campestris ssp. borealis*	May Be At Risk (Orange)	S1
Field Wormwood	*Artemisia campestris var. borealis*	May Be At Risk (Orange)	S1
Northern Birch	*Betula borealis*	Sensitive (Yellow)	S2
Glandular Birch	*Betula glandulosa*	May Be At Risk (Orange)	S1
Dwarf White Birch	*Betula minor*	Sensitive (Yellow)	S1S2

Appendix 3: Special Occurrences (Ecodistrict 210)

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***
Bog Birch	*Betula pumila*	Sensitive (Yellow)	S2S3
Bog Birch	*Betula pumila var. pumila*	Sensitive (Yellow)	S2S3
Yellow Marsh Marigold	*Caltha palustris*	Sensitive (Yellow)	S2
Small-flowered Bittercress	*Cardamine parviflora var. arenicola*	Sensitive (Yellow)	S2
Chinese Hemlock-parsley	*Conioselinumchinense*	Sensitive (Yellow)	S2
Swedish Bunchberry	*Cornus suecica*	Sensitive (Yellow)	S1S2
Diapensia	*Diapensia lapponica*	May Be At Risk (Orange)	S1
Rock Whitlow-Grass	*Draba arabisans*	Sensitive (Yellow)	S2
Rock Whitlow-Grass	*Draba glabella*	May Be At Risk (Orange)	S1
Norwegian Whitlow-Grass	*Draba norvegica var. clivicola*	May Be At Risk (Orange)	S1
Dense Whitlow-grass	*Draba pycnosperma*	May Be At Risk (Orange)	S1
Pink Crowberry	*Empetrum eamesii*	Sensitive (Yellow)	S3
Pink Crowberry	*Empetrum eamesii ssp. atropurpureum*	Sensitive (Yellow)	S2S3
Pink Crowberry	*Empetrum eamesii ssp. eamesii*	Sensitive (Yellow)	S2S3
Hornemann's Willowherb	*Epilobium hornemannii*	Sensitive (Yellow)	S3
Hyssop-leaved Fleabane	*Erigeron hyssopifolius*	Sensitive (Yellow)	S3
Northern Wild Licorice	*Galium kamtschaticum*	Secure (Green)	S3
Labrador Bedstraw	*Galium labradoricum*	Sensitive (Yellow)	S2
Northern Gentian	*Gentianella amarella*	May Be At Risk (Orange)	S1
Northern Comandra	*Geocaulon lividum*	Sensitive (Yellow)	S3
Spurred Gentian	*Halenia deflexa*	Sensitive (Yellow)	S2S3
Robinson's Hawkweed	*Hieracium robinsonii*	Sensitive (Yellow)	S2
Pinebarren Golden Heather	*Hudsonia ericoides*	Sensitive (Yellow)	S2
Alpine Azalea	*Loiseleuria procumbens*	May Be At Risk (Orange)	S1
Greenland Stitchwort	*Minuartiagroenlandica*	Sensitive (Yellow)	S2
Blunt Sweet Cicely	*Osmorhiza depauperata*	May Be At Risk (Orange)	S1
Field Locoweed	*Oxytropis campestris var. johannensis*	May Be At Risk (Orange)	S1
Balsam Groundsel	*Packera paupercula*	Secure (Green)	S3
Blue Mountain Heather	*Phyllodoce caerulea*	May Be At Risk (Orange)	S1
Common Butterwort	*Pinguicula vulgaris*	May Be At Risk (Orange)	S1
Sharp-fruited Knotweed	*Polygonum raii*	Undetermined (Undetermined)	S2S3
Alpine Bistort	*Polygonum viviparum*	May Be At Risk (Orange)	S1
Pennsylvania Cinquefoil	*Potentilla pensylvanica var. litoralis*	.1 Extirpated ()	S1
Mistassini Primrose	*Primula mistassinica*	Sensitive (Yellow)	S2
Pink Pyrola	*Pyrola asarifolia*	Secure (Green)	S3
Lesser Pyrola	*Pyrola minor*	Sensitive (Yellow)	S2
Little Yellow Rattle	*Rhinanthus minor ssp. groenlandicus*	Undetermined (Undetermined)	S1?
Lapland Rosebay	*Rhododendronlapponicum*	May Be At Risk (Orange)	S1

Appendix 3: Special Occurrences (Ecodistrict 210)

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***
Gray Willow	*Salix glauca ssp. callicarpaea*	May Be At Risk (Orange)	S1
Net-Veined Willow	*Salix reticulata*	May Be At Risk (Orange)	S1
Bearberry Willow	*Salix uva-ursi*	May Be At Risk (Orange)	S1
Hairy Willow	*Salix vestita*	May Be At Risk (Orange)	S1
Yellow Mountain Saxifrage	*Saxifraga aizoides*	May Be At Risk (Orange)	S1
Nodding Saxifrage	*Saxifraga cernua*	May Be At Risk (Orange)	S1
Purple Mountain Saxifrage	*Saxifraga oppositifolia*	May Be At Risk (Orange)	S1
White Mountain Saxifrage	*Saxifraga paniculata ssp. neogaea*	Sensitive (Yellow)	S2
Soapberry	*Shepherdiacanadensis*	Sensitive (Yellow)	S2
Moss Campion	*Silene acaulis var. exscapa*	May Be At Risk (Orange)	S1
Multi-rayed Goldenrod	*Solidagomultiradiata*	May Be At Risk (Orange)	S1S2
Northern Meadowsweet	*Spiraea septentrionalis*	Undetermined (Undetermined)	S1?
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow)	S2
Humped Bladderwort	*Utricularia gibba*	Secure (Green)	S3S4
Yellowish-white Bladderwort	*Utricularia ochroleuca*	Undetermined	S1
Northern Blueberry	*Vaccinium boreale*	May Be At Risk (Orange)	S2
Dwarf Bilberry	*Vaccinium caespitosum*	Sensitive (Yellow)	S2
Oval-leaved Bilberry	*Vaccinium ovalifolium*	May Be At Risk (Orange)	S1
Alpine Bilberry	*Vaccinium uliginosum*	Sensitive (Yellow)	S2
Thyme-Leaved Speedwell	*Veronica serpyllifolia ssp. humifusa*	Sensitive (Yellow)	S2S3
Squashberry	*Viburnum edule*	Sensitive (Yellow)	S3
Northern Bog 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
Common Moonwort	*Botrychium lunaria*	May Be At Risk (Orange)	S1
Mingan Moonwort	*Botrychium minganense*	Extirpated	SH
Least Moonwort	*Botrychium simplex*	Sensitive (Yellow)	S2S3
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Laurentian Bladder Fern	*Cystopteris laurentiana*	May Be At Risk (Orange)	S1
Fragrant Wood Fern	*Dryopteris fragrans var. remotiuscula*	Sensitive (Yellow)	S2
Meadow Horsetail	*Equisetum pratense*	Sensitive (Yellow)	S2
Appalachian Fir-Clubmoss	*Huperzia appalachiana*	Undetermined	S1S3
Northern Firmoss	*Huperzia selago*	Undetermined	S1S3
Northern Clubmoss	*Lycopodium complanatum*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 210)

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***
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?
Sitka Clubmoss	*Lycopodium sitchense*	Secure (Green)	S3?
Northern Holly Fern	*Polystichum lonchitis*	Sensitive (Yellow)	S2
Little Curlygrass Fern	*Schizaea pusilla*	Secure (Green)	S3
Low Spikemoss	*Selaginella selaginoides*	May Be At Risk (Orange)	S2
Alpine Cliff Fern	*Woodsia alpina*	May Be At Risk (Orange)	S1S2
Smooth Cliff Fern	*Woodsia glabella*	Sensitive (Yellow)	S2
INSECTS			
Eastern Red Damsel	*Amphiagrion saucium*	Secure (Green)	S3
Arctic Fritillary	*Boloria chariclea*	Sensitive (Yellow)	S2
Subarctic Bluet	*Coenagrioninterrogatum*	May Be At Risk (Orange)	S1
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Canada Whiteface	*Leucorrhinia patricia*	May Be At Risk (Orange)	S1
Jutta Arctic	*Oeneis jutta*	May Be At Risk (Orange)	S1
Riffle Snaketail	*Ophiogomphuscarolus*	Secure (Green)	S3
Spot-Winged Glider	*Pantala hymenaea*	Sensitive (Yellow)	S2B
Short-tailed Swallowtail	*Papilio brevicauda*	Sensitive (Yellow)	S1S2
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Green Comma	*Polygonia faunus*	Secure (Green)	S3
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Ringed Emerald	*Somatochloraalbicincta*	May Be At Risk (Orange)	S1
Quebec Emerald	*Somatochlorabrevicincta*	May Be At Risk (Orange)	S1
Forcipate Emerald	*Somatochlora forcipata*	May Be At Risk (Orange)	S2
Muskeg Emerald	*Somatochlora septentrionalis*	Sensitive (Yellow)	S2
Black Meadowhawk	*Sympetrum danae*	Sensitive (Yellow)	S3
LICHENS			
Crinkled Snow Lichen	*Flavocetraria nivalis*	Sensitive (Yellow)	S2S3
Rockmoss Rosette Lichen	*Massalongia carnosa*	May Be At Risk (Orange)	S1?
MAMMALS			
Rock Vole	*Microtuschrotorrhinus*	Secure (Green)	S2
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
Southern Bog Lemming	*Synaptomys cooperi*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 210)

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***
MONOCOTS			
Lesser Brown Sedge	*Carex adusta*	Sensitive (Yellow)	S2S3
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined	S2
Scabrous Black Sedge	*Carex atratiformis*	Sensitive (Yellow)	S2
Hairlike Sedge	*Carex capillaris*	Sensitive (Yellow)	S2
Chestnut Sedge	*Carex castanea*	May Be At Risk (Orange)	S2
Bristle-leaved Sedge	*Carex eburnea*	Sensitive (Yellow)	S3
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Rosy Sedge	*Carex rosea*	Secure (Green)	S3
Narrow-leaved Beaked Sedge	*Carex rostrata*	May Be At Risk (Orange)	S1?
Russet Sedge	*Carex saxatilis*	May Be At Risk (Orange)	S1
Scirpuslike Sedge	*Carex scirpoidea*	Sensitive (Yellow)	S2
Greenish Sedge	*Carex viridula ssp. brachyrrhyncha*	May Be At Risk (Orange)	S1
Wiegand's Sedge	*Carex wiegandii*	May Be At Risk (Orange)	S1
Long-bracted Frog Orchid	*Coeloglossum viride var. virescens*	May Be At Risk (Orange)	S2S3
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Woolly Panic Grass	*Dichanthelium acuminatum var. lindheimeri*	Undetermined	S1?
Russet Cotton-Grass	*Eriophorumchamissonis*	Secure (Green)	S3S4
Slender Cottongrass	*Eriophorum gracile*	Sensitive (Yellow)	S2
Proliferous Fescue	*Festuca prolifera*	Sensitive (Yellow)	S1S2
Menzies' Rattlesnake-plantain	*Goodyera oblongifolia*	Sensitive (Yellow)	S3
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Richardson's Rush	*Juncus alpinoarticulatus ssp. nodulosus*	May Be At Risk (Orange)	S1S2
Moor Rush	*Juncus stygius ssp. americanus*	Sensitive (Yellow)	S1S2
Highland Rush	*Juncus trifidus*	Sensitive (Yellow)	S2
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Small-flowered Woodrush	*Luzula parviflora*	Secure (Green)	S3S4
Spiked Woodrush	*Luzula spicata*	May Be At Risk (Orange)	S1
Alpine Timothy	*Phleum alpinum*	May Be At Risk (Orange)	S1
Canada Rice Grass	*Piptatherumcanadense*	Sensitive (Yellow)	S2
Large Purple Fringed Orchid	*Platantheragrandiflora*	Secure (Green)	S3
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Small Round-leaved Orchid	*Platantheraorbiculata*	Secure (Green)	S3
Glaucous Blue Grass	*Poa glauca*	Sensitive (Yellow)	S2S3
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Northern Burreed	*Sparganium hyperboreum*	Sensitive (Yellow)	S1S2
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 210)

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

*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 210)
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;	N/A
Loon nesting lakes	Freshwater lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Provincial Parks	Ecosystem / recreation	DNR Restricted Land Use Database	Nova Scotia Parks Act
Moose Wintering Areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	
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 areas	Freshwater wetlands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act

Appendix 3: Special Occurrences (Ecodistrict 210)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Seabird nesting Colonies	Cliffs and islands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Shorebird breeding and staging areas	Freshwater Wetlands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Fish habitat areas	Rivers, streams, and lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Canada Fisheries Act
Dragonfly, damselfly, and butterfly habitats	Forest and wetland habitats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act
Rare plant habitat	Forest and wetland habitats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act
DNR Old Forest Reserves	Old forest habitat	Old Forest Database	Policy reserve
Cape Breton Highlands National Park	National Park	DNR Restricted Land Use Database	Federal Parks Act
International Biological reserve	International biological Program Site	DNR Restricted Land Use Database	N/A
Nature Reserves	Ecosystem	DNR Restricted Land Use Database	Special Places Protection Act
Wilderness Areas	Ecosystem / recreation	DNR Restricted Land Use Database	Nova Scotia Wilderness Areas Protection Act

Appendix 3: Special Occurrences (Ecodistrict 210)
Table 1d – Heritage Features

Feature	Type	Information Source
Heritage River - Headwaters of Margaree River	Heritage	Canadian Heritage River System
Native Artifacts	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge/DNR
Abandoned Mines	Geological and Cultural Heritage	NS Abandoned Mines Database
Significant Geological Features	Geological and Cultural Heritage	Local Knowledge

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	%		
IMHO	bF bS	18,650	10.1	22,308	12.1	66 to 71	0.5	18,650	9.2	22,308	11.0	66 to 71	0.5
IMKK	barrens	4,711	2.5	0	0.0	73 to 76	1.0	4,711	2.3	0	0.0	73 to 76	1.0
IMRD	bF bS	3,658	2.0	22,308	12.1	73 to 80	0.3	3,658	1.8	22,308	11.0	73 to 80	0.3
IMSM	bS	566	0.3	5,124	2.8	81 to 84	0.7	566	0.4	5,124	2.5	64 to 66	8.2
WCDS	sM yB Be	1,478	0.8	1,789	1.0	100	0.0	1,478	0.8	1,789	0.9	96	0.3
WCHO	bS bF	1,179	0.6	15,140	8.2	75 to 79	6.0	1,179	4.3	15,140	7.4	51 to 53	13.6
WCKK	rockland	28,865	15.6	14,885	8.0	90 to 93	0.3	28,865	17.1	14,885	7.3	88 to 91	0.8
WCRD	rockland	905	0.5	14,885	8.0	100	0.0	905	0.4	14,885	7.3	100	0.0
WMHO	bF	24,205	13.1	94,272	50.9	78 to 84	0.2	24,205	12.1	94,272	46.3	77 to 82	0.9
WMKK	bF	93,635	50.6	94,272	50.9	70 to 77	0.5	93,635	46.3	94,272	46.3	68 to 74	0.6
WMRD	wS bS bF	770	0.4	616	0.3	69 to 76	0.0	770	0.4	616	4.9	69 to 76	0.0
WTLD	wetlands	3,436	1.9	0	0.0	83 to 84	0.1	3,436	1.7	0	0.0	83 to 84	0.1

*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)
WMKK	bF	93,635	78.6	7,390	0	621	0	8,011	8.6	0	0.0	8,011	8.6
WCKK	rockland	28,865	48.1	7,129	0	88	0	7,216	25.0	0	0.0	7,216	25.0
WMHO	bF	24,205	91.6	7,954	0	983	0	8,937	36.9	0	0.0	8,937	36.9
IMHO	bF bS	18,650	96.8	517	1	586	0	1,103	5.9	1	0.0	1,104	5.9
IMKK	barrens	4,711	90.3	0	0	2	0	2	0.0	0	0.0	2	0.0
IMRD	bF bS	3,658	97.5	538	0	286	0	824	22.5	0	0.0	824	22.5
WTLD	wetlands	3,436	88.2	946	0	36	0	981	28.6	0	0.0	981	28.6
WCDS	sM yB Be	1,478	5.2	77	0	0	0	77	5.2	0	0.0	77	5.2
WCHO	bS bF	1,179	57.9	0	0	8	0	8	0.6	0	0.0	8	0.6
WCRD	rockland	905	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMRD	wS bS bF	770	91.2	0	0	52	0	52	6.8	0	0.0	52	6.8
IMSM	bS	566	77.5	77	0	7	0	85	14.9	0	0.0	85	14.9
WMKK	bF	93,635	78.6	7,390	0	621	0	8,011	8.6	0	0.0	8,011	8.6

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	34,292	0	Old Forests	14,165	0
Wilderness Areas	24,587	0	Designated Provincial Parks & Park Reserves	29	0
Sites of Ecological Significance - Moratoriums	70	0	Operational Non Designated Park Reserves	0	0
Protected Beaches	0	0	Nova Scotia Nature Trust	0	9

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	1,062
Utility corridors	3	3
Gravel Roads and active railways	6	728
Paved streets and roads collectors	10	19
Highways	15	3

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	133,483	72.1
Forest Resource	7 to 15	50,457	27.3
Mixed Rural	16 to 24	1,116	0.6
Agriculture Suburban	25 to 39	46	0.0
Urban	40 to 100	<1	0.0
Total		**185,101**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Highland Spruce Fir	139,618	0.6
Valley Corridors	1,460	0.7
Highland Barrens	4,708	0.3
Rockland	29,584	0.6
Highland Mixedwood	2,732	0.5
Wetlands	3,956	1.2
Total	**185,101***	**0.6**

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

Appendix 8: Development Classes and Seral Stages

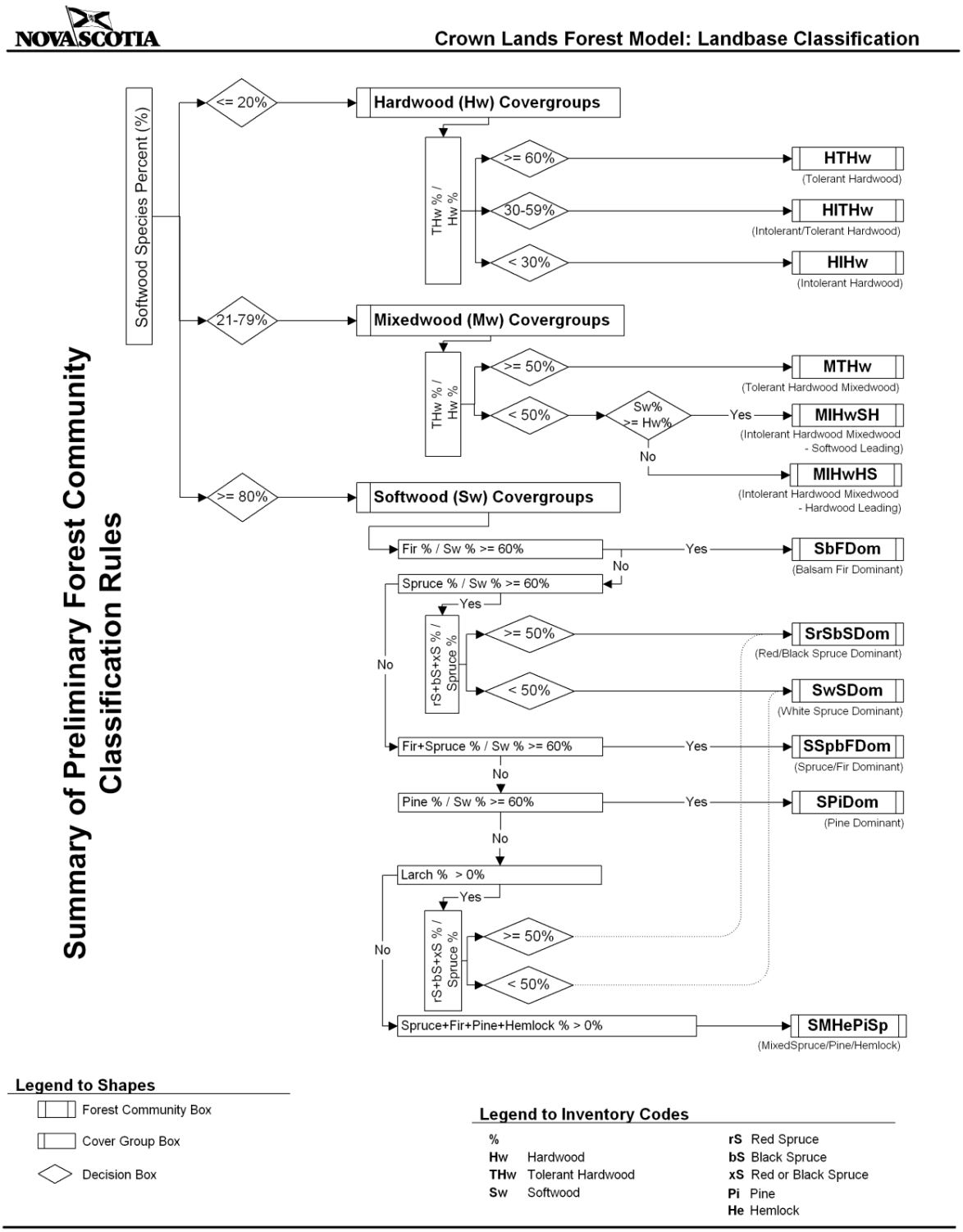
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and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

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

Species		Ecodistrict																																							
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	4	3	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



Note: 1) Exotic species (Norway Spruce, Japanese Larch, etc.) were grouped with similar native species where required.
2) Unclassified species were assigned based on supplementary information (i.e.: Wood Acquisition Program / Regional Services)

Preliminary Draft: November 14, 2006

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Highlands 210)

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)				
Highland Fir Spruce Matrix	WMKK (65.2%) WMHO (17.2%) IMHO (12.3%) IMRD (26.0%)	Softwood	bF bS	Frequent	96,951; 69.4	Early	7,828	569	317	87	8,801	67,310; 55.8	EARLY	14,795; 12.3
						Mid	1,458	624	242	342	2,666			
						Late	30,347	14,591	4,130	6,228	55,296			
						Uncl	547	0	0	0	547			
		Mixedwood	yB bF	Frequent	18,223; 13.0	Early	418	419	626	106	1,569	23,277; 19.3	MID	17,979; 14.9
						Mid	6,352	2,019	2,475	820	11,666			
						Late	3,692	1,000	3,715	913	9,320			
						Uncl	723	0	0	0	723			
		Hardwood				Early	895	614	889	125	2,523	1,2040; 10.0	LATE	70,390; 58.3
						Mid	561	405	2,548	133	3,646			
						Late	16	68	5,448	243	5,774			
						Uncl	97	0	0	0	97			
		Unclassified				Early	1,700	4	199	0	1,903	18,070; 15.0	UNCL	17,533; 14.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	16,167	0	0	0	16,167			
Total					**139,618***	**# ha**	**70,801**	**20,313**	**20,589**	**8,997**	**120,700**			
						%	**58.7%**	**16.8%**	**17.1%**	**7.5%**	**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 (Northern Plateau 100)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	WTLD (3.2%) IMRD (1.8%) WCDS (47.6%) IMHO (11.6%) WCKK (12.7%) WMHO (5.4%) WMKK (17.3%) IMKK (0.1%)	Softwood	bS bF bS bF	Frequent	375; 26	Early	11	2	6	0	19	315; 28.1	EARLY	283; 25.2
						Mid	4	11	2	0	17			
						Late	130	92	46	9	277			
						Uncl	3	0	0	0	3			
		Mixedwood	yB bF	Gap	51; 3	Early	0	0	1	0	1	182; 16.2	MID	336; 29.9
						Mid	31	54	31	0	116			
						Late	1	32	26	6	65			
						Uncl	1	0	0	0	1			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	695; 48	Early	3	81	168	5	257	491; 43.7	LATE	372; 33.2
						Mid	1	29	156	17	203			
						Late	0	4	25	3	32			
						Uncl	0	0	0	0	0			
		Unclassified				Early	7	0	0	0	7	135; 12.0	UNCL	132; 11.8
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	128	0	0	0	128			
Total					**30,622***	**# ha**	**320**	**305**	**461**	**40**	**1,126**			
						%	**28.4%**	**27.1%**	**40.9%**	**3.6%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Highlands 210)

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)				
Highland Mixedwood	WCDS (22.6%) WMRD (28.2%) WCHO (43.2%)	Softwood	wS bS bF bS bF	Gap	1,323; 48.4	Early	16	0	0	0	16	717; 40.1	EARLY	124; 6.9
						Mid	0	0	15	0	15			
						Late	159	306	107	89	661			
						Uncl	27	0	0	0	27			
		Mixedwood		Gap		Early	0	9	0	0	9	298; 16.7	MID	268; 15.0
						Mid	20	35	16	0	71			
						Late	23	46	106	31	206			
						Uncl	10	0	0	0	10			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	936; 34.3	Early	0	26	66	0	92	429; 24.0	LATE	1,022; 57.1
						Mid	6	8	168	0	182			
						Late	3	11	142	0	156			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	8	0	8	345; 19.3	UNCL	375; 20.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	338	0	0	0	338			
Total					**2,732***	**# ha**	**602**	**441**	**628**	**120**	**1,791**			
						%	**33.6%**	**24.6%**	**35.1%**	**6.7%**	**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 (Cape Breton Highlands 210)

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)				
Rockland	WCKK (96.9%) WCRD (3.1%)	Softwood	bS bF	none	14,339; 48.4	Early	31	78	30	0	139	7,359; 38.5	EARLY	1,723; 9.0
						Mid	25	74	243	0	342			
						Late	2,926	2,830	447	664	6,867			
						Uncl	12	0	0	0	12			
		Mixedwood				Early	52	142	179	30	403	3,746; 19.6	MID	3,608; 18.9
						Mid	593	1,009	451	168	2,221			
						Late	510	425	68	119	1,122			
						Uncl	1	0	0	0	1			
		Hardwood	sM yB Be	none	453; 1.5	Early	227	508	354	79	1,168	2,381; 12.5	LATE	8,142; 42.6
						Mid	66	243	614	123	1,046			
						Late	15	0	137	1	153			
						Uncl	14	0	0	0	14			
		Unclassified				Early	14	0	0	0	14	5,620; 29.4	UNCL	5,633; 29.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	5,606	0	0	0	5,606			
Total					**29,584***	**# ha**	**10,092**	**5,309**	**2,523**	**1,184**	**19,108**			
						%	**52.8%**	**27.8%**	**13.2%**	**6.2%**	**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 (Cape Breton Highlands 210)

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 (85.6%) IMSM (14.4%)	Softwood	bS	None Frequent	283; 7.2	Early	24	3	2	0	29	781; 78.2	EARLY	51; 5.1
						Mid	1	5	0	9	15			
						Late	282	225	90	141	738			
						Uncl	1	0	0	0	1			
		Mixedwood				Early	0	0	3	0	3	42; 4.2	MID	33; 3.3
						Mid	11	0	0	6	17			
						Late	6	3	5	7	21			
						Uncl	2	0	0	0	2			
		Hardwood				Early	1	0	7	0	8	15; 1.5	LATE	762; 76.3
						Mid	3	0	0	0	3			
						Late	0	0	4	0	4			
						Uncl	2	0	0	0	2			
		Unclassified				Early	13	0	0	0	13	160; 16	UNCL	152; 15.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	147	0	0	0	147			
Total					**3,956***	**# ha**	**493**	**236**	**111**	**163**	**1,003**			
						%	**49.2%**	**23.5%**	**11.1%**	**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 (Cape Breton Highlands 210)

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)				
Highland Barrens	IMKK (100.0%)	Softwood		None		Early	0	0	0	2	2	953; 46.1	EARLY	158; 7.7
						Mid	0	0	0	0	0			
						Late	486	213	200	52	951			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	8	35	1	44	473; 22.9	MID	465; 22.5
						Mid	314	14	50	10	388			
						Late	33	6	2	0	41			
						Uncl	0	0	0	0	0			
		Hardwood				Early	45	0	66	0	111	211; 10.2	LATE	1,015; 49.1
						Mid	17	10	36	13	76			
						Late	4	0	20	0	23			
						Uncl	0	0	0	0	0			
		Unclassified				Early	2	0	0	0	2	431; 20.9	UNCL	429; 20.8
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	429	0	0	0	429			
Total					**4,708***	**# ha**	**1,330**	**251**	**409**	**78**	**2,068**			
						%	**64.3%**	**12.1%**	**19.8%**	**3.8%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Cape Breton Highlands 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
Highland Spruce Fir Matrix	IMHO IMRD WMKK WMRD	Frequent	bS bF	S	SbFDom	31,948	31.1%	L	**Well-drained** Early VTs: pCh, mtnA, wB Mid VTs: bF, wB, wS Late VTs: bF, yB **Moist** Early-Mid VTs: bF, wB Late VTs: bS, bF **Poorly Drained** Mid-Late VTs: bS, tL
				S	SrSbSDom	21,577	21.0%	L	
				S	SwSDom	9,907	9.7%	L	
				S	SSpbFDom	3,869	3.8%	L	
				S	SPiDom	6	0.0%	L	
				S	SMHePiSp	4	0.0%	L	
				M	MIHwSH	11,346	11.1%	E/M	
				M	MIHwHS	7,706	7.5%	E/M	
				M	MTHw	4,224	4.1%	L	
				H	HTHw	6,048	5.9%	L	
				H	HIHw	4,065	4.0%	E/M	
				H	HITHw	1,927	1.9%	M	
Total						**102,627**	**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 Cape Breton Highlands 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	IMHO IMKK IMRD WCDS WCHO WCKK WMDS WMHO WMKK	Frequent None Gap	bS barrens sM yB Be rockland None	S	SbFDom	173	17.5%	L	**Well-drained** Early VTs: pCh, mtnA, wB Mid VTs: bF, wB, wS Late VTs: bF, yB **Moist** Early-Mid VTs: bF, wB Late VTs: bS, bF **Poorly Drained** Mid-Late VTs: bS, tL
				S	SrSbSDom	105	10.6%	L	
				S	SwSDom	35	3.5%	L	
				S	SSpbFDom	2	0.2%	L	
				M	MIHwSH	87	8.8%	E/M	
				M	MIHwHS	71	7.2%	E/M	
				M	MTHw	24	2.4%	L	
				H	HIHw	428	43.3%	E/M	
				H	HTHw	34	3.4%	L	
				H	HITHw	29	2.9%	M	
Total						**988**	**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 Cape Breton Highlands 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
Highland Mixedwood	WCDS WCHO WMRD	Gap	bS bF wS bS bF sM yB Be	S	SrSbSDom	393	27.2%	L	**Well-drained** Early VTs: pCh, mtnA, wB Mid VTs: bF, wB, wS Late VTs: bF, yB
				S	SbFDom	282	19.5%	L	
				S	SSpbFDom	26	1.8%	L	
				S	SwSDom	16	1.1%	L	
				M	MTHw	163	11.3%	L	
				M	MIHwSH	72	5.0%	E/M	
				M	MIHwHS	63	4.4%	E/M	
				H	HIHw	232	16.1%	E/M	
				H	HTHw	172	11.9%	L	
				H	HITHw	25	1.7%	M	
Total						**1,444**	**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 Cape Breton Highlands 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
Rockland	WCKK WCRD	Open seral	bS bF sM yB Be	S	SrSbSDom	4,803	35.6%	L	**Well-drained** Early – Late VTs: bF, bS **Moist** Late VTs: bS, bF **Poorly Drained** Mid- VTs: Late bS, tL
				S	SbFDom	1,867	13.8%	L	
				S	SSpbFDom	479	3.6%	L	
				S	SwSDom	206	1.5%	L	
				S	SMHePiSp	4	0.0%	L	
				M	MIHwHS	1,918	14.2%	E/M	
				M	MIHwSH	1,763	13.1%	E/M	
				M	MTHw	65	0.5%	L	
				H	HIHw	1,894	14.0%	E/M	
				H	HITHw	322	2.4%	M	
				H	HTHw	165	1.2%	L	
Total						**13,486**	**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 Cape Breton Highlands 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	IMSM WTLD	Open Seral	bS bF	S	SrSbSDom	457	54.5%	L	**Moist** Early-Mid VTs: bF, wB Late VTs: bS, bF **Poorly Drained** Mid-Late VTs: bS, tL
				S	SbFDom	273	32.6%	L	
				S	SwSDom	29	3.5%	L	
				S	SSpbFDom	21	2.5%	L	
				M	MIHwSH	21	2.5%	E/M	
				M	MIHwHS	14	1.7%	E/M	
				M	MTHw	7	0.8%	L	
				H	HIHw	12	1.4%	E/M	
				H	HTHw	4	0.5%	L	
Total						**839**	**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 Cape Breton Highlands 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
Highland Barrens	IMKK	Frequent	bS bF	S	SrSbSDom	555	33.9%	L	**Well-drained** Early – Late VTs: bF, bS **Moist** Late VTs: bS, bF **Poorly Drained** Mid-Late VTs: bS, tL
				S	SbFDom	342	20.9%	L	
				S	SSpbFDom	53	3.2%	L	
				S	SwSDom	2	0.1%	L	
				M	MIHwHS	246	15.0%	E/M	
				M	MIHwSH	227	13.9%	E/M	
				H	HIHw	148	9.1%	E/M	
				H	HITHw	37	2.3%	M	
				H	HTHw	25	1.5%	L	
Total						**1,635**	**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**
bF	94,272	50.9	94,272	46.3
bF bS	22,308	12.1	22,308	11.0
yB bF	18,727	10.1	18,727	9.2
bS bF	15,140	8.2	15,140	7.4
rockland	14,885	8.0	14,885	7.3
bS	5,124	2.8	5,124	2.5
sM yB Be	1,789	1.0	1,789	0.9
wS bS bF	616	0.3	616	4.9
sM yB Be eH wP	296	0.2	296	0.1
Total	173,157	**93.5%***	173,157	**89.6%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Highland Fir Spruce	135,732	35,503	72,980	9,235	619	17,395	96,895 to 105,593	71 to 78
Rockland	29,495	21,809	5,748	0	88	1,850	26,582 to 27,507	90 to 93
Highland Barrens	4,703	394	3,915	0	49	344	3,417 to 3,589	73 to 76
Wetlands	3,951	1,551	2,248	39	6	108	3,274 to 3,327	83 to 84
Highland Mixedwoods	2,732	1,221	1,235	17	71	188	2,198 to 2,292	80 to 84
Valley Corridors	1,451	1,110	265	14	1	60	1,327 to 1,357	91 to 94
Total	178,063	61,588	86,391	9,306	834	19,945	**133,694 to 143,667**	**75 to 81**

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
IMHO	18,446	1,193	13,707	1,576	94	1,878	12,336 to 13,275	67 to 72
IMKK	4,706	394	3,918	0	49	344	3,419 to 3,591	73 to 76
IMRD	3,657	824	2,306	22	13	492	2,682 to 2,928	73 to 80
IMSM	566	212	316	0	4	34	458 to 475	81 to 84
WCDS	1,478	1,478	0	0	0	0	1478	100
WCHO	1,179	386	639	1	71	82	886 to 927	75 to 79
WCKK	28,776	21,088	5,750	0	88	1,850	25,863 to 26,788	90 to 93
WCRD	905	905	0	0	0	0	905	100
WMHO	24,029	10,340	10,139	909	52	2,589	18,819 to 20,114	78 to 84
WMKK	90,120	23,331	47,088	6,743	462	12,496	63,457 to 69,705	68 to 77
WMRD	770	52	596	16	0	106	529 to 583	69 to 76
WTLD	3,431	1,385	1,932	39	2	74	2,862 to 2,899	83 to 84
Total	178,063	61,588	86,391	9,306	835	19,945	**133,694 to 143,667**	**75 to 81**

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).

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