Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CAPE BRETON HILLS ECODISTRICT 310

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2015-310

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 310: Cape Breton Hills

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ISBN 978-1-55457-575-6

This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Cape Breton Hills 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
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

Conventions

Where major changes have occurred since the original ELA report was written, the new information will be provided in *italics,* so that the reader can see how some conditions have changed since the benchmark date of the ELA.

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

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

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Understanding the Landscape as an Ecological System

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

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

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

Elements Within Landscapes (Map 2)

The landscape analysis identified and mapped seven distinctive elements in the Cape Breton Hills Ecodistrict – one matrix, five 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).

Tolerant Hardwood Hills is the matrix element, representing 85% of the ecodistrict. The element is dominated by tolerant hardwoods typical of the Acadian Forest, such as sugar maple, beech, and yellow birch, with white ash and ironwood on richer sites.

Spruce Pine Hummocks, representing 8% of the ecodistrict, is the largest patch element. The main tree species are black spruce, balsam fir, and scattered white pine with some tamarack and red maple. The other patch elements, in order of size, are **Spruce Fir Hills and Hummocks**, **Tolerant Mixedwood Hills**, **Wetlands**, and **Coastal Beach**.

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

Flow – Element Interactions (Appendix 1; Map 2)

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

One of the more well-defined flows is the movement of white-tailed deer from their summer range in Skye and McIntyres mountains to their winter yards in Eden in Bras d'Or Lowlands Ecodistrict 510.

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

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

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

River corridors promote connectivity.

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

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

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

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

The Cape Breton Hills Ecodistrict is dominated by the tolerant hardwood forest in the matrix element. The matrix, because of its distribution across the ecodistrict, functions as the most important feature influencing the landscape connectivity.

The extensive forest management area within the matrix represents a high percentage of the total element area. Data indicates that only a minor percentage of the matrix area has been changed to intensive forest management or converted to non-forested areas. Because of this, the degree of fragmentation is relatively low and the ability of many species to move through the matrix is not likely compromised on the broad landscape.

There are local exceptions such as the Mabou highlands where the abandoned old farmlands contain a higher percentage of altered land.

The physical distribution of the Cape Breton Hills across the landscape does, however, present unique issues for connectivity. The hills are inter-spaced among and separated by neighbouring ecodistricts and the Bras d'Or Lake. These features could be considered barriers within the landscape. Maintaining the linkages among these hills is important for many species.

Practices and opportunities for improving landscape connectivity could include:

- Mitigating the potentially negative barrier effects of concentrated land use in the Valley Corridors element by sustaining and restoring natural communities in keyareas.
- 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)

Most of the landscape flows identified (deer, moose, lynx, people, migratory birds) are also linkages to adjacent areas or ecodistricts (Map 2).

Deer, moose, and lynx flows are important linkages both within the ecodistrict and through neighbouring ecodistricts. These animals often spend different seasons in different areas (e.g. for winter cover or forage requirements).

Seasonal movement across the landscape often connects different ecosystems in important flow patterns. As well, the movement of humans via transportation and recreation routes connects the various ecodistricts together.

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

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

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

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

Managing landscapes for biodiversity requires a variety of planning approaches and tools. Sustaining forest composition diversity by reflecting natural patterns of disturbance and succession is one approach that DNR is employing to try and realize this objective. A number of additional approaches and planning tools are being developed which will be integrated with objectives defined in the ELA protocol.

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

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

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

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

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

- early (seral score 10 to 23)
- mid (seral score 24 to 37)
- late (seral score 38 to 50)

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

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

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

Target Ranges for Composition Indicators

Table 7 provides target ranges for development class and seral stage composition appropriate for different disturbance regimes. These ranges have been derived from the professional judgment of DNR forest ecologists to guide composition objectives for large landscape areas. This guidance can be used to assess how land holdings contribute to the overall ecodistrict structure by referring to the element analysis section which summarizes the levels of these indicators.

A full description of definitions and mapping of Nova Scotia's disturbance regimes is contained in the report "Mapping Nova Scotia's Natural Disturbance Regimes" available from the DNR website (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)*** (see 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 Hills

Element	**Seral Stage**					
	Early	**% ***	**Middle**	**%**	**Late**	**%**
Spruce Pine Hummocks	OW2	9.0	SP4, SP6, SH9	27.0	**SP5, SP7,** SH8, SH10	59.0
Spruce Fir Hills and Hummocks	IH4, IH6, MW4, SP6, SP8, SP10	13.0	**SH8**, SH9, MW5, **SP7**	27.0	**SH8, SH10, SP7**	52.0
Tolerant Hardwood Hills	OF1, OF2, OF4, OF5, IH4, IH5, IH6, IH7, MW5	9.0	MW4, TH7, **TH8**	33.0	**TH1, TH2**, TH3, TH4, TH5	52.0
Tolerant Mixedwood Hills	IH4, IH5, IH6, MW5, SH8	10.0	MW4, IH7	36.0	**MW3,** SH1, **MW1**	45.0
Coastal Beaches	Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	FP3, WC1, WC2, WC6, WC7, WD1, WD2, WD3, WD6, WD7, SP7					

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

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

Bolded vegetation types indicate typical late successional community

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

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

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

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

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

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

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

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

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

The overall EEI for Cape Breton Hills is 71 to 75 (Appendices 12a and 12b). This indicates a lower degree of manmade disturbances to the structure of the forest structure of the ecosystem.

About 69% of the land falls in the extensive EEC (Appendix 12b). This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

About 4% 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 17% of the area and is divided into two categories: legal reserves and policy reserves. The legal reserves are those areas that have legal status under in IUCN (The

International Union for the Conservation of Nature and Natural Resources) codes of I, II, or III such as wilderness areas, protected beaches, and designated provincial parks. The second type of reserves is those set aside under various provincial policies, such as the Old Forest Policy.

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

The remaining 8% 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.

Cape Breton Hills has an overall Road Index value of approximately 3 (Appendix 7, Table 3), which falls within the Remote Index range of 0 to 6 and accounts for 59% of the ecodistrict (Appendix 7, Table 2). Less than 2% has indices of Agriculture Suburban or Urban. Forest Resource at 30% is the second most common class.

Among elements, Coastal Beach has the highest RI of 54.

Roads can contribute to habitat fragmentation and environmental degradation. Since 57% of land ownership in the ecodistrict is in private hands, efforts could be made to:

- Encourage sharing of access roads and decommissioning of excess roads.
- Educate the public about proper road construction.
- Encourage road maintenance.
- Encourage maintenance of areas without roads, and promote linkages among them and other areas without roads either within or outside the ecodistrict.

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.

Species at risk listed under the NSESA that occur within the Cape Breton Hills Ecodistrict include eight endangered, five threatened, and three vulnerable species.

Endangered species found within the ecodistrict include three mammal species: Canada lynx (*Lynx canadensis*), little brown bat (*Myotis lucifugus*), and the Cape Breton population of American marten (*Martes america*).

Also at risk are five bird species: rusty blackbird (*Euphagus carolinus*), barn swallow (*Hirundo rustica*), Canada wabler (*Wilsonia canadensis*), Bicknell's thrush (*Catharus bicknellii*), and piping plover (*Charadrius melodius*). One endangered plant, sage willow (*Salix candida*), is also found within the ecodistict. Boreal felt lichen (*Erioderma pendicellatum*) is an endangered lichen found in Cape Breton Hills.

Two bird species – common nighthawk (*Chordeiles minor*) and olive-sided flycatcher (*Contopus cooperi*) – and black ash (*Fraximus nigra*) are listed as threatened. Wood turtle (*Glyptemys insculpta*) and the mollusk yellow lampmussel (*lampsillis cariosa*) are also listed as threatened.

Two bird species – eastern wood pewee (*Contopus virens*) and bobolink (*Dolichonyx oryzivorus*) – as well as blue felt lichen (*Degelia plumbea*) are listed vulnerable under the NSESA.

Although not yet listed under the NSESA, several COSEWIC-listed species are found in the Cape Breton Hills Ecodistrict, including bank swallow (*Riparia riparia*; threatened), Atlantic salmon – Eastern Cape Breton population (*Samlo salar*; endangered), Atlantic salmon – Gaspé – Southern Gulf of St. Lawrence population (*Salmo salar*; special concern), striped bass – Southern Gulf of St. Lawrence population (endangered), and the lichen eastern waterfan (*Peltigera hydrothyria*; threatened).

Long-tailed shrew (*Sorex dispar*) is listed as being of special concern federally.

In addition to the listed species, the national General Status process also identifies 85 orange-status species, 119 yellow-status species, 58 green-status species, and 16 undetermined species for a total of for a total of 278 other species of conservation concern in this ecodistrict.

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 dominate animal in the region prior to the arrival of the first European settlers. By 1825, as a result of over-harvesting for commercial and subsistence purposes, the population was in serious decline. Moose 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. There is a small population on Boularderie Island. 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. Marten have recently been sighted in a number of locations within the ecodistrict, such as Sugarloaf and Margaree. The recent number of sighting indicates that the population may be recovering at least to some degree.

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 including the Cape Breton Hills in search of prey. There is a small resident lynx population in the Boisedale Hills, East Bay Hills, South Mountain (Richmond County), and on McIntyres Mountain. Historic and current threats to lynx include forest harvesting, competition from bobcats, coyote and fisher, habitat loss to development, disease, and climate change.

Birds

Cape Breton Hills supports a large population of bald eagle (*Haliaeetus leucocephalus*), second only to that of the Bras d'Or Lowlands Ecodistrict. Eagles nest in mature pines and hardwood along the slopes of the hills usually within easy flight of water. They are mainly fish eaters but will forage on other prey, including carrion, as it becomes available. Special management practices for forestry are in place to protect their breeding sites during the active season (see http://novascotia.ca/natr/wildlife/habitats/terrestrial/).

There are at least 40 nesting sites in the ecodistrict and more than half of these may be active in a given year. Concentrations of nests are found at West Mabou Harbour, St. Anns, and Washabuck Centre.

A number of other raptors are found throughout the region. Northern harrier (*Circus cyaneus*) can be found in 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 owl (*Bubo virginianus*) nests in cavities in trees or on the ground and has been known to take over nests of other raptors such as eagles or goshawks. Northern saw-whet owl (*Aegolius acadicus*) is one of

the smallest owl species in the ecodistrict. Northern goshawk (*Accipiter gentilis*) is a bird of the mature hardwood or hardwood-dominant 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.

Osprey (*Pandion haliaetus*), which feeds almost exclusively on fish, has been noted nesting at various locations throughout Cape Breton Hills including Glengarry Valley, Baddeck, and Lake Ainslie. Osprey often nest along power lines which brings them into conflict with man. Guidelines are in place to direct the removal of the nests from these types of structures and provide alternate nest platforms. The osprey is Nova Scotia's provincial bird.

The common loon (*Gavia immer*) is an expert swimmer and diver. The loon's feet are located far back on its 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 areas around East Bay Hills, Boularderie, and a Lake Ainslie.

Bicknell's thrush, listed as endangered in Nova Scotia, breeds in the stunted softwood forests at higher elevations generally above 300 metres. Not much 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 has been recorded at Money Point and the upper reaches of the Chéticamp River. A set of guidelines has been developed to help protect the bird's nests and nesting habitat during forest harvesting.

Insectivores such as chimney swift (*Chaetura pelagica*; endangered NSESA), barn swallow (*Hirunda rustica*; endangered NSESA), and bank swallow (*Riparia riparia*; threatened under COSEWIC) are reported in a number of areas in the ecodistrict including Sporting Mountain, Margaree, and Inverness. There has been a decline in the populations of these birds over the past number of years. 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. It is listed as endangered in Nova Scotia. The rusty blackbird is a bird of the wetlands and wet boreal forest. This blackbird has been found in Bornish Hills, Bevis Point, Glengarry Valley, and several other locations in the ecodistrict.

Several small songbirds of note have been recorded in the Cape Breton Hills. Olive-sided flycatcher (*Contopus cooperi*; threatened) has been documented in many areas around Lake Ainslie, along East Bay and at Big Intervale in northern Cape Breton. Eastern wood-pewee (*Contopus virens*; vulnerable) is inconspicuous until it opens its bill and gives its unmistakable slurred call: pee-a-wee! – its characteristic sound. The pewee can be heard in the hills around Lake Ainslie, at Sporting Mountain, and at North Mountain on West Bay.

Margaree Island (Sea Wolf Island) is a National Wildlife Area administered by the Canadian Wildlife Service. The island is located approximately four kilometres off the shore at Rear Dunvegan. A survey of the island in 2007 showed the presence of a number of colonial nesting birds including great cormorant (*Phalacrocorax carbo*; yellow), double crested cormorant (*Phalacrocorax auritus*), herring gull (*Larus smithsonianus*), and greater black-back gull (*Larus marinus*). Great cormorants nest on the rocky cliff while the double crested cormorants and gulls nest in the open field areas. Razorbills (*Alea torda*; yellow) and black guillemots (*Cepphus grylle*; S3S4) also nest on Margaree Island. Blue herons (*Ardea herodias*) and bank swallows (*Riparia riparia*) are also recorded as nesting on the Island.

Amphibians and Reptiles

Amphibians are quite common in wetlands throughout the ecodistrict. Some of the more common species include four-toed salamander (*Hemidactylium scutatum*), spotted salamander (*Ambystoma maculatum),* green frog (*Lithobates clamitans*), and wood frog (*Lithobates sylvaticus*).

Wood turtle (*Glyptemys insculpta*) is listed as endangered under NSESA. Larger populations of this turtle are along the River Denys River and River Inhabitants in Bras d'Or Lowlands Ecodistrict 510. In Cape Breton Hills, reports show the turtle in tributaries to these larger streams as well as in the Chéticamp River area.

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. 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. The 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 Aspy, Middle Aspy, and Baddeck rivers. They seem to be restricted to the lower parts of the rivers with no spawning activity reported to date.

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 Hills.

Of the species collected in Cape Breton Hills, jutta arctic (*Oeneis jutta*), forcipate emerald (*Somatochlora forcipata*), Quebec emerald (*Somatochlora brevicincta*), and Williamson emerald (*Somatochlora williamsonii*) are listed as may be at risk (orange) in the provincial general status.

All the Somatochlorids are beautiful dragonflies with bright green eyes (hence the name emerald). Williamson emerald is only found in one area in Big Baddeck. Arctic jutta is a medium sized greyish-brown butterfly associated with bogs and fens in a few areas of the ecodistrict. Five species are listed as sensitive (yellow). These are spot-winged glider (*Pantala hymenaea*), black meadowhawk (*Sympetrum danae*), muskeg emerald (*Somatochlora septentrionalis*), harlequin darner (*Gompaeschna furcillata*), and harpoon clubtail (*Gomphus descriptus*).

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 Island. Two species are listed as sensitive (yellow). These are short-tailed swallowtail (*Papilio brevicauda*) and mustard white (*Pieris oleracae*). Mustard white was recorded in several areas, including Baddeck, Inverness, and Chéticamp. Short-tailed swallowtail patrols coastal areas and headlands where its host plant scotch lovage (*Ligusticum scoticum*) is found. Records show that the host plant has been found near Baddeck.

Monarch (*Danaus plexippus*) is one of the most recognizable butterflies. It has a close association with milkweed (*Asclepias sp.).* The monarch is a migratory species with the eastern population overwintering in a handful of sites at high altitude near Mexico City. The monarch has been recorded in Rear Estmere in this ecodistrict.

Dorcas copper (*Lycaena dorcas*; not assessed) is a small butterfly closely associated with its host plant shrubby cinquefoil (*Dasiphora fruticosa*). This butterfly is found in wet areas where the host plant grows. In this ecodistrict, it is found in the area of the Black River bog near Lake Ainslie.

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 Hills Ecodistrict.

Plants

A total of 73 Nova Scotia orange-listed, 83 Nova Scotia yellow-listed, and 11 undetermined (insufficient data to define status) plants are known from the Cape Breton Hills. As well there are 35 species that are listed as S3 uncommon for a total of 202 species in 2,849 records. There are several sites that harbour notable concentrations of plant species of conservation concern based on extensive surveys done in the past several years. Two of these sites are the Polletts Cove River area and Lockhart Brook. Both are in the Polletts Cove - Aspy Fault Wilderness Area.

At the Pollett Cove River area, there are seven orange-listed species, including nodding fescue (*Festuca subverticillata*), long bracted frog orchid (*Coeloglossum viride*), northern maiden fern (*Adiantum pedatum*), and spiked woodrush (Luzula spicata). The site also hosts 27 sensitive or yellow-listed plants. Among these are meadow horsetail (*Equisetum pretense*), lance-leaf grape-fern (*Botrychium lanceolatum*), and highland rush (*Juncus trifidus*).

Lockhart Brook is another site with large concentration of plants of conservation concern. Here, there are seven orange-listed plants. Long bracted frog orchid and field wormwood (*Artemisia campestris*) and wiegand sedge (*Carex wiegandii*) are among them. Pink crowberry (*Empetrum eamesii*) belongs to the heath family of plants and is one of 21 yellow-listed plants growing in this area. Several other yellow-listed plants found here are maidenhair spleenwort (*Asplenium trichomanes*), hairlike sedge (*Carex capillaris*), and alpine bilberry (*Vaccinium uliginosum*).

Orange-listed northern gentian (*Gentianella amarella*) can be found in the area around Meat Cove. Indian Brook is one of the larger streams that flows on the eastern side of Cape Breton. In its river valley one would find smooth cliff fern (*Woodsia glabella*), a yellow-listed species. As well, orange-listed species western hairy rockcress (*Arabis hirsute*) and rock whitlow grass (*Draba arabisans*) are found here.

At Rear Estmere on the Washabuck peninsula, bastard's toadflax (*Comandra umbellate*), an orange-listed species, can be found. Toadflax is also recorded near South Harbour in the northern section of Cape Breton Hills Ecodistrict 310. Another orange-listed species, large St. John's wort (*Hypericum majus*), appears at the same site in Rear Estmere. Two species of lady's slipper can be located here, small yellow lady's slipper (*Cypripedium parviflorum var. makasin*) and yellow lady's slipper (Cypripedium parviflorum).

Showy lady's slipper (*Cypripedium reginae*; orange) usually grows on calcareous soils. It is recorded in both Iona and Skye Mountain. Bebb's sedge (*Carex bebbii*), another orange-listed species, is also found at Skye Mountain. In a small bog near Pleasant Hill, southern twayblade (*Listera australis*) is found in abundance. This small orchid is the smallest of the twayblades and is listed as orange.

At River Inhabitants near Glenora several rare plants can be found. Fries pondweed (*Potamogetan freii*), blunt-leaved pondweed (*Potamogetan obtusifolia*), and sweet wood reed grass (*Cinna arundinacea*) are all orange-listed species located at this site. Yellow-listed climbing false buckwheat (*Polygonum scanens*), short-awned foxtail (*Alopecurus aequalis*), and alder-leaved buckthorn (*Rhammus alnifolia*) are located nearby.

Black ash (*Fraxinus nigra*), an NSESA endangered species, is recorded in several sites in the Boisdale Hills. The species is a tree that likes open wet areas and is shade intolerant. Black ash is very important species to the Mi'kmaq as it is used in traditional basket making. It can be found at Ironville and near Eskasoni. Seabeach ragwort (*Senecio pseudoarnica; yellow*) can be found along many of the barachois pond beaches in the area. Boreal aster (*Symphytrichum boreale; yellow*) grows at MacAdams Lake. Along the shores of East Bay, in the East Bay Hills, lesser rattlesnake plantain (*Goodyera repens*; yellow) is found.

These are some of the rare plants that one might find in the ecodistrict. For a more complete list refer to Appendix 3, tables 1a and 1b.

Lichens

There are four lichens listed as species at risk and four listed as species of concern in the ecodistrict. Boreal felt lichen (*Erioderma pedicellatum* Atlantic pop.) is listed as endangered under NSESA. There is a special management practice in place to help protect and recover this species (see http://novascotia.ca/natr/wildlife/habitats/terrestrial/). This lichen can be found at several sites in the East Bay Hills.

Blue felt lichen (*Degelia plumbea*; vulnerable NSESA) grows as an epiphyte, predominately on hardwoods in woodlands and is vulnerable to disturbance that leads to a reduction in habitat humidity. The species is also very sensitive to acid rain. Forest harvesting is a threat to the species through direct removal or through the creation of an edge effect, leading to reduced humidity within the stand. In this ecodistrict, it can be found in the St. Rose area.

Eastern waterfan (*Peltigera hydrothyria*) and frosted glass-whiskers lichen (*Sclerophora peronella* Nova Scotia pop.) are listed under COSEWIC as threatened and special concern respectively. Four other lichens are listed a species of special concern in this ecodistrict: two orange-listed and two yellow-listed species.

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.

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

310 Cape Breton Hills Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Hills (Matrix)	WCDS WCKK WFHO WFKK WMDS WMHO WMKK WMRD WMSM	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Spruce Pine Hummocks (Patch)	ICHO IMHO	Frequent	black Spruce (bS), white Pine (wP)
Tolerant Mixedwood Hills (Patch)	IFKK	Infrequent	red Spruce (rS), yB, sM, Be
Wetlands (Patch)	IMSM WTLD	Open Seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Coastal Beach (Patch)	XXCB	N/A	N/A
Valley Corridors (Corridor)	Various	Various	Various

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

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

Soil Texture: **C** – Coarse-textured soils (e.g. sands) **M** – Medium-textured soils (e.g. loams) **F** – Fine-textured soils (e.g. clays)

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

Within the Cape Breton Hills Ecodistrict, there are nine ecosections – ICHO, IFKK, IMRD, IMSM, WCHO, WCKK, WFHO, WMSM, and WTLD – that each comprise less than 2% of the ecodistrict area. These ecosections combined form 4.9% of the ecodistrict.

Practices or policies that might be implemented or devised to address conservation issues include:

- Conservation of species that are threatened as indicated by DNR's General Status Rank of Wild Species in Nova Scotia (yellow and red listed) or those listed as S1, S2, or S3 in

the Atlantic Canada Conservation Data Centre rankings.

- Conservation of significant habitats or climax communities considered to be rare.
- Identification of sites of cultural significance.
- Identification of more old forest.
- Ecological restoration where resource use has significantly altered species composition (i.e. in areas where the intolerant hardwood component has dramatically increased).

Ecological Representivity (Appendices 4, 5)

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

The overall goal is biodiversity conservation through protection of natural habitat diversity. Ecological representation is employed as a "coarse scale" ecosystem planning concept. The analysis evaluated and identified the reserve status of the ecosections and climax communities located within the ecodistrict where two levels of reserves were recognized: legally protected reserves, such as Wilderness Areas, and policy protected reserves under the 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.

Restricted and Limited Use Lands

The Cape Breton Hills Ecodistrict includes 31,646 hectares of provincial wilderness areas, parks, protected areas, and other areas of legislated protection. The largest category is wilderness areas which account for 28,862 hectares.

National parks and adjuncts represent another 20,740 hectares.

Among the areas identified in a provincial lands database, seven provincial wilderness areas fall partly within the boundaries of Cape Breton Hills. These are Polletts Cove - Aspy Fault, Margaree, Jim Campbells Barren, French River, North River, Middle River, Sugarloaf Mountain, and Trout Brook. Three International Biological Preserves (IBPs) are found within the boundaries of the ecodistrict – French River, Second Fork Brook, and Lake O'Law.

Six provincial parks and 18 park reserves are partly or completely within this ecodistrict. The Cape Breton Highlands National Park takes up a significant area of this ecodistrict, mostly in river valleys that are heading to the highland plateau.

There are two nature reserves in the ecodistrict: MacFarlane Woods located at Mull River and the Bornish Hills Nature Reserve at River Denys Mountain.

The Nature Conservancy of Canada has three properties in the ecodistrict. These are at Mull River, Sight Point, and South Ridge in the Mabou area. Portions of three major native reserves – Eskasoni, Wagmatcook, and Waycobah – are in the ecodistrict.

Protected beaches at Lily Pond, Colindale, and Grand Narrows area form part of the ecodistrict.

Many of the communities on Cape Breton Island have water supply area that may or may not be designated. Designation gives the area more protection from disturbance. There is one designated water supply area partly within the ecodistrict boundaries at Landrie Lake. There are seven
non-designated water supply areas listed as well.

ELA Summary

Element Interpretation (All appendices and maps)

Most elevations in the Cape Breton Hills Ecodistrict range from 150 to 300 metres above sea level. Hardwood forested hills and steep slopes define this ecodistrict. When travelling along Bras d'Or Lake, the hilly topography of Kellys Mountain, Boisdale Hills, Sporting Mountain, East Bay Hills, Whycocomagh, and Lewis Mountain is easily visible. The total area is 370,183 hectares.

The ecodistrict is influenced by the strong, cold winds of the Gulf of St. Lawrence. Temperatures are slow to warm in the spring, resulting in a short growing season.

Most of the rivers passing through the Inverness and Bras d'Or lowlands have their headwaters originating from wetlands and a few small lakes in the hills.

The Cape Breton Hills Ecodistrict provides important habitat to wildlife, including two species of mammals that are endangered in Nova Scotia: Canada lynx and American marten.

Deer wintering yards are common on the sheltered south-facing slopes and numerous eagle nests are found along the ravines of major streams.

Shade-tolerant hardwood forests of yellow birch, sugar maple, and beech, along with red maple and scattered white spruce and balsam fir, are found throughout this ecodistrict on well-drained, sandy loam soils at mid-slope.

Eastern hemlock, white pine, and scattered red spruce are found on ravines with well-drained, medium-textured soils. Forests of white spruce are also common.

The higher steep-sloped hills are underlain with older resistant rocks and are covered with well-drained, moderately coarse-textured tills. In general, the lower more gradually sloping hills are underlain by coarse carboniferous sediments. The soils tend to be imperfectly drained, fine- textured tills. Seepage sites are common on the slopes providing some of the richer sites for tree and plant growth.

The mainly tolerant hardwood forest exists on the side sloops of the hill complexes while black spruce and balsam fir are found on the imperfectly drained soils of the depressions located on the major hill tops.

In areas where soils and climate permitted agriculture by the early settlers, abandoned farmlands have reverted to balsam fir, white spruce, and mixedwood stands, in places such as Creignish and Mabou.

The tolerant hardwood forest is shaped by gap dynamic disturbances, in which individual trees or small groups of trees die as opposed to the stand-level disturbances common in softwood forests.

There have also been species-specific disturbances in the hardwood forests resulting in significant mortality of entire species.

Tolerant Hardwood Hills

(Matrix) (WCDS, WCKK, WFHO, WFKK, WMDS, WMHO, WMKK, WMRD, and WMSM ecosections) (312,120 ha)

The element is dominated by mid to late successional shade-tolerant hardwood forests typical of the Acadian Forest. Representative species include sugar maple, beech, yellow birch, and white ash with ironwood on the richer sites. Early successional forests following stand-level disturbances are typically of similar species with white birch and red maple usually more abundant.

Human settlement patterns and forestry practices have altered portions of the forest cover. These altered areas now contain younger softwood and mixedwood stands in the mid seral stage (approximately 33% of the area). At least 50 % of the area remains in mature late seral stages of development.

About 85% of the ecodistrict is represented by this element. Tolerant Hardwood Hills occurs on the slopes of hilly and hummocky terrain where soils are well-drained and enriched with moisture and nutrients from upper slope positions. Soils are typically coarse to medium-textured loams and sandy loams but better-drained fine-textured clay loams will also support this element on steeper slopes.

Between Dunvegan and Belle Côte, the western-facing slopes of the hills have been altered by a landform feature called “slumping” which has created a unique ridge-like pattern that also supports this element.

Natural stand-level disturbances are rare. Stands will usually maintain themselves through gap replacement leading to an uneven-aged climax forests and the opportunity to develop old forest characteristics. Natural disturbance agents include hurricanes, ice storms, disease, and insects.

This element occurs primarily on hilly topography and steep slopes underlain with well-drained soils of variable textures but generally of medium to rich fertility. Seepage areas are common on the slopes and provide an important habitat for biodiversity. Under these closed canopy forests the shrub layer consists of regenerating trees and shrubs such as fly honeysuckle and beaked hazelnut. These forests also have an abundant cover to ferns and club mosses.

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

When the Scottish settlers arrived in the early 1800s they cleared and farmed significant areas of the tolerant hardwood forest on the upland sites with major settlements on the Mabou highlands, River Denys Mountain, and Skye Mountain.

At the start of the 1920s many rural families departed their farms to live and work in urban areas and as these fields were abandoned they reforested to white spruce. Currently, very little remains of the settlements except rock walls, foundations, and cemeteries.

On the Mabou highlands, however, owing to the large areas of well-drained soils on level terrain, the fields have been maintained as community pastures for the sheep and cattle of farmers from Mabou to Inverness.

Flows

People (timber, recreation, hunting, off-highway vehicle (OHV)); deer (travel, foraging, winter cover); moose (travel, foraging); lynx (travel); eagle (nesting, foraging); migratory birds (breeding, habitat, foraging); water (catchment, filter, groundwater recharge).

Composition

Cape Breton Hills Ecodistrict 310 (based on statistics up to 2006)
Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	19%	13%	68% (57 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	9%	33%	52%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	20%	45%	30%	5%

Desired Condition

A mature late seral hardwood forest.

Issues

- Restore the area to approximately 70% or more late seral stage hardwood stands via partial and selection harvesting with long rotations.
- Reduce the percentage of mixedwood intolerant hardwood stands.

Spruce Pine Hummocks

(Patch) (ICHO and IMHO ecosections) (30,795 ha)

Dominating many of the hilltop ridges, these are generally mature softwood stands on imperfectly drained, coarse to medium-textured soils. Intermixed with these on the better-drained soils are tolerant hardwood and mixedwood stands.

Spruce Pine Hummocks is generally associated with the hummocky to level terrain on top of several hill systems including the East Bay Hills, Boisdale Hills, North Mountain, and Sporting Mountain. The imperfect drainage conditions expressed in the soils underlying this terrain can be attributed to the gentle slope of the landscape.

The inherent low fertility and imperfect drainage give rise to forests of black spruce and scattered white pine. With progressively poorer drainage, wet forests of black spruce, tamarack, and red maple or shrubby wetlands will occur. Occasionally, open woodlands of black spruce and reindeer lichen occur where soils are either shallow to bedrock or extremely gravelly.

This element also occurs as a small linear area in some of these hilly regions along watercourses that eventually make their way to the lowlands. Examples of this feature are in the hills near Glencoe and Dunakin and throughout the Boisdale and East Bay hills. Along these riparian zones small alluvial deposits can provide enriched conditions for small floodplain forests. Otherwise, forests comprise black spruce on the imperfectly drained soils and balsam fir on the better- drained upper slopes.

Stands may be frequently disturbed by windthrow and fire and are usually even-aged. Early successional forests originating from stand-level harvesting or natural disturbance will include red maple, white birch, grey birch, and pin cherry.

Flows

People (timber, recreation, hunting, OHV); deer (travel, foraging, winter cover); moose (travel, foraging); lynx (travel, foraging, denning); eagle (nesting, foraging); migratory birds (breeding, habitat, foraging); water (catchment, filter, groundwater recharge).

Composition

Cape Breton Hills Ecodistrict 310 (based on statistics up to 2006)
Composition of Spruce Pine Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	27%	14%	59% (33 Mat + 26 OF)	26%
Seral Stage	Early	Mid	Late	Unclassified
	9%	27%	59%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	50%	21%	22%	7%

Desired Condition

Late seral stage black spruce-balsam fir stands intermixed with mature tolerant hardwood stands.

Issues

- Present stand composition within this patch element is within the desired range of species, ages, and seral stages.

Spruce Fir Hills and Hummocks

(Patch) (IFHO and IMRD ecosections) (7,404 ha)

This patch element occurs on imperfectly drained hummocky terrain underlain by fine-textured soils (clay loams).

The forests tend to be dominated by black spruce on the moister sites and balsam fir with white spruce on the better-drained soils usually associated with the upper slopes of the hummocky terrain.

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

Early successional forests tend to have a higher component of aspen, tamarack, and balsam fir but overall regenerating forests from stand-level harvesting will also include red maple, white birch, grey birch, and pin cherry.

The dominant natural disturbance is frequent and results in primarily even-aged forests. Natural disturbance agents include windthrow and insects (e.g. spruce budworm if forests have a high component of balsam fir or white spruce).

This element is primarily found on the upper elevations of the hilly topography of western Cape Breton Island. Good examples of this element are on the Big Ridge between Port Hastings and Mabou and at Maple Brook.

Flows

People (timber, recreation, hunting, OHV); deer (travel, foraging, winter cover); moose (travel, foraging, thermal cover); lynx (travel, foraging, denning); migratory birds (breeding, habitat, foraging); water (catchment, filter, groundwater recharge).

Composition

Cape Breton Hills Ecodistrict 310 (based on statistics up to 2006) **Composition of Spruce Fir Hills and Hummocks**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	37%	21%	42% (26 Mat + 16 OF)	16%
Seral Stage	Early	Mid	Late	Unclassified
	13%	27%	52%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	54%	13%	23%	10%

Desired Condition

Predominately a black spruce forest patch with lesser amounts of balsam fir and an even distribution of development classes. All seral stages should be represented.

Issues

- Maintain and increase black spruce component of the patch.
- Reduce, where possible, hardwood and to a lesser degree balsam fir components.
- Maintain a balance in development classes.

Tolerant Mixedwood Hills

(Patch) (IFKK ecosection) (4,325 ha)

This is a localized large patch element south of Mabou (Alpine Ridge and Southwest Ridge) supporting shade-tolerant species of the Acadian Forest.

The element occurs on the slopes of rounded hills underlain by imperfectly drained fine-textured soils. On the upper slopes and crests, forests comprise sugar maple, yellow birch, and beech, but at the middle and lower slope positions forests tend to comprise white spruce and balsam fir mixed with yellow birch and maple.

At lower and toe slope positions and where there are seepage sites along the slope, soils are moister and richer with trees such as white ash and ironwood indicating this improved condition. Earlier successional species follow after stand-level disturbances and include red maple, aspens, white and grey birch, and balsam fir.

Natural disturbances are infrequent and include small gaps or patches created in the stand canopy by individual tree mortality or windthrow. Due to the long life of the dominant species and the infrequent nature of stand-level disturbances, uneven-aged forests can develop.

Many of these hills have been cleared for agriculture and when abandoned reforest to white spruce and tamarack.

Flows

Human (timber, recreation, hunting, OHV); deer (travel, foraging, winter cover); moose (travel, foraging); lynx (travel, foraging, denning); eagle (Nesting, foraging); migrating song birds (breeding, habitat, foraging); water (catchment, filter, groundwater recharge).

Composition

Cape Breton Hills Ecodistrict 310 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	13%	55% (49 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	10%	36%	45%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	33%	23%	40%	4%

Desired Condition

Tolerant mixedwood stands dominated by black spruce, red spruce, sugar maple, and yellow birch. Will also contain minor components of white pine and eastern hemlock.

Issues

- Increase the tolerant hardwood percentage in the mixedwood stands with stand management.

Wetlands

(Patch) (IMSM and WTLD ecosections) (1,513 ha)

This element mainly consists of tolerant softwood stands on wet ground and open bog conditions.

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

The East Bay Hills have one of the largest concentrations of large wetlands in the ecodistrict. Smaller disjoint wetlands are often embedded within other elements, especially the Spruce Pine Hummocks element.

Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple. For the most part sites are underlain by poorly drained mineral soils derived from sandstone

tills or organic soils derived from peat (sphagnum mosses) or sedges. On the higher ground with better-drained soils, softwood forests of white and black spruce will occur.

This element plays a critical role in water collection, filtering, and groundwater recharge.

Flows

People (timber, recreation, hunting, OHV); deer (travel, foraging, fawning areas); moose (travel, foraging, calving areas); lynx (travel, foraging); migratory birds (breeding, habitat, foraging); water (catchment, filter ground water recharge).

Composition

Cape Breton Hills Ecodistrict 310 (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
	20%	24%	56% (24 Mat + 32 OF)	32%
Seral Stage	Early	Mid	Late	Unclassified
	5%	22%	68%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	66%	12%	18%	4%

Desired Condition

Mature late seral softwood stands on the better-drained sites.

Issues

- Late seral stage black spruce and red spruce on the better-drained sites.

Coastal Beach*

(Patch) (XXCB ecosection) (25 ha)

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

In this ecodistrict, the hills slope quickly to the Bras d'Or Lake near Ben Eoin and St. Andrews Channel and several beaches have been included.

In the Bras d'Or Lake, the beaches are created by the movement of sediments along the shore by tidal currents and are called spits. Where currents meet on straight shorelines, spits may coalesce to form a triangular beach enclosing a small lagoon locally known as "barrachois" ponds. These ponds, often with brackish water, are quite common along the shores of Bras d'Or Lake.

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

*Note: Because of the small size of this element (25 ha), statistically significant data on the various sections could not be obtained.

Valley Corridors

(Corridor) (Various ecosections) (12,564 ha)

Located mainly along watercourses, this element is associated with a variety of early mature and mature stands.

The most evident linear features within this ecodistrict are faults, folds, and associated watercourses. A number of corridors have significant levels of land use which have created settlements, agricultural fields, power lines, roads, and railways.

A significant manmade feature is a reservoir dam. These land use changes reduce the connective function of the corridor for some species and may also increase the barrier effect of the corridors for species that must move across or through them.

Flows

People (recreation, hunting); deer (travel, foraging, winter cover); moose (travel, foraging); lynx (travel, foraging); eagle (Nesting, foraging); migratory birds (breeding, habitat, foraging); water (catchment, discharge).

Composition

Cape Breton Hills Ecodistrict 310 (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
	19%	14%	67% (53 Mat + 14 OF)	14%
Seral Stage	Early	Mid	Late	Unclassified
	7%	34%	54%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	26%	39%	30%	5%

Desired Condition

Intact tolerant late seral stage softwood, mixedwood, and hardwood stands.

Issues

- Maintain and increase development classes of stands to ensure connectivity.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Cape Breton Hills 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:

- Cape Breton Hills is generally rural in nature with scattered small communities. The overall EEI is 71 to 75. This indicates a lower degree of manmade disturbances to the forest structure of the ecosystem.
- Maintain a balance between the four ecological emphasis classes, attempting to keep EEI above 50.
- Subject to ownership constraints, enhance connectivity of the corridor elements by maintaining, and where required, restoring natural forest conditions.
- Where feasible, utilize gap disturbance harvesting techniques to maintain and enhance current forest structure.

Appendix 1: Flow - Element Interactions

Element	People	Deer	Moose	Lynx	Eagle	Migratory Birds	Water
Matrix Tolerant Hardwood Hills	Forestry, OHVs, and Outdoor Recreation (Hunting, fishing, trapping, etc.)	Travel ways, Wintering areas, Foraging	Travel ways, Foraging	Travel ways	Nesting, foraging	Breeding Habitat, foraging	Surface water quality, catchment, filtration, groundwater recharge and discharge
Patches Spruce Pine Hummocks	Forestry, OHVs and Outdoor Recreation (Hunting, fishing, trapping, etc.)	Travel ways, Wintering areas, Foraging	Travel ways, Foraging	Travel ways, Foraging	Nesting, foraging	Breeding Habitat, foraging (e.g. songbirds)	Surface water quality, catchment, filtration, groundwater recharge and discharge
Spruce Fir Hills and Hummocks	Forestry, OHVs, and Outdoor Recreation (Hunting, fishing, trapping, etc.)	Travel ways, Foraging, Winter cover	Travel ways, Foraging, Thermal cover	Travel ways, Foraging, Denning	--	Breeding Habitat, foraging	Surface water quality, catchment, filtration, groundwater recharge and discharge
Tolerant Mixedwood Hills	Forestry, OHVs and Outdoor Recreation (Hunting, fishing, Trapping, etc.)	Travel ways, Foraging, winter cover	Travel ways, Foraging	Travel ways, Foraging, Denning	Nesting, foraging	Breeding Habitat, foraging (e.g. songbirds)	Surface water quality, catchment, filtration, groundwater recharge and discharge
Wetlands	Forestry, Outdoor Recreation (Hunting, fishing, trapping, etc.)	Travel ways, Foraging, fawning areas	Travel ways, Foraging, calving areas	Travel ways, Foraging	--	Breeding Habitat, foraging (e.g. waterfowl)	Surface water quality, catchment, filtration, groundwater recharge and discharge
Coastal Beach	Outdoor recreation (Swimming, etc.)	Travel ways	--	--	Foraging, Perching, Nesting	Breeding Habitat, foraging and staging habitat (e.g. shorebirds)	--

Appendix 1: Flow - Element Interactions

Element	People	Deer	Moose	Lynx	Eagle	Migratory Birds	Water
Corridors - Collins Brook - Southwest Mabou River - Indian Brook - Upper Mabou - Big Brook - MacLellans Brook - Peters Brook - Morgans Brook - Boisdale Hills - Irish Cove Brook	Outdoor Recreation (Hunting, fishing, Trapping, etc.)	Travel ways, Wintering areas, Foraging	Travel ways, Foraging	Travel ways	Nesting, Foraging	Breeding Habitat, foraging	Catchment, Discharge

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Matrix	High	Canada Lynx habitat	Dominant feature of the landscape	Gap	sM, yB, Be	Black Spruce - Tolerant Hardwood, Black Spruce - Balsam Fir, Tolerant Hardwood - Softwood, Black Spruce - Wetlands, Coastal Beach	Fragmentation due to Forestry, farming, and development.	Conserve Deer Wintering areas, Lynx habitat, other significant habitats (e.g. eagle nest sites)	Manage forests using a gap disturbance-based strategy. Minimize barriers and recognize key corridors between uplands and lowlands
Spruce Pine Hummocks	Patch	High	Canada Lynx habitat	Dominant feature of the landscape	Frequent	bS, bF sM, yB, Be sM, yB, Be eH, wP	Tolerant Hardwood, Black Spruce - Balsam Fir, Black Spruce - Wetlands	Some fragmentation due to forestry and roads	Conserve Deer Wintering areas, Lynx habitat, other significant habitats (e.g. eagle nest sites, etc.)	Maintain functional amount of mature cover for habitat and connectivity. Create stand-level disturbances using harvesting that mimic natural patch size.
Spruce Fir Hills and Hummocks	Patch	Low	Canada Lynx habitat	Dominant feature of the landscape	Frequent	bS, bF bS	Tolerant Hardwood, Tolerant Hardwood - Softwood, Black Spruce-Tolerant Hardwood, Black Spruce - Wetlands		Conserve Deer Wintering areas, Lynx habitat, other significant habitats	Maintain functional amount of mature cover for habitat and connectivity. Create stand-level disturbances using harvesting that mimic natural patch size

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Mixedwood Hills	Patch	Low	Mull River Area	Isolated local patch of unique habitat	Infrequent	yB, Be rS, eH, wP, sM	Tolerant Hardwood, Black Spruce - Balsam Fir		Hill top cleared for agriculture	Maintain functional amount of mature cover for habitat and connectivity. Create stand-level disturbances using harvesting that mimic natural patch size.
Wetlands	Patch	Moderate		Few scattered throughout Ecodistrict	Frequent	bS, bF	Tolerant Hardwood, Black Spruce - Balsam Fir, Black Spruce-Tolerant Hardwood		Conversion Infilling	Seasonal access for harvesting to reduce site impacts. Maintain appropriate riparian and machine exclusion zone.
Coastal Beach	Patch	Low		Local - Only few small areas	Seral	barrier cobble beach	Tolerant Hardwood	Beach erosion	Human development, beach erosion, Channel openings	Maintain connectivity along coast, minimize development footprint, government land purchases
Valley Corridors	Corridor	High	Various	Dominant feature of landscape providing linkage within and between ecodistricts.	Frequent with inclusions of Gap and Open Seral.	Riparian forests, wetland forests and upland forests of spruce-fir and occasionally tolerant hardwood.	Lower slopes of the Cape Breton Hills and Cape Breton Highlands.	Fragmentation due to land use such as agriculture, settlement and transportation.	Loss of mature forest cover	Maintain appropriate riparian and machine exclusion zones. Reduce road access. Recognize key “choke points” in corridors and maintain functionality.

Appendix 2b: Connective Management Strategies

Structure Type	Attributes	Conditions of Concern	Management Strategies
Matrix	percolation, large patch, interior habitat	fragmentation, excessive edge	1. Promote contiguous forest structure using strategies suchas patch aggregation and overstory-sustaining selectioncutting 2. Promote large patch structure and interiorconditions 3. Mitigate large-scale, long-term, fragmentation of the matrixthat could impede percolation 4. Manage age and structure appropriate to naturaldisturbance regime (NDR). For gap and infrequently disturbed ecosections maintain 60% maturecover
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 qualityor 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 unnaturalbarriers 2. Map and Manage along naturalboundaries 3. Conserve "interior" conditions where appropriatethrough strategic management of neighbouringecosystems 4. Sustain continuity, through management of overstoryand interior structure appropriate to NDR 5. Follow habitat regulations for buffer management. Establish wider buffers with natural boundaries along majorwaterways

Appendix 3: Special Occurrences (Ecodistrict 310)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-	-	-	-
Piping Plover	*Charadrius melodus*	Endangered	Endangered	Endangered
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Bank Swallow	*Riparia riparia*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
Bicknell's Thrush	*Catharus bicknelli*	Endangered	Special Concern	Threatened
DICOTS	-	-	-	-
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
Sage Willow	*Salix candida*	Endangered	N/A	N/A
INSECTS	-	-	-	-
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
FISH	-	-	-	-
Atlantic Salmon - Eastern Cape Breton population	*Salmo salar*	N/A	N/A	Endangered
Atlantic Salmon - Gaspé - S. Gulf of St. Lawrence population	*Salmo salar*	N/A	N/A	Special Concern
LICHENS	-	-	-	-
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Boreal Felt Lichen - Atlantic population	*Eriodermapedicellatum*	Endangered	Endangered	Endangered
Eastern Waterfan	*Peltigera hydrothyria*	N/A	N/A	Threatened
Frosted Glass-whiskers Lichen - Nova Scotia population	*Sclerophora peronella*	N/A	Special Concern	Special Concern
MAMMALS	-	-	-	-
Canadian Lynx	*Lynx canadensis*	Endangered	N/A	Not at Risk
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Long-tailed Shrew	*Sorex dispar*	N/A	Special Concern	Not at Risk
American Marten (C.B. population)	*Martes america*	Endangered	N/A	N/A
Woodland Caribou (Atlantic-Gaspésie population)	*Rangifer tarandus*	Extirpated	Endangered	Endangered
MOLLUSKS	-	-	-	-
Yellow Lampmussel	*Lampsilis cariosa*	Threatened	Special Concern	Special Concern
REPTILES	-	-	-	-
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 310)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS			
Four-toed Salamander	*Hemidactyliumscutatum*	Secure (Green)	S3
BIRDS			
Northern	*Accipiter gentilis*	Secure (Green)	S3S4
Goshawk Spotted	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Sandpiper	*Alca torda*	Sensitive (Yellow)	S1B,S4N
Razorbill	*Bucephala clangula*	Secure (Green)	S2B,S5N
Common Goldeneye	*Calidris pusilla*	Sensitive (Yellow)	S3M
Semipalmated Sandpiper	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5
Pine Siskin	*Cepphus grylle*	Secure (Green)	N S3S4
Black Guillemot	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Semipalmated Plover	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Bay-breasted Warbler	*Dendroica striata*	Sensitive (Yellow)	S3S4B
Blackpoll Warbler	*Dendroica tigrina*	Sensitive (Yellow)	S3?B
Cape May Warbler	*Empidonaxflaviventris*	Sensitive (Yellow)	S3S4B
Yellow-bellied Flycatcher	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Common Loon Ring-	*Larus delawarensis*	Secure (Green)	S1?B,S5N
billed Gull	*Mergus serrator*	Secure (Green)	S3B,S5N
Red-breasted Merganser	*Morus bassanus*	Secure (Green)	SHB,S5M
Northern Gannet	*Passerella iliaca*	Secure (Green)	S3S4B
Fox Sparrow	*Perisoreuscanadensis*	Sensitive (Yellow)	S3S4
Gray Jay	*Petrochelidonpyrrhonota*	May Be At Risk (Orange)	S3B
Cliff Swallow	*Phalacrocorax carbo*	Sensitive (Yellow)	S3
Great Cormorant	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
Rose-breasted Grosbeak	*Pinicola enucleator*	May Be At Risk (Orange)	S3?B,S5N
Pine Grosbeak	*Poecile hudsonica*	Sensitive (Yellow)	S3
Boreal Chickadee	*Sterna hirundo*	Sensitive (Yellow)	S3B
Common Tern	*Tringa melanoleuca*	Sensitive (Yellow)	S3B,S5M
Greater Yellowlegs	*Tringa semipalmata*	May Be At Risk (Orange)	S2S3B
Willet	*Tyrannus tyrannus*	Sensitive (Yellow)	S3S4B
Eastern Kingbird	*Wilsonia pusilla*	Sensitive (Yellow)	S3S4B
Wilson's Warbler			

Appendix 3: Special Occurrences (Ecodistrict 310)

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***
BRYOPHYTES			
Coast Creeping Moss	*Conardia compacta*	Sensitive (Yellow)	S2?
False Willow Moss	*Platydictya jungermannioides*	Sensitive (Yellow)	S2?
Hooked Scorpion Moss	*Scorpidium scorpioides*	Sensitive (Yellow)	S2?
DICOTS			
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Running Serviceberry	*Amelanchierstolonifera*	Secure (Green)	S3?
Virginia Anemone	*Anemone virginiana*	May Be At Risk (Orange)	S2
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
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3
Swamp Milkweed	*Asclepias incarnata ssp. pulchra*	Undetermined	S2S3
Frankton's Saltbush	*Atriplex franktonii*	Secure (Green)	S3S4
Bog Birch	*Betula pumila*	Sensitive (Yellow)	S2S3
Estuary Beggarticks	*Bidens hyperborea*	May Be At Risk (Orange)	S1
Yellow Marsh Marigold	*Caltha palustris*	Sensitive (Yellow)	S2
Cuckoo Flower	*Cardamine pratensis var. angustifolia*	May Be At Risk (Orange)	S1
Cuckoo Flower	*Cardamine pratensis var. pratensis*	May Be At Risk (Orange)	S1
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2
Seaside Spurge	*Chamaesyce polygonifolia*	Secure (Green)	S3
Rock Whitlow-Grass	*Draba arabisans*	Sensitive (Yellow)	S2
Pink Crowberry	*Empetrum eamesii*	Sensitive (Yellow)	S3
Downy Willowherb	*Epilobium strictum*	Sensitive (Yellow)	S3
Hyssop-leaved Fleabane	*Erigeron hyssopifolius*	Sensitive (Yellow)	S3
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
False Mermaidweed	*Floerkea proserpinacoides*	Sensitive (Yellow)	S2
Northern Wild Licorice	*Galium kamtschaticum*	Secure (Green)	S3
Labrador Bedstraw	*Galium labradoricum*	Sensitive (Yellow)	S2
Kalm's Hawkweed	*Hieracium kalmii*	Undetermined	S2?
Robinson's Hawkweed	*Hieracium robinsonii*	Sensitive (Yellow)	S2
Disguised St John's-wort	*Hypericum dissimulatum*	Sensitive (Yellow)	S2S3
Large St John's-wort	*Hypericum majus*	May Be At Risk (Orange)	S1
Pale Jewelweed	*Impatiens pallida*	Sensitive (Yellow)	S2
Canada Wood Nettle	*Laportea canadensis*	Sensitive (Yellow)	S3

Appendix 3: Special Occurrences (Ecodistrict 310)

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***
Yellow-seeded False Pimperel	*Lindernia dubia*	Secure (Green)	S3S4
Brook Lobelia	*Lobelia kalmii*	May Be At Risk (Orange)	S1
Water Beggarticks	*Megalodonta beckii*	Sensitive (Yellow)	S3
Water Blinks	*Montia fontana*	May Be At Risk (Orange)	S1
Siberian Water Milfoil	*Myriophyllum sibiricum*	Secure (Green)	S3S4
Narrow-leaved Evening Primrose	*Oenothera fruticosa ssp. glauca*	Undetermined	S2
Smooth Sweet Cicely	*Osmorhiza longistylis*	May Be At Risk (Orange)	S2
Balsam Groundsel	*Packera paupercula*	Secure (Green)	S3
Marsh Grass-of-Parnassus	*Parnassia palustris var. parviflora*	May Be At Risk (Orange)	S2
Pennsylvania Smartweed	*Polygonum pensylvanicum*	Secure (Green)	S3
Sharp-fruited Knotweed	*Polygonum raii*	Undetermined	S2S3
Stout Smartweed	*Polygonum robustius*	Secure (Green)	S3S4
Climbing False Buckwheat	*Polygonum scandens*	Sensitive (Yellow)	S3
Marsh Mermaidweed	*Proserpinacapalustris*	Secure (Green)	S3
Marsh Mermaidweed	*Proserpinaca palustris var. crebra*	Secure (Green)	S3
Pink Pyrola	*Pyrola asarifolia*	Secure (Green)	S3
Lesser Pyrola	*Pyrola minor*	Sensitive (Yellow)	S2
Gmelin's Water Buttercup	*Ranunculus gmelinii*	Secure (Green)	S3
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow)	S3
Bog Willow	*Salix pedicellaris*	Sensitive (Yellow)	S2
Seaside Brookweed	*Samolus valerandi ssp. parviflorus*	Sensitive (Yellow)	S2
Bloodroot	*Sanguinaria canadensis*	Secure (Green)	S3S4
Clustered Sanicle	*Sanicula odorata*	May Be At Risk (Orange)	S1
Lance-leaved Figwort	*Scrophularia lanceolata*	Undetermined	S1
Seabeach Ragwort	*Senecio pseudoarnica*	Sensitive (Yellow)	S2
Soapberry	*Shepherdiacanadensis*	Sensitive (Yellow)	S2
Long-leaved Starwort	*Stellaria longifolia*	Sensitive (Yellow)	S3
Horned Sea-blite	*Suaedacalceoliformis*	Secure (Green)	S2S3
Boreal Aster	*Symphyotrichum boreale*	Sensitive (Yellow)	S2?
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow)	S2
Northern Blueberry	*Vaccinium boreale*	May Be At Risk (Orange)	S2
Canada Violet	*Viola canadensis*	Extirpated	S1
Northern Bog Violet	*Viola nephrophylla*	Sensitive (Yellow)	S2

Appendix 3: Special Occurrences (Ecodistrict 310)

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***
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
Mingan Moonwort	*Botrychium minganense*	Extirpated	SH
Steller's Rockbrake	*Cryptogramma stelleri*	May Be At Risk (Orange)	S1
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Laurentian Bladder Fern	*Cystopteris laurentiana*	May Be At Risk (Orange)	S1
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Marsh Horsetail	*Equisetum palustre*	May Be At Risk (Orange)	S1
Variegated Horsetail	*Equisetumvariegatum*	Secure (Green)	S3
Appalachian Fir-Clubmoss	*Huperzia appalachiana*	Undetermined	S1S3
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?
Northern Holly Fern	*Polystichum lonchitis*	Sensitive (Yellow)	S2
Smooth Cliff Fern	*Woodsia glabella*	Sensitive (Yellow)	S2
INSECTS			
Mottled Darner	*Aeshna clepsydra*	Secure (Green)	S3
Eastern Red Damsel	*Amphiagrion saucium*	Secure (Green)	S3
Harlequin Darner	*Gomphaeschna furcillata*	Sensitive (Yellow)	S3
Harpoon Clubtail	*Gomphusdescriptus*	Sensitive (Yellow)	S2
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Dorcas Copper	*Lycaena dorcas*	Not Assessed	S1
Elfin Skimmer	*Nannothemis bella*	Secure (Green)	S3
Jutta Arctic	*Oeneis jutta*	May Be At Risk (Orange)	S1
Brook Snaketail	*Ophiogomphusaspersus*	May Be At Risk (Orange)	S1
Riffle Snaketail	*Ophiogomphuscarolus*	Secure (Green)	S3
Short-tailed Swallowtail	*Papilio brevicauda*	Sensitive (Yellow)	S1S2
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Green Comma	*Polygonia faunus*	Secure (Green)	S3
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Clamp-Tipped Emerald	*Somatochloratenebrosa*	Secure (Green)	S3
Williamson's Emerald	*Somatochlora williamsoni*	May Be At Risk (Orange)	S1
Black Meadowhawk	*Sympetrum danae*	Sensitive (Yellow)	S3

Appendix 3: Special Occurrences (Ecodistrict 310)

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***
LICHENS			
Blistered Tarpaper Lichen	*Collema furfuraceum*	Sensitive (Yellow)	S3?
Arctic Kidney Lichen	*Nephroma arcticum*	May Be At Risk (Orange)	S1S2
Naked Kidney Lichen	*Nephroma bellum*	Sensitive (Yellow)	S3?
MAMMALS			
Rock Vole	*Microtuschrotorrhinus*	Secure (Green)	S2
Cougar - Eastern pop.	*Puma concolor pop. 1*	Undetermined	SH
Southern Bog Lemming	*Synaptomys cooperi*	Secure (Green)	S3S4
MONOCOTS			
Short-awned Foxtail	*Alopecurusaequalis*	Sensitive (Yellow)	S2S3
Broad-Glumed Brome	*Bromuslatiglumis*	May Be At Risk (Orange)	S1
Scabrous Black Sedge	*Carex atratiformis*	Sensitive (Yellow)	S2
Bebb's Sedge	*Carex bebbii*	May Be At Risk (Orange)	S1S2
Bearded Sedge	*Carex comosa*	Sensitive (Yellow)	S2
Hidden-scaled Sedge	*Carex cryptolepis*	Secure (Green)	S3?
Bristle-leaved Sedge	*Carex eburnea*	Sensitive (Yellow)	S3
Limestone Meadow Sedge	*Carex granularis*	Undetermined	S1
Pubescent Sedge	*Carex hirtifolia*	Sensitive (Yellow)	S2S3
Porcupine Sedge	*Carex hystericina*	May Be At Risk (Orange)	S2
Greenish Sedge	*Carex viridula var. elatior*	May Be At Risk (Orange)	S1
Sweet Wood Reed Grass	*Cinna arundinacea*	May Be At Risk (Orange)	S1
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Small Yellow Lady's-Slipper	*Cypripedium parviflorum var. makasin*	Sensitive (Yellow)	S2
Yellow Lady's-slipper	*Cypripedium parviflorum var. pubescens*	Sensitive (Yellow)	S2
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Few-flowered Spikerush	*Eleocharis quinqueflora*	May Be At Risk (Orange)	S2
Wiegand's Wild Rye	*Elymus wiegandii*	May Be At Risk (Orange)	S1
Menzies' Rattlesnake-plantain	*Goodyera oblongifolia*	Sensitive (Yellow)	S3
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Sharp-Fruit Rush	*Juncus acuminatus*	Sensitive (Yellow)	S3S4
Richardson's Rush	*Juncus alpinoarticulatus ssp. nodulosus*	May Be At Risk (Orange)	S1S2
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Highland Rush	*Juncus trifidus*	Sensitive (Yellow)	S2
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3

Appendix 3: Special Occurrences (Ecodistrict 310)

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***
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Small Round-leaved Orchid	*Platantheraorbiculata*	Secure (Green)	S3
Glaucous Blue Grass	*Poa glauca*	Sensitive (Yellow)	S2S3
Fries' Pondweed	*Potamogeton friesii*	May Be At Risk (Orange)	S2
Blunt-leaved Pondweed	*Potamogetonobtusifolius*	Sensitive (Yellow)	S2S3
White-stemmed Pondweed	*Potamogetonpraelongus*	Sensitive (Yellow)	S3?
Richardson's Pondweed	*Potamogetonrichardsonii*	May Be At Risk (Orange)	S2S3
Flat-stemmed Pondweed	*Potamogetonzosteriformis*	Sensitive (Yellow)	S2S3
Slender Beakrush	*Rhynchospora capillacea*	May Be At Risk (Orange)	S1
Stalked Bulrush	*Scirpus pedicellatus*	Undetermined	S1
Northern Burreed	*Sparganium hyperboreum*	Sensitive (Yellow)	S1S2
Small Burreed	*Sparganium natans*	Secure (Green)	S3
Shining Ladies'-Tresses	*Spiranthes lucida*	May Be At Risk (Orange)	S2
Thread-leaved Pondweed	*Stuckenia filiformis ssp. alpina*	Undetermined	S2S3
Sticky False-Asphodel	*Triantha glutinosa*	May Be At Risk (Orange)	S1
GaspΘ Arrowgrass	*Triglochin gaspensis*	Undetermined	S1?

*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 denoting 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 310)

Table 1c – Other ConservationFeatures

Feature	Type	Information Source	Legislation or Status Ranking System
Deer wintering areas (DWA)	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	
Caves	Caves and mine adits	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database; Atlantic Canada Conservation Data Centre database	
Loon nesting lakes	Freshwater lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Eagle nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Osprey nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Hawk and owl nesting areas	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Waterfowl breeding, staging and wintering areas	Freshwater wetlands, saltmarshes, and coastal waters	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act

Appendix 3: Special Occurrences (Ecodistrict 310)

Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Seabird nesting Colonies	Coastal headlands, cliffs, and islands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Shorebird breeding and staging areas	Beaches, saltmarshes, and mudflats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Great blue heron rookeries	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Wood turtle habitat	Rivers, streams, and riparian habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act; Nova Scotia Endangered Species Act
Fish habitat areas	Rivers, streams, and lakes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Canada Fisheries Act
Designated and Non-designated water Supplies	Watersheds	DNR Restricted Land Use Database	Nova Scotia Environment Act
Dragonfly, damselfly, and butterfly habitats	Upland and wetland habitats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Endangered Species Act

Appendix 3: Special Occurrences (Ecodistrict 310)

Table 1c – Other ConservationFeatures

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

Appendix 3: Special Occurrences (Ecodistrict 310)

Table 1d – Heritage Features

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

Appendix 3: Special Occurrences

Table 2: Comparison of Ecological Emphasis Classification Index by Ecosection (Within Ecodistrict and Ecoregion) Ecosections that form 2% or less of the ecodistrict and/or ecoregion area or are more than 75% converted are highlighted. The table provides a sense of how unique or uncommon an ecosection and its associated climax communities are within the ecodistrict and across the ecoregion. The EEC Index value conveys an indication of relative land use pressure on theecosection.

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS	762	0.2	1,339	0.4	56 to 63	13.8	34,403	3.1	95,529	8.7	58 to 69	3.8
IFHO	bS bF	7,827	2.1	33,483	9.0	60 to 67	8.8	31,024	2.8	33,856	3.1	51 to 59	12.8
IFKK	rS eH wP sM yB Be	4,325	1.2	4,325	1.2	54 to 59	18.1	33,575	3.1	6,223	0.6	49 to 59	12.1
IMHO	bS bF	31,282	8.5	33,483	9.0	69 to 74	0.8	121,008	11.1	33,856	3.1	60 to 69	3.4
IMRD	bS bF	347	0.1	33,483	9.0	75	0.0	3,120	0.3	33,856	3.1	53 to 64	5.8
IMSM	bS bF	565	0.2	33,483	9.0	60 to 64	14.3	9,670	0.9	33,856	3.1	50 to 55	17.4
WCDS	sM yB Be	13,706	3.7	316,852	85.6	86 to 87	1.2	34,567	3.2	518,002	47.4	73 to 76	2.8
WCHO	sM yB Be	967	0.3	316,852	85.6	62 to 64	21.4	69,678	6.4	518,002	47.4	58 to 65	8.5
WCKK	sM yB Be	5,443	1.5	316,852	85.6	81 to 83	2.9	190,197	17.4	518,002	47.4	55 to 64	7.6
WFHO	sM yB Be	1,335	0.4	316,852	85.6	59 to 64	12.7	19,086	1.7	518,002	47.4	49 to 57	14.0
WFKK	sM yB Be	34,472	9.3	316,852	85.6	59 to 65	10.5	75,788	6.9	518,002	47.4	49 to 57	12.3
WMDS	sM yB Be	129,222	34.9	316,852	85.6	79 to 81	2.3	130,519	11.9	518,002	47.4	74 to 76	2.3
WMHO	sM yB Be	20,250	5.5	316,852	85.6	65 to 71	3.5	84,128	7.7	518,002	47.4	55 to 65	5.2

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

Appendix 3: Special Occurrences

Table 2: Comparison of Ecological Emphasis Classification Index by Ecosection (Within Ecodistrict and Ecoregion) Ecosections that form 2% or less of the ecodistrict and/or ecoregion area or are more than 75% converted are highlighted. The table provides a sense of how unique or uncommon an ecosection and its associated climax communities are within the ecodistrict and across the ecoregion. The EEC Index value conveys an indication of relative land use pressure on the ecosection.

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index Ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
WMKK	sM yB Be	102,916	27.8	316,852	85.6	67 to 73	4.1	184,216	16.8	518,002	47.4	58 to 66	5.8
WMRD	sM yB Be	11,490	3.1	316,852	85.6	68 to 71	4.1	11,490	1.1	518,002	47.4	61 to 64	4.1
WMSM	sM yB Be	2,606	0.7	316,852	85.6	60 to 62	10.9	2,952	0.3	518,002	47.4	38 to 40	14.3
WTLD	wetlands	1,184	0.3	0.0	0.0	74 to 75	0.3	6,085	0.6	0	0.0	60 to 64	6.7

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
WMDS	sM yB Be	129,222	41.4	22,364	56	3,326	9	25,690	19.9	65	0.1	25,755	19.9
WMKK	sM yB Be	102,916	30.5	4,779	23	2,410	0	7,189	7.0	23	0.0	7,212	7.0
WFKK	sM yB Be	34,472	11.7	122	2	34	0	156	0.5	2	0.0	158	0.5
IMHO	bS bF	31,282	54.8	0	0	1,097	0	1,097	3.5	0	0.0	1,097	3.5
WMHO	sM yB Be	20,250	35.4	62	0	256	0	318	1.6	0	0.0	318	1.6
WCDS	sM yB Be	13,706	53.2	2,468	0	377	0	2,845	20.8	0	0.0	2,845	20.8
WMRD	sM yB Be	11,490	27.8	0	0	105	0	105	0.9	0	0.0	105	0.9
IFHO	bS bF	7,827	26.3	0	0	2	0	2	0.0	0	0.0	2	0.0
WCKK	sM yB Be	5,443	30.4	104	0	161	0	264	4.9	0	0.0	264	4.9
IFKK	rS eH wP sM yB Be	4,325	1.1	0	0	0	0	0	0.0	0	1.9	0	1.9
WMSM	sM yB Be	2,606	50.5	0	77	0	4	0	0.0	81	0.0	81	0.0
WFHO	sM yB Be	1,335	32.6	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	1,184	65.7	0	0	0	0	0	1.8	0	0.0	0	1.8
WCHO	sM yB Be	967	18.1	0	0	21	0	21	9.1	0	0.0	21	9.1
ICHO	bS	762	4.9	84	0	4	0	88	0.0	0	0.0	88	0.0
IMSM	bS bF	565	15.1	0	0	0	0	0	3.9	0	0.0	0	3.9
IMRD	bS bF	347	100.0	21	0	1	0	22	0.0	0	0.0	22	0.0
XXCB	coastal beach	25	22.1	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**368,723**		**30,003**	**158**	**7,795**	**13**	**37,798**		**172**		**37,969**	

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)
Areas under the Special Places Act	945	73	Old Forest	29,156	0
Wilderness Areas	28,862	0	Operational Non Designated Parks and Reserves	897	0
Designated Provincial Parks and Park Reserves	122	0	Designated Provincial Parks and Park Reserves	494	0
National Wildlife Management Areas	77	70	Nature Conservancy of Canada	0	4
Nature Conservancy of Canada	0	2	Nova Scotia Nature Trust	0	9
Protected Beaches	0.0	0			
Sites of Ecological Significance Under Moratorium	249	0			
National Parks and Adjuncts	20,740				

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	2,479
Utility corridors	0	379
Gravel Roads and active railways	6	1,682
Paved streets and roads collectors	10	406
Highways	15	44

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	218,906	59.1
Forest Resource	7 to 15	111,898	30.2
Mixed Rural	16 to 24	34,048	9.2
Agriculture Suburban	25 to 39	4,654	1.3
Urban	40 to 100	678	0.2
Total		**370,184**	**100.0**

Table 3: Road Index Values for Each Landscape ElementType

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Hills	312,120	3
Valley Corridors	12,564	4
Spruce Fir Hills and Hummocks	7,404	6
Spruce Pine Hummocks	30,795	2
Wetlands	1,513	4
Coastal Beach	25	54
Tolerant Mixedwood Hills	4,303	5
Total	**368,724**	**3**

*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

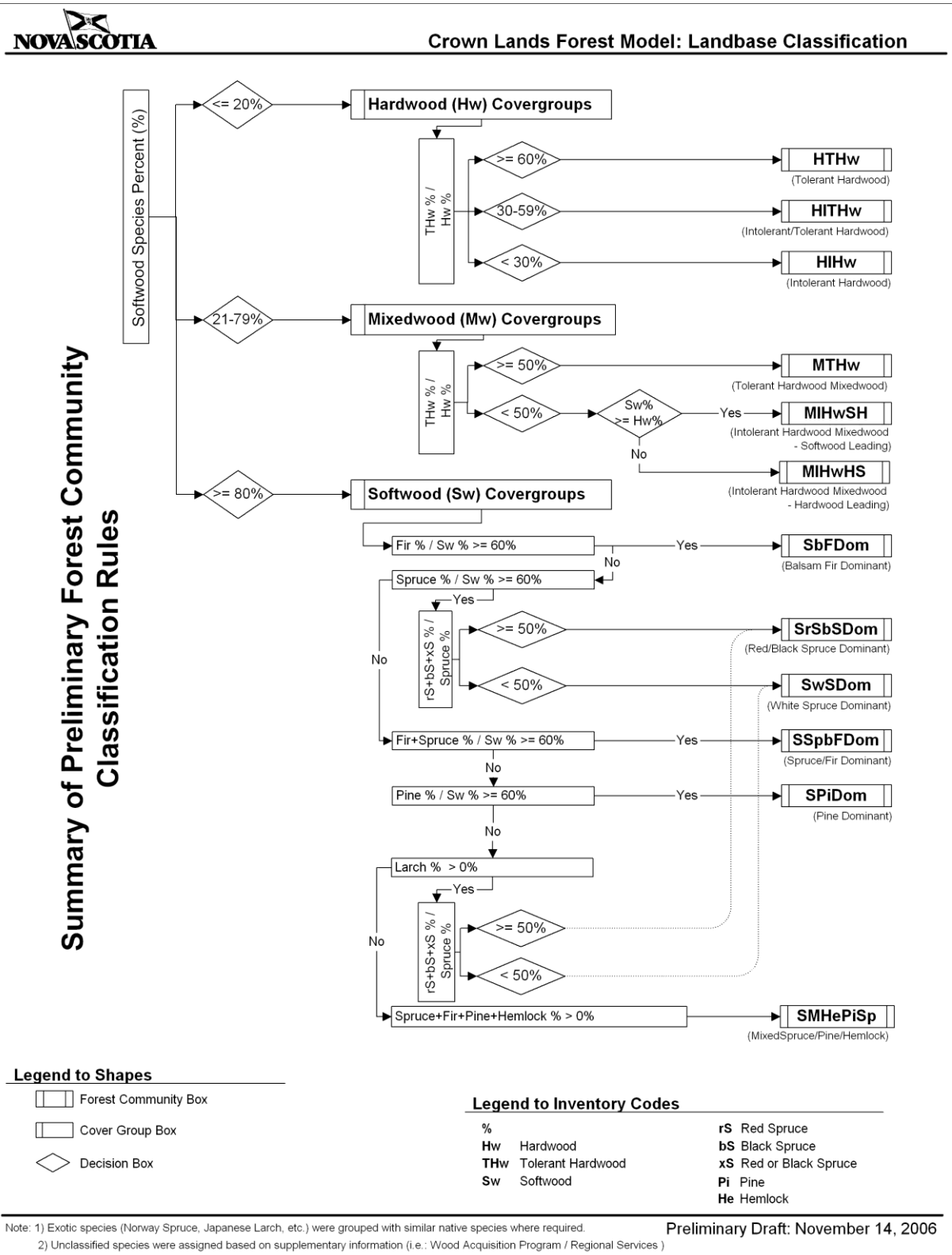
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and 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	3	4	3	3	3	4	3	3	3	3	4	4	4	4	4	4	4	3	4	3	3	3	4	4	3	4	4	3	3	3	3
RS	red spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SM	sugar maple	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
ST	striped maple	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TA	aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TH	tolerant hardwood	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TL	eastern larch	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
UC	unclassified	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WA	white ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
WB	white birch	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WE	white elm	2	2	4	2	4	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WP	white pine	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
WS	white spruce	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red&black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

A look-up table assigns each species in the forest inventory a value from 1 to 5 for its position on the successional scale.The look-up table may change by ecodistrict since climax on the coast or the Cape Breton Highlands differs from inland and lowland districts.This successional value is multiplied by the species' percent in the stand to give a stand successional score. Each stand may have up to four species, and the four percentages add to 10, so the stand successional scores range from 10 to 50. These scores are subdivided into three successional categories: 10 - 23 early, 24 - 37 mid and 38 - 50 late.

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Hills 310)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills	WMKK (32.9%) WMDS (39.0%) WFKK (10.9%) WMHO (6.4%) WMRD (3.7%) WCDS (4.0%) WMSM (0.8%) WFHO (0.4%) WCHO (0.2%) WCKK (1.7%)	Softwood	wS bS bF bS wS	Gap	7,516; 3.6	Early	1,151	1,368	1,454	466	4,439	59,325; 20.3	EARLY	27,053; 9.3
						Mid	780	1,113	943	809	3,644			
						Late	10,033	14,140	13,891	7,969	46,032			
						Uncl	5,210	0	0	0	5,210			
		Mixedwood				Early	1,208	1,356	1,915	589	5,068	87,009; 29.8	MID	95,119; 32.6
						Mid	10,660	9,141	17,540	8,082	45,423			
						Late	3,091	4,560	18,325	7,251	33,227			
						Uncl	3,292	0	0	0	3,292			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	304,167; 97.4	Early	3,007	3,088	4,889	289	11,273	132,513; 45.4	LATE	151,975; 52.0
						Mid	2,522	2,891	37,692	2,949	46,053			
						Late	219	918	69,611	1,969	72,717			
						Uncl	2,471	0	0	0	2,471			
		Unclassified				Early	5,590	68	615	0	6,273	13,283; 4.5	UNCL	17,983; 6.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	7,010	0	0	0	7,010			
Total					**312,120***	**# ha**	**56,243**	**38,642**	**166,874**	**30,372**	**292,130**			
						%	**19.3%**	**13.2%**	**57.1%**	**10.4%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Hills 310)

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	IMHO (7.4%) IFHO (6.1%) ICHO (2.6%) WCHO (4.2%) WCDS (9.6%) WMDS (59.2%) WMHO (3.1%) WMKK (2.5%) WFKK (3.2%) WFHO (3.1%)	Softwood	bS bF bS bS wS	Frequent	1,795; 15.7	Early	1,151	1,368	1,454	466	4,439	3,045; 26.7	EARLY	763; 6.7
						Mid	780	1,113	943	809	3,644			
						Late	10,033	14,140	13,891	7,969	46,032			
						Uncl	5,210	0	0	0	5,210			
		Mixedwood				Early	1,208	1,356	1,915	589	5,068	3,370; 29.5	MID	3,893; 34.1
						Mid	10,660	9,141	17,540	8,082	45,423			
						Late	3,091	4,560	18,325	7,251	33,227			
						Uncl	3,292	0	0	0	3,292			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	10,261; 81.6	Early	3,007	3,088	4,889	289	11,273	4,442; 38.9	LATE	6,109; 53.5
						Mid	2,522	2,891	37,692	2,949	46,053			
						Late	219	918	69,611	1,969	72,716			
						Uncl	2,471	0	0	0	2,471			
		Unclassified				Early	5,590	68	615	0	6,273	565; 4.9	UNCL	656; 5.7
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	7,010	0	0	0	7,010			
Total					**12,564***	**# ha**	**56,244**	**38,643**	**166,874**	**30,372**	**292,133**			
						%	**19.3%**	**13.2%**	**57.1%**	**10.4%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Hills 310)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Hummocks	IMHO (98.6%) ICHO (1.4%)	Softwood	bS bF bS	Frequent	22,548; 79.7	Early	196	68	9	51	324	13,896; 50.0	EARLY	2,592; 9.3
						Mid	124	319	165	392	999			
						Late	2,640	2,554	1,865	5,212	12,271			
						Uncl	302	0	0	0	302			
		Mixedwood				Early	92	13	9	11	124	6,179; 22.2	MID	7,418; 26.7
						Mid	1,072	405	1,561	909	3,946			
						Late	268	265	825	588	1,946			
						Uncl	163	0	0	0	163			
		Hardwood	sM yB Be sM yB Be eH wP		6,246.8; 20.3	Early	288	88	634	35	1,044	5,829; 21.0	LATE	16,352; 58.9
						Mid	219	54	2,090	109	2,472			
						Late	21	2	2,097	17	2,136			
						Uncl	176	0	0	0	176			
		Unclassified				Early	1,071	2	27	0	1,100	1,881; 6.8	UNCL	1,421; 5.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	781	0	0	0	781			
Total					**30,795***	**# ha**	**7,411**	**3,769**	**9,281**	**7,323**	**27,783**			
						%	**26.7%**	**13.6%**	**33.4%**	**26.4%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cape Breton Hills 310)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Fir Hill and Hummocks	IFHO (95.3%) IMRD (4.7%)	Softwood	bS bF	Frequent	7,404; 100.0	Early	24	32	20	10	85	3,388; 54.0	EARLY	799; 12.7
						Mid	66	52	53	49	220			
						Late	380	1,040	680	697	2,795			
						Unclass	287	0	0	0	287			
		Mixedwood				Early	83	4	0	1	87	1,448; 23.1	MID	1,687; 26.9
						Mid	477	149	311	130	1,066			
						Late	33	20	71	103	226			
						Unclass	68	0	0	0	68			
		Hardwood				Early	41	21	108	14	184	823; 13.1	LATE	3,253; 51.9
						Mid	242	3	145	11	401			
						Late	0	0	229	3	232			
						Unclass	6	0	0	0	6			
		Unclassified				Early	443	0	0	0	443	615; 9.8	UNCL	534; 8.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	173	0	0	0	173			
Total					**7,404***	**# ha**	**2,322**	**1,320**	**1,616**	**1,016**	**6,273**			
						%	**37.0%**	**21.0%**	**25.8%**	**16.2%**	**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 Hills 310)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Hills	IFKK (100.0%)	Softwood				Early	51	5	51	6	113	1,141; 32.7	EARLY	342; 9.8
						Mid	75	35	25	40	175			
						Late	231	158	236	66	690			
						Uncl	163	0	0	0	163			
		Mixedwood	rS eH wP sM yB Be	Infrequent	4,303; 100.0	Early	40	1	1	0	42	1,402; 40.2	MID	1,254; 35.9
						Mid	273	186	332	82	872			
						Late	35	24	336	30	425			
						Uncl	62	0	0	0	62			
		Hardwood				Early	39	35	64	1	139	809; 23.2	LATE	1,560; 44.7
						Mid	7	13	187	0	206			
						Late	0	0	445	0	445			
						Uncl	19	0	0	0	19			
		Unclassified				Early	34	0	15	0	49	139; 4.0	UNCL	335; 9.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	91	0	0	0	91			
Total					**4,303***	**# ha**	**1,119**	**455**	**1,691**	**225**	**3,491**			
						%	**32.0%**	**13.0%**	**48.5%**	**6.5%**	**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 (Cape Breton Hills 310)

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 (78.2%) IMSM (21.8%)	Softwood	bS bS bF	None Frequent	757; 50.0	Early	0	0	1	1	2	449; 66.1	EARLY	35; 5.1
						Mid	7	14	8	7	36			
						Late	37	127	50	184	398			
						Uncl	13	0	0	0	13			
		Mixedwood				Early	0	0	0	0	0	124; 18.2	MID	149; 22.0
						Mid	22	10	36	13	81			
						Late	9	12	10	9	39			
						Uncl	3	0	0	0	3			
		Hardwood				Early	13	2	5	0	19	83; 12.3	LATE	463; 68.2
						Mid	3	0	27	2	32			
						Late	2	0	24	0	26			
						Uncl	6	0	0	0	6			
		Unclassified				Early	14	0	0	0	14	23; 3.4	UNCL	32; 4.7
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	10	0	0	0	10			
Total					**1,513***	**# ha**	**139**	**165**	**161**	**215**	**679**			
						%	**20.4%**	**24.2%**	**23.7%**	**31.7%**	**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 2: Composition of Forest Communities (in Cape Breton Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WCHO WCKK WFHO WFKK WMDS WMHO WMKK WMRD WMSM WCDS	Gap	rS eH wP sM yB Be sM yB Be	S	SwSDom	18,687	6.7%	E	**Well-drained** Early VTs: rM, wB, tA, bF Mid VTs: rM, wA, yB Late VTs: sM, yB, Be **Moist** Early-Mid VTs: bF, rM, wB, tA Late VTs: bF, wS, yB, rM, rS, eH **Poorly Drained** Early-Late VTs: bS, tL, rM **Old Fields** Early VTs: wS, tL, bF
				S	SrSbSDom	17,175	6.2%	M/L	
				S	SbFDom	15,295	5.5%	L	
				S	SSpbFDom	7,739	2.8%	L	
				S	SMHePiSp	376	0.1%	L	
				S	SPiDom	53	0.0%	M/L	
				M	MIHwSH	34,032	12.2%	E/M	
				M	MIHwHS	31,707	11.4%	E/M	
				M	MTHw	21,270	7.6%	L	
				H	HTHw	76,292	27.4%	L	
				H	HITHw	28,208	10.1%	M/L	
				H	HIHw	28,014	10.0%	E/M	
Total						**278,847**	**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 Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Hummocks	ICHO IMHO	Frequent Frequent	bS bF bS bF	S	SrSbSDom	8,087	31.2%	M/L	**Well-drained** Early - Mid VTs: rM, wB, bF Late VTs: bF, wS **Moist** Early-Mid VTs: rM, wB, gB, pCh Late VTs: bS, wP **Poorly Drained** Early-Late VTs: bS, tL, rM
				S	SSpbFDom	2,906	11.2%	L	
				S	SbFDom	2,262	8.7%	L	
				S	SwSDom	613	2.4%	E	
				S	SPiDom	20	0.1%	M/L	
				S	SMHePiSp	7	0.0%	L	
				M	MIHwSH	3,346	12.9%	E/M	
				M	MIHwHS	2,156	8.3%	E/M	
				M	MTHw	676	2.6%	L	
				H	HTHw	2,290	8.8%	L	
				H	HIHw	2,175	8.4%	E/M	
				H	HITHw	1,364	5.3%	M/L	
Total						**25,902**	**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 Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Fir Hills and Hummocks	IFHO IMRD	Frequent Frequent	bS bF bS bF	S	SrSbSDom	2,541	44.9%	M/L	**Well-drained** Early - Mid VTs: rM, wB, tA, bF, gB, pCh Late VTs: bF, wS **Moist** Early-Mid VTs: rM, wB, tA, gB, pCh, tL, bF Late VTs: bS, bF **Poorly Drained** Early-Late VTs: bS, tL, rM
				S	SSpbFDom	286	5.1%	L	
				S	SbFDom	280	4.9%	L	
				S	SwSDom	274	4.8%	E	
				S	SMHePiSp	8	0.1%	L	
				M	MIHwSH	753	13.3%	E/M	
				M	MIHwHS	637	11.3%	E/M	
				M	MTHw	57	1.0%	L	
				H	HIHw	479	8.5%	E/M	
				H	HTHw	248	4.4%	L	
				H	HITHw	96	1.7%	M/L	
Total						**5,659**	**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 Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Hills	IFKK	Infrequent	rS eH wP sM yB Be	S	SrSbSDom	595	17.8%	M/L	**Well-drained** Early VTs: rM, wB, gB, tA, bF Mid VTs: rM, wA, yB Late VTs: sM, yB, Be **Moist** Early-Mid VTs: bF, rM, wB, gB, tA Late VTs: bF, wS, yB, rM, wA **Poorly Drained** Early-Late VTs: bS, tL, rM **Old Fields** Early VTs: wS, tL, bF
				S	SwSDom	207	6.2%	E	
				S	SSpbFDom	187	5.6%	L	
				S	SbFDom	148	4.4%	L	
				S	SPiDom	3	0.1%	M/L	
				M	MIHwSH	693	20.7%	E/M	
				M	MIHwHS	539	16.1%	E/M	
				M	MTHw	171	5.1%	L	
				H	HTHw	478	14.3%	L	
				H	HIHw	172	5.1%	E/M	
				H	HITHw	159	4.7%	M/L	
Total						**3,352**	**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	ICHO IFHO IMHO IMSM WCHO WCKK WFHO WFKK WMDS WMHO WMKK XXWA	Frequent Frequent Frequent Frequent Gap Gap Gap Gap Gap Gap Gap None	bS bS bF bS bF bS bF sM yB Be sM yB Be sM yB Be sM yB Be sM yB Be sM yB Be sM yB Be None	S	SrSbSDom	1,197	11.8%	M/L	**Well-drained** Early VTs: rM, wB, gB, pCh, tA, bF Mid VTs: rM, wA, yB Late VTs: sM, yB, Be **Moist** Early-Mid VTs: bF, rM, wB, tA Late VTs: bF, wS, yB, rM, wA, rS, eH **Poorly Drained** Early-Late VTs: bS, tL, rM **Old Fields** Early VTs: wS, tL, bF
				S	SbFDom	1,106	10.9%	L	
				S	SSpbFDom	439	4.3%	L	
				S	SwSDom	279	2.8%	E	
				S	SMHePiSp	16	0.2%	E/M	
				S	SPiDom	8	0.1%	E/M	
				M	MIHwHS	1,277	12.6%	L	
				M	MIHwSH	1,131	11.2%	L	
				M	MTHw	963	9.5%	E/M	
				H	HTHw	2,305	22.8%	M/L	
				H	HIHw	1,400	13.8%	M/L	
Total						**10,121**	**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 Hills 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	Frequent Open Seral	bS bF rM tL	S	SrSbSDom	288	43.8%	M/L	**Moist** Early-Mid VTs: bF, rM, wB, tA Late VTs: bS, bF, rM **Poorly Drained** Early-Late VTs: bS, tL, rM
				S	SSpbFDom	86	13.1%	L	
				S	SbFDom	54	8.2%	L	
				S	SwSDom	21	3.2%	E	
				M	MIHwSH	60	9.1%	E/M	
				M	MIHwHS	58	8.8%	E/M	
				M	MTHw	6	0.9%	L	
				H	HTHw	38	5.8%	E/M	
				H	HIHw	30	4.6%	L	
				H	HITHw	16	2.4%	M/L	
Total						**657**	**100.0%**		

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

Appendix 10:

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

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
sM yB Be	316,852	85.6%	518,002	47.4%
bS bF	33,483	9.0%	33,856	3.1%
1rS eH wP sM yB Be	4,325	1.2%	6,223	0.6%
sM yB Be eH wP	4,195	1.1%	4,195	0.4%
bS wS	4,050	1.1%	10,818	1.0%
wS bS bF	3,581	1.0%	3,581	0.3%
bS	1,339	0.4%	95,529	8.7%
Total	**367,824**	**99.4%***	**672,204**	**61.5%****

*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	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Hills	291,334	51,491	199,496	3,502	12,716	24,129	208,021 to 220,086	71 to 76
Spruce Pine Hummocks	30,226	1,097	25,087	1,037	284	2,721	20,851 to 22,212	69 to 73
Spruce Fir Hills and Hummocks	7,130	2	5,259	157	661	1,051	4,249 to 4,774	60 to 67
Valley Corridors	12,250	6,069	5,396	32	426	328	10,206 to 10,370	83 to 85
Wetlands	1,491	42	1,361	6	26	57	1,078 to 1,107	72 to 74
Coastal Beach	25	0	13	0	11	0	10	40
Total	**342,456**	**58,701**	**236,612**	**4,733**	**14,123**	**28,286**	**246,654 to 260,992**	**71 to 75**

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

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

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

EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
ICHO	744	0	528	24	105	86	424 to 467	56 to 63
IFHO	7,500	2	5,554	161	692	1,091	4,481 to 5,026	60 to 67
IFKK	4,146	81	2,688	206	782	389	2,246 to 2,440	54 to 59
IMHO	30,696	1,097	25,620	1,019	241	2,720	21,246 to 22,607	69 to 74
IMRD	347	0	347	0	0	0	260 to 261	75
IMSM	546	22	390	5	81	49	328 to 352	60 to 64
WCDS	13,389	7,079	5,742	0	159	408	11,488 to 11,692	86 to 87
WCHO	896	248	404	3	207	35	560 to 577	62 to 64
WCKK	5,147	2,185	2,562	2	157	241	4,167 to 4,287	81 to 83
WFHO	1,265	0	938	14	170	143	743 to 815	59 to 64
WFKK	31,495	158	22,744	839	3,625	4,130	18,458 to 20,522	59 to 65
WMDS	121,577	40,110	72,898	700	2,954	4,916	96,187 to 98,645	79 to 81
WMHO	19,570	385	15,610	590	708	2,278	12,809 to 13,949	65 to 71
WMKK	96,078	7,289	71,763	1,250	4,248	11,529	64,306 to 70070	67 to 73
WMRD	10,271	105	9,012	114	473	567	7,034 to 7,318	68 to 71
WMSM	1,718	0	1,356	10	283	68	1,037 to 1,071	60 to 62
WTLD	1,169	21	1,116	4	3	25	865 to 878	74 to 75
XXCB	25	0	13	0	11	0	10	40
Total	**346,580**	**58,782**	**239,285**	**4,939**	**14,899**	**28,675**	**246,639 to 260,977**	**71 to 75**

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

Appendix 13:

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

Aspect	The direction of a downhill slope expressed in degrees or as a compass point.
Atlantic Coastal Plain Flora (ACPF)	A group of 90 species of taxonomically unrelated wetland plants that inhabit lake and river shores, bogs, fens, and estuaries and which are found primarily in southwestern Nova Scotia. The distribution of this group of plants extends down the eastern coast of the USA with isolated populations in Nova Scotia and along the Great Lakes.
Biodiversity	The diversityof plants, animals, and other living organisms, in all their forms and level of organization, including genes, species, ecosystems, and the evolutionary and functional process that link them.
Canopy	The uppermost continuous layer of branches and foliage in a stand of trees.
Climax forest community	A relatively stable and self-perpetuating forest community condition that maintains itself (more or less) until stand-level disturbance causes a return to an earlier successional stage. The final stage of natural succession for its environment.
Climax vegetation	A forest or non-forest community that represents the final stage of natural succession for its environment.
Coarse filter approach	A habitat-based approach to conserving biodiversity by maintaining a natural diversity of structures within stands, and representation of ecosystems across landscapes. The intent is to meet the habitat requirements of most native species over time. Usually combined with a fine filter approach to conserve specific rare species and ecosystems.
Coarse Woody Debris (CWD)	Dead tree stems greater than 7.5 centimetres in diameter and laying horizontally at 45 degrees or less. Provides habitat for many species and is a source of nutrients for soil development.
Commercial thinning	Silviculture treatment that “thins” out an overstocked stand by removing trees that are large enough to be sold as products, such as poles or fence posts. This treatment is carried out to improve the health and growth rate of the remaining crop trees.

Composition	The proportion of biological components within a specified unit such as a stand or landscape: **Stand or Species Composition.** The proportion of each plant species in a community or stand. May be expressed as a percentage of the total number, basal area, or volume of all species in that community. **Landscape Composition.** The proportion of each community type within a landscape. Community type may be defined by vegetation type, covertype, seral stage, or development class (age).
Connectivity	The way a landscape enables or impedes movement of resources, such as water and animals.
Converted	Lands removed from a natural state (e.g. forest) and changed to other uses (e.g. agriculture, urban, settlement, road).
Corridor	Corridors are natural linear communities or elements, such as river valleys, that link parts of the ecodistrict. They are a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.
Crown land and Provincial Crown land	Used in the Ecological Landscape Analysis to include all land under the administration and control of the Minister of Natural Resources under the Forests Act, Section 3; as well as the lands under the administration and control of the Minister of Environment under the Wilderness Areas Protection Act. Also includes Federal Parks in the accounting of protected area representation.
Covertype	Refers to the relative percentage of softwood versus hardwood species in the overstory of a stand. In this guide, covertype classes are: **Softwood:** softwood species compose 75% or more of overstory **Hardwood:** hardwood species compose 75% or more of overstory **Mixedwood:** softwood species composition is between 25% and 75%
Development class	The description of the structure of forests as they age and grow (e.g. establishment forest, young forest, mature forest, multi-aged / old forest).
Disturbance	An event, either natural or human-induced, that causes a change in the existing condition of an ecological system.
Ecodistrict	The third of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecoregions. Characterized by distinctive assemblages of relief, geology, landform, and vegetation. Used to define the landscape unit for these Ecological Landscape Analysis reports.

Ecological land classification	A classification of lands from an ecological perspective based on factors such as climate, physiography, and site conditions. The Ecological Land Classification for Nova Scotia Volume 1 delineates ecosystems at five hierarchical scales: ecozone, ecoregion, ecodistrict, ecosection, and ecosite.
Ecological integrity	The quality of a natural unmanaged or managed ecosystem in which the natural ecological processes are sustained, with genetic, species, and ecosystem diversity assured for the future.
Ecoregion	The second level of the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecozone. Used to characterize distinctive regional climate as expressed by vegetation. There are nine ecoregions identified in Nova Scotia.
Ecosection	The fourth of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecodistricts. An ecological land unit with a repeating pattern of landform, soils, and vegetation throughout an ecodistrict.
Ecosite	The fifth of five levels in the Ecological Land Classification for Nova Scotia Volume 1, and a subdivision of ecosections. Characterized by conditions of soil moisture and nutrient regimes. Although not mapped, the Acadian and Maritime Boreal ecosites of the province are fully described in the Forest Ecosystem Classification for Nova Scotia (2010).
Ecosystem	A functional unit consisting of all the living organisms (plants, animals, and microbes) in a given area, and all the non-living physical and chemical factors of their environment, linked together through nutrient cycling and energy flow. An ecosystem can be of any size – a log, pond, field, forest, or the earth's biosphere – but it always functions as a whole unit. Ecosystems are commonly described according to the major type of vegetation, such as a forest ecosystem, old-growth ecosystem, or range ecosystem. Can also refer to units mapped in the DNR Ecological Land Classification system.
Ecozone	The first of five levels in the Ecological Land Classification for Nova Scotia Volume 1. Ecozones are continental ecosystems characterized by the interactions of macroclimate, soils, geographic and physiographic features. The entire province is contained within the Acadian ecozone, one of 15 terrestrial ecozones in Canada.
Edge effect	Habitat conditions (such as degree of humidity and exposure to light or wind) created at or near the more-or-less well-defined boundary between ecosystems, as, for example, between open areas and adjacent forest.

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

Gap replacement	An absence of stand-initiating disturbances supports the development of a dominant overstory that is sustained through dynamic processes of canopy gap formation, understory development, and overstory recruitment. Gap formation ranges from individual tree mortality to periodic gap formation events that are rarely of a stand-initiating intensity.
Habitat	The place where an organism lives and/or the conditions of that environment including the soil, vegetation, water, and food.
Infrequent stand initiating	The time between stand-initiating disturbances is usually longer than the average longevity of dominant species, thereby supporting processes of canopy gap formation and understory development in mature forests.
Inherent conditions	Refers to the natural condition of ecosystems based on their enduring physical features. This is the potential condition expected in the absence of human influence.
Integrated Resource Management (IRM)	A decision-making process whereby all resources are identified, assessed, and compared before land use or resource management decisions are made. The decisions themselves, whether to approve a plan or carry out an action on the ground, may be either multiple or single use in a given area. The application of integrated resource management results in a regional mosaic of land uses and resource priorities which reflect the optimal allocation and scheduling of resource uses.
Intensive land use	Lands managed intensively to optimize resource production from sites maintained in a forested state.
Land capability (LC)	LC values represent the maximum potential stand productivity (m^3/ha/yr) under natural conditions.
Landform	A landscape unit that denotes origin and shape, such as a floodplain, river terrace, or drumlin.
Landscape	An expanse of natural area, comprising landforms, land cover, habitats, and natural and human-made features that, taken together, form a composite. May range in scale from a few hectares to large tracts of many square kilometres in extent.
Long range management frameworks	A strategic, integrated resource plan at the subregional level. It is based on the principles of enhanced public involvement, consideration of all resource uses and values, consensus-based decision making, and resource sustainability.

Matrix	A widespread vegetation forest community which dominates the landscape and forms the background in which other smaller scale communities (patches) occur. The most connected or continuous vegetation type within the landscape, typically the dominant element. (Matrix is a fundamental feature of the “matrix, patch, corridor” concept of landscape structure).
Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old growth. Mature forests include multi-aged and old growth. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes, and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old growth.
Memorandum of understanding (MOU)	An agreement between ministers defining the roles and responsibilities of each ministry in relation to the other or others with respect to an issue over which the ministers have concurrent jurisdiction.
Mixed stand	A stand composed of two or more tree species.
Multiple use	A system of resource use where the resources in a given land unit serve more than one user.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.

Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand-initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand-initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand-initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.

Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.
Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)
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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