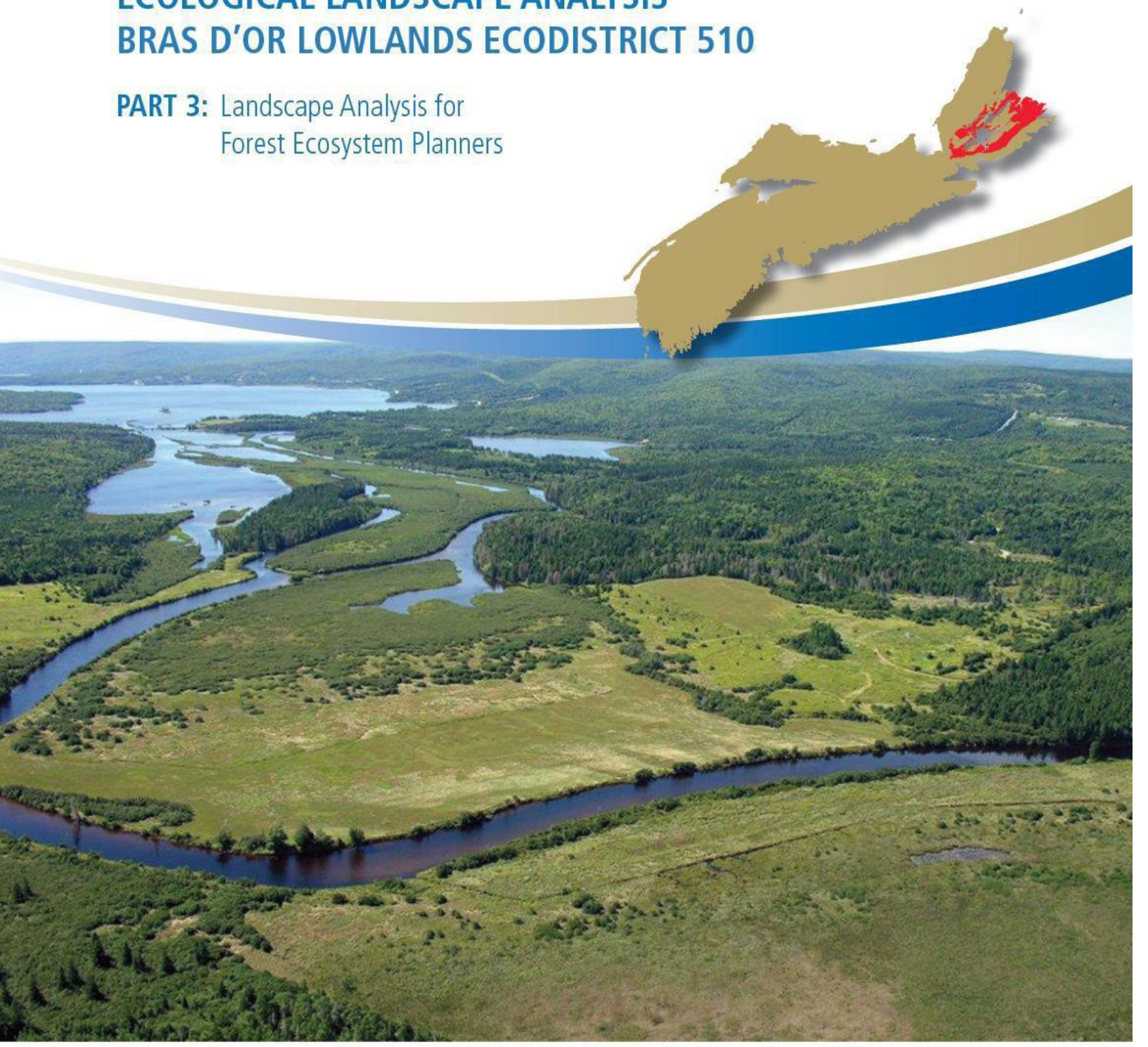
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS
BRAS D'OR LOWLANDS ECODISTRICT 510

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-510

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 510: Bras d'Or Lowlands

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

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Bras d'Or Lowlands Ecodistrict.

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (1997 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 Bras d'Or Lowlands 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).

The matrix **Tolerant Hardwood Drumlins and Hummocks** element, representing more than half of the ecodistrict's area, naturally supports shade-tolerant forests of long-lived species, such as sugar maple, yellow birch, and beech. The current forest has been strongly influenced by human settlement, abandonment of marginal agricultural land, considerable forestry activity, and an extensive history of fire. This has resulted in more softwood and mixedwood stands of early to mid- successional species, such as trembling aspen, red maple, grey and white birch.

Spruce Pine Hummocks is the largest patch element, representing more than one-third of the ecodistrict. Black spruce, balsam fire, white spruce, and white pine are the most common species. The other patch elements, in order of size, are **Wetlands**, **Spruce Pine Flats**, **Salt Marsh**, and **Coastal Beach**.

In **Valley Corridors,** a linear element, a total of 13 corridors have been identified, all associated with rivers or smaller stream systems.

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: humans, water, deer, anadromous fish, aquatic furbearers, reptiles and amphibians, migratory birds, and goshawk.

There is a natural percolation or movement throughout the ecodistrict, but more specific locations of the flow phenomena are shown in Map 2. One of the more well-defined flows is the natural migration of anadromous fish – that migrate upriver from the sea the sea to spawn – through the many rivers and streams found in this ecodistrict. Flows of migratory birds along the coastlines of the Atlantic Ocean and Bras d'Or Lake are also major flow components of the ecodistrict.

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)

River corridors promote connectivity.

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

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

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

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

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

Overall, the Bras d'Or Lowlands Ecodistrict is dominated by a forest that has been somewhat altered by human intervention, but is still a reasonable representation of forest communities. In the eastern portion of the ecodistrict, the forest has been altered much more than in the western end, mainly due to heavy settlement in the mid to late 1800s and industrial development, especially in the Sydney coalfield. As such, the connective structure of the ecodistrict, and the movement it supports, appears to be in relatively good shape to sustain most connective functions necessary for biodiversity.

The forest bordering the Mira River corridor has been altered to some extent by settlement and farming, but still exhibits some of the characteristics of the tolerant hardwood matrix, especially

where the clearing of the land for farming was somewhat deterred due to hilly ground. Such alterations of the forest may serve as a barrier to the movement of some species.

The transportation systems in this ecodistrict, as well as the Mira River corridor, may also form barriers to some species that may wish to move across the corridor.

Opportunities to improve landscape connectivity include:

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

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

The hydrological system provides the most obvious physical connection between the Cape Breton Coastal Ecodistrict 810 and the Bras d'Or Lowlands Ecodistrict 510. River Inhabitants, Grand River, and the Mira River all provide linkages between these two ecodistricts.

As well, River Inhabitants, Baddeck River, and River Denys provide linkages between the Cape Breton Hills Ecodistrict 310 and Bras d'Or Lowlands. Many smaller streams connect this ecodistrict with its neighbours and there are numerous lakes located along the edge of the boundaries that also serve as links.

The main corridors in the ecodistrict are the upper reaches of Grand River to Loch Lomond and a corridor from the headwaters of the Mira River east along the river to the Atlantic Ocean as well as River Inhabitants, River Denys, and Baddeck River.

Stretching from east to west, the Salmon River Valley provides a corridor linking Sydney River and Bras d'Or Lake at East Bay.

There is a strong tidal influence at the mouth of the Mira River corridor. Anadromous fish, and to a large extent, aquatic furbearers, including beaver, otter, mink, and muskrat, are tied to river and lake drainages that generally flow from north to south from the Bras d'Or Lowlands Ecodistrict into the Cape Breton Coastal Ecodistrict.

There are also numerous rivers and streams that flow from Cape Breton Hills and drain through this ecodistrict as well.

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

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

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

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

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

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

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

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

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

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

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

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

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

- softwood (overstory cover of softwood species is 75% or more)

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

Target Ranges for Composition Indicators

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

A full description of definitions and mapping of Nova Scotia's disturbance regimes is contained in the report "Mapping Nova Scotia's Natural Disturbance Regimes" available from the DNR website (http://novascotia.ca/natr/library/forestry/reports/NDRreport3.pdf).

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Bras d'Or Lowlands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Pine Flats	OW2, SP10 (FP4, FP6)	15.0	SH9, SP6, SP8 (FP3)	37.0	SP5, **SP7** (**FP1**)	43.0
Spruce Pine Hummocks	IH1, IH4, IH6, OW2, SP10	22.0	SH9, SP4, SP6, SP8	37.0	**SP5**, SP7	31.0
Tolerant Hardwood Drumlins and Hummocks	IH3, IH6	27.0	IH7, TH7	37.0	TH1, TH2, TH3, TH4, TH5, **TH8**	25.0
Salt Marsh	Grasslands of *Spartina spp.*					
Coastal Beach	Beach grass, Bayberry, Rose spp., White spruce					
Wetlands	WC1, WC2, WC6, WC7, WD1, WD2, WD3, WD5, WD6, WD7					

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.

Bras d'Or Lowlands is generally rural in nature with light to moderate intensity of land use. The overall EEI is 58 to 63 (Appendices 12a and 12b). However, the eastern end of the ecodistrict is much more urbanized and has more industrial development, especially in the Sydney coalfield. A pattern of more intense use of the land for both farming and industrial use has resulted in more altered forest conditions.

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.

Appendix 7 and Map 5 depict the road index statistics for the Bras d'Or Lowlands Ecodistrict.

Forest Resource is the dominant RI class at 35%, followed by Remote at 31%, Mixed Rural at 23%, Agriculture Suburban at 9%, and Urban at 2%.

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

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

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

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

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

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

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

Species at Risk

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

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

A second system commonly used is NatureServe Conservation Data Centre system. This system uses numbers from 1 (extremely) to 5 (widespread, abundant) to denote the relative rarity and conservation concern for species. At the provincial scale numbers are prefixed with "S" to indicate that this is a state/provincial level rank. Ranks at the National (N) and Global (G) levels are also available for all species. In Nova Scotia, the Atlantic Canada Conservation Data Centre (http://www.accdc.com/) works with partners to provide ranks and data on species' occurrence.

Old Forest

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

Wildlife Habitat

Bras d'Or Lake is the dominant feature of the Bras d'Or Lowlands Ecodistrict. Numerous smaller lakes and rivers together occupy about 3% (5,500 hectares) of the total area of the ecodistrict (279,300 hectares, or 33% of the ecoregion). Wetlands, predominantly bogs and fens, also occupy a significant part of this ecodistrict, comprising a total of 24,700 hectares (9% of the area).

Wetlands are sensitive ecosystems that are often very rich in wildlife species as well as providing other important ecological functions and services. Forested wetlands, especially wooded swamps, are under-represented in the wetlands database due to difficulty in identification of these wetland types using aerial photograph interpretation. For much of the forest in the Bras d'Or Lowlands, the predicted climax species are softwoods, such as black spruce and balsam fir or tolerant hardwoods (yellow birch, sugar maple, beech). At present, about 18% of the forested land has tolerant hardwood species.

A fairly large portion of this ecodistrict has been identified as significant wildlife habitat, with 789 element occurrences recorded in DNR's significant wildlife habitats database. These include sites with unusual concentrations of wildlife, habitats used by species at risk, or habitats that are few in number in the province as defined within the policy document, Nova Scotia DNR Significant Species and Habitats Policy of 2004. In addition, the Atlantic Canada Conservation Data Centre database lists 16,506 element occurrences for Bras d'Or Lowlands. Altogether, 28 species at risk and 220 additional species of conservation concern have been documented in Bras d'Or Lowlands.

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. 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.

Healthy populations of moose (*Alces alces*) and black bear (*Ursus americanus*) occur on Cape Breton Island, including Bras d'Or Lowlands Ecodistrict 510, but are only infrequently found south of Bras d'Or Lake. The reason for the absence of established populations of these two prominent game species south of the lake is not well understood. Although native to Cape Breton, moose are thought to have been extirpated from the island before the mid-1920s. The current moose population is a result of introduction of Alberta moose to Cape Breton beginning in the 1940s.

Lynx formerly occurred in areas of suitable habitat across mainland Nova Scotia and Cape Breton Island. The current population is very small. Although lynx may be found, from time to time, almost anywhere on Cape Breton Island, lynx reaches its highest densities in the Cape Breton Highlands. Lynx is also more common in upland areas such as Boisdale Hills, East Bay Hills, and the South Mountain area of Richmond County, based on verified reports and trapper by-catch.

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 into adjoining lowland areas including the Bras d'Or Lowlands. However, verified reports of lynx and other data collected by DNR indicate lynx persist in some areas of Cape Breton throughout the hare cycle. Historic and current threats to lynx include forest harvesting, competition from bobcats and coyotes, habitat loss to development, disease, and climate change.

American marten is a small carnivore of temperate and boreal forests which feeds primarily on red squirrel, small mammals such as mice and voles, as well snowshoe hare. The Cape Breton population of marten is very small and there has been extensive loss and degradation of suitable habitat. Marten were trapped extensively throughout Nova Scotia since the 1700s until the season was closed in the early 1900s due to low numbers.

Marten was thought to have been extirpated from the mainland and several re-introductions were attempted in the past. There have been recent records of marten in Southwest Nova Scotia. However, the status of the marten on the mainland is considered "data deficient." Historically known in Cape Breton only from the highlands, a marten population augmentation program was conducted between 2007 and 2010 when 135 marten from New Brunswick were released into Cape Breton. If the population responds as expected, marten should become more common throughout lowland Cape Breton.

Bras d'Or Lowlands has historically supported a healthy population of white-tailed deer which permits an annual harvest for recreation and food. Population levels of deer here fluctuate due to differential survivorship and productivity among years largely due to winter severity (snow depth and persistence).

Harsher winters in Cape Breton cause deer to concentrate in areas of mature softwood cover to shelter from deep snow. There are 75 deer wintering areas (DWAs) identified in the ecodistrict. Deer wintering areas in Ecodistrict 510 are typically situated on sheltered slopes with close juxtaposition of good cover stands of mature conifers and hardwood browse for winter feed. With a few notable exceptions, DWAs are small and isolated and often include south-facing slopes along watercourses.

Some DWAs comprise, at least in part, old field white spruce stands which have developed on abandoned farm fields. However, over the past two decades in particular, these stands are fast disappearing from the landscape due to harvesting of mature stands. More recently, spruce bark beetle damage to white spruce is taking a heavy toll on these cover stands.

The juxtaposition of good softwood cover stands in close proximity to woody browse generally defines the areas where deer will concentrate in winter. Deer move to cover stands along defined trails established throughout the area which are used consistently from year to year. Deer activity in DWAs is modified from year to year depending on snow accumulation, with movement becoming more restricted during deep snow conditions.

As softwood stands mature and begin to break up to create small openings of wind-thrown trees, deer are attracted to these areas in winter to feed on lichens including old man's beard (*Usnea spp.)*,

as well as woody browse and other plants. Established deer trails through decadent softwood stands are often modified only slightly over time to take advantage of remaining cover afforded by the trees remaining standing, but with the essential route of the trail remaining unchanged. Forest harvesting and silviculture, if properly managed, can maintain high habitat values for deer.

In some parts of the ecodistrict, deer migrate off the adjacent hills to winter in sites with suitable softwood and mixedwood cover stands that provide good protection from snow accumulation. Under these conditions, some of the largest deer DWAs occur, most notably in Inverness and Victoria counties. These include four larger DWAs located in the River Inhabitants area (Long Stretch Road DWA, MacIntyre Lake DWA, Glenora DWA, and Dowlings Brook DWA) as well as three other DWAs located in the River Denys area (Eden Deer Yard, Seal Cove DWA, and Southside River Denys DWA). In addition, there are several fairly large DWAs along the north shore of Bras d'Or Lake from Whycocomagh to Baddeck where deer congregate at lower elevations during winter. In deep snow conditions, deer may migrate for considerable distances to winter in these areas.

Several gypsum caves are potentially bat hibernating areas but few sites have been verified. Many bat records in the significant habitats and species database are unconfirmed. Recent investigations of summer bat roosts in Cape Breton have shown that large maternity colonies of two to three hundred bats are fairly common in Ecodistrict 510 at this time. However, in 2014, white-nose bat syndrome was first documented for little brown bat in Cape Breton and is expected to result in severe population declines for this and other species. Among other small mammals found in Bras d'Or Lowlands, the long-tailed shrew *(Sorex dispar)* is considered sensitive to human disturbance and so yellow-listed for Nova Scotia.

Birds

The Bras d'Or Lowlands Ecodistrict has more nesting eagles than any other ecodistrict in the province, with 216 nesting areas recorded over the years by DNR staff. Surveys by DNR in 2013 documented 150 nests in the annual eagle survey, most of which are located in the Bras d'Or Lowlands. Of these, at least 104 nests were active in 2013. Eagle nests are occasionally taken over by great horned owls or ospreys which are incidentally recorded during annual surveys.

Because eagles in Cape Breton feed mostly on fish during the nesting season, most eagle nests are located in close proximity to coastal water, though some inland waterways are also used. Nests are typically situated in large "super-canopy" trees, often along steep valleys and often associated with a stream. White pine is the most common tree species used by eagles for nesting although other species of either coniferous trees (e.g. spruce) or deciduous trees (e.g. red maple) are also used. Although a nest may be abandoned over time as individual trees become decadent, the nesting pair will usually re-locate to an adjacent tree when the old nest becomes unusable. Eagles tend to return to the same forest stands to nest year after year as long as suitable nest trees and other habitat requisites are met.

While nesting eagles are sensitive to forest harvesting and other disturbance during the nesting season, they will tolerate significant disturbance as long as it is part of the normal cadence of activity in the area. New or unusual activity, however, may cause a nest to be abandoned. The

dependence of eagles on suitable stands of nest trees may be locally limiting to nesting eagles in the Bras d'Or Lowlands as forest harvesting and land clearing occurs.

Among the forest raptors which occur in the ecodistrict, goshawk (*Accipiter gentilis*) is one of the species most sensitive to forest harvesting, silviculture, and other developments. For this reason, goshawk is yellow-listed by the DNR. Goshawk occurs throughout the ecodistrict and nests in mature mixedwood and hardwood stands.

Because its main prey is snowshoe hare, goshawk generally nest in mature hardwood or mixedwood stands which are interspersed with younger stands which make good hare habitat. Although populations appear to fluctuate depending on abundance of snowshoe hare, forest stands suitable for nesting may also be a limiting factor for this species locally.

Most gowhawk nests in Bras d'Or Lowlands occur in yellow birch trees though other species and occasionally even softwoods are used. Nests are commonly encountered during forest harvesting operations and sometimes reported to DNR. This usually occurs during the nesting season when the birds make their presence known. Other nests may go unreported or unnoticed, especially outside of the nesting season when the birds are absent. Proactive conservation for this species involves surveys of potential nesting areas prior to commencement of forest harvesting operations or other disturbance.

Other common forest nesting raptors in the Bras d'Or Lowlands include ospreys, hawks, and owls. Ospreys, which feed almost exclusively on fish, nest in softwood trees along sheltered coastal areas of the Bras d'Or Lake and the Atlantic coast (including coastal islands), and occasionally on freshwater lakes. Ospreys are commonly encountered during eagle surveys and nests are incidentally recorded. A nocturnal owl survey initiated in Cape Breton in 2001 has shown a relatively high nesting density of several species in the Bras d'Or Lowlands, including great horned owl, barred owl, and northern saw-whet owl.

The coastal areas and offshore islands of Bras d'Or Lowlands Ecodistrict 510 are important habitat for waterfowl, shorebirds, terns, herons, gulls, and seabirds, including many species which are colonial nesters.

Coastal islands and headlands, cliffs, wetlands, and beaches are used by a variety of birds for breeding, staging, and wintering. In winter, several sea ducks including common eider, greater scaup, scoters, and long-tailed ducks, as well as red-breasted mergansers, goldeneye, Canada geese, and dabbling ducks – most commonly black duck and mallard – frequent the coastal waters. While most sea ducks are found from Main-à-Dieu to Isle Madame, notable concentrations of other species occur in Lingan Bay, Glace Bay, Morien Bay, Mira Bay, and Mira River. Local concentrations of dabbling ducks occur at urban parks in Sydney, North Sydney, and Glace Bay, and in the Baddeck area during winter.

Big Glace Bay Lake is a federal Migratory Bird Sanctuary, which is important habitat for waterfowl, great blue herons, and shorebirds including piping plover (NESA endangered), common and arctic tern, and willet. Morien sand bar is a locally significant staging area for a number of shorebirds, including semipalmated and least sandpipers, short-billed dowitchers, both greater and lesser yellowlegs. Significant numbers of yellowlegs, willets, and terns also breed here.

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

The coastal barrens along the Atlantic shore of the Bras d'Or Lowlands, particularly at Schooner Pond and Northern Head, support large numbers of staging whimbrel and occasional nesting colonies of Leaches storm petrels. Cliffs associated with coastal headlands (particularly at Northern Head and South Head) support nesting colonies of gulls, black-legged kittiwake, black guillemot, and both double-crested and great cormorant.

The Bird Islands off Cape Dauphin (Hertford Island and Ciboux Island) comprise one of the most significant nesting areas for colonial seabirds in Nova Scotia, and in 2009 were designated a Nova Scotia Wildlife Management Area.

The Bird Islands were previously designated an Important Bird Area in 1999 because they host more than 5% of the population of great cormorants in North America. About 500 pairs of great cormorants nest on the two islands – mostly on Hertford. The islands also host significant numbers of other seabirds including razorbills, puffins, guillemots, terns, and gulls. The Bird Islands seasonally host concentrations of eagles, including young birds which prey on and scavenge among the nesting seabirds.

Great blue herons nest at several colonies in the Bras d'Or Lowlands Ecodistrict. Important feeding areas for Great Blue Heron here include Lingan Bay, Big Glace Bay Lake, and most notably Morien Bay. Loons, which typically nest on islands or emergent beds within lakes or rivers, have been recorded at 22 lakes across the ecodistrict.

Amphibians and Reptiles

Large populations of wood turtle occur at River Denys and River Inhabitants. Occasional sightings elsewhere are believed to represent formerly captive turtles which have been released, as are scattered sightings of painted turtle. However, recent findings suggest wood turtle may also be established elsewhere within Cape Breton County.

A well-established population of snapping turtle occurs at Salmon River and regular reports during egg-laying (June to July) from elsewhere in Cape Breton County suggest they are more widespread. Four-toed salamanders (NS yellow listed) have been recorded from a few locations near Baddeck and are likely more widespread than is known.

Although there may be as many as 2,500 wood turtles within River Inhabitants in Cape Breton, largely within Ecodistrict 510, information suggests that this species is declining. Like other turtles, wood turtles are of concern because even low mortality rates of adults can have serious population impacts. Threats to wood turtles in Nova Scotia include alteration and destruction of river and stream habitats and re-locations of turtles by people.

Fish

Atlantic salmon occur in at least 32 river systems in Ecodistrict 510. These and other streams and lakes provide good brook trout habitat and support runs of smelt and gaspereau. Shad are found in a few locations and both Atlantic sturgeon and lake whitefish occur in Mira River. Striped Bass are known from the Bras d'Or Lakes, particularly in East Bay, as well as the Mira River where recreational angling occurs. American eel is quite common in the Bras d'Or Lowlands and is fished commercially in the Bras d'Or Lake and elsewhere. The recent illegal introduction of chain pickerel into the Blacketts Lake/Sydney River watershed during the past decade, represents a significant threat to native species in this system.

Northern cod populations support a recreational fishery in the Bras d'Or Lake.

Freshwater Mussels

Among seven freshwater mussel species which occur in the ecodistrict, yellow lamp mussel (*Lampsillis cariosa*) is red-listed by DNR and listed threatened under the NS Endangered Species Act. Yellow lamp mussel occurs in Nova Scotia only within the Sydney River watershed at Blacketts Lake as well as nearby Pottle Lake. The current population of yellow lamp mussel is large and apparently stable, but confined to a small area. Threats are currently limited, but the very small and discontinuous range of this species in Nova Scotia makes it vulnerable to pollution and degradation of habitat. Two yellow listed species, tidewater mucket (*Leptodea ochracea*), and eastern lamp mussel (*Lampsillis radiata*) are also recorded for Bras d'Or Lowlands.

The eastern pearlshell (*Margaritifera margaritifera*), which is green-listed by the DNR, occurs most commonly in larger streams such as Salmon River, Grand River, and River Inhabitants. Green-listed species eastern elliptio (*Elliptio complanata*), alewife floater (*Anondonta implicata*), and eastern floater (*Pyganodon cataracta*) occur fairly commonly throughout the ecodistrict.

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. Among those species which have been documented for the Bras d'Or Lowlands, two species are listed S1 (extremely rare), two listed as S2 (rare), and eight are listed as S3 (uncommon).

In the Sydney area, extensive collections are available only on the Cape Breton University campus, all of which are common species. Of those species collected elsewhere in the Sydney

area, only common baskettail (*Epithica cynosura*; undetermined) recorded at Coxheath is a species of conservation concern. In the Trout Brook area near the Mira River, one species of conservation concern, oscillated darner (*Boyeria grafiana*; undetermined), has been recorded. A collection from Lake Uist in Richmond County has documented the presence of northern pygmy clubtail (*Lanthus parvulus*; S3 - uncommon) which is associated with the freshwater lake shallows.

The most extensive Odonate collections for Cape Breton are available from Inverness and Victoria counties. Fairly extensive collections were made in the McIntyres Mountain area and common baskettail has been recorded for MacIntyre Lake. Collections of Odonates are also available for the River Denys Basin from Ashfield downstream to Big Marsh and south to River Denys.

Among a large collection from Ashfield, one species of conservation concern, harlequin darner (*Gomphaeschna furcillata*; yellow) has been recorded. Harpoon clubtail (*Gomphus descriptus*; yellow) has been recorded for Big Marsh to the west. Harpoon clubtail has also been found at River Denys Centre (farther south), as well as one orange-listed (may be at risk) species, brook snaketail (*Ophiogomphus aspersus*). Moving further east along the north shore of the Bras d'Or Lake, northern pygmy clubtail (*Lanthus parvulus*; S3 uncommon) has been collected from Bucklaw.

The area of the Baddeck River basin from New Glen to Nyanza has been fairly well surveyed for Odonates. Northern pygmy clubtail has been collected at New Glen. Among an extensive collection made at North Branch Plaster Pond, one species of conservation concern Williamson's emerald (*Somatochlora williamsoni*; orange), has been recorded. Among extensive collections made in the Baddeck area, northern pygmy clubtail and forcipate emerald (*Somatochlora forcipata*; orange) have been found. Harpoon clubtail is known from Nyanza near the mouth of the Baddeck River.

Butterflies

The Maritime Butterfly Atlas has been ongoing since 2010 and the last year of data collection will be 2014. These efforts have provided a considerable amount of information on butterflies in all areas of the Maritimes. Currently there are 71 species of butterflies in Nova Scotia, many of which occur on Cape Breton. In Ecodistrict 510 there are seven species listed as S1 (extremely rare); one listed as S2 (rare), and seven listed as S3 (uncommon).

There are a number of species of conservation concern found in the Baddeck area. Two species listed as S1 (rare) which can be found here are Short-tailed swallowtail *(Papilio brevicauda*; orange; may be at risk) and arctic jutta (*Oeneis jutta*; orange). Short-tailed swallowtail is a species of salt marshes and headlands. Arctic jutta is found in a bog near Inlet Baddeck. As well, mustard white (*Pieris oleracae*: yellow) and hoary comma (*Polygonia gracilis*: yellow), are recorded from the Baddeck area, both listed as rare (S1). Hoary comma over winters as an adult and can be seen flying in April until early August. A number of species listed as S3 (uncommon) can be found near Baddeck. These include hoary elfin (*Callophrys polios*), Baltimore checkerspot (*Euphydryas phaeton*), common branded skipper (*Hesperia comma*), question mark (*Polygonia interrogationis*), and grey comma (*Polygonia progne).*

In Sydney, a yellow-listed species satyr comma (*Polygonia satyrus*; S1 - rare) can be found. This species also overwinters as an adult and as a result is an early flyer. Hoary elfin is recorded in the Glen Morrison area just west of Sydney.

Moving along the ecodistrict to the west, near Stirling in Cape Breton County, a rare species arctic fritillary (*Boloria chariclea*; yellow) is recorded. It is found in boggy areas especially where willows are found. French Cove, near St. Peter's, has a number of listed species. Monarchs (*Danaus plexippus*; species of special concern) are found here. Monarchs are a migrant species and, as a result, can be found anywhere in the province on any given year. Also at this site are Compton's tortoiseshell (*Nymphalis l-album*; S1-rare), green comma (*Polygonia faunus*; S3-uncommon), grey comma, and mustard white.

At River Denys Centre, arctic jutta is found in a small bog near the end of the Big Marsh road. Northern pearly-eye (*Enodia anthedon*; S3 - uncommon) is found near this site as well.

As data from the Maritime Butterfly Atlas are processed, more information on species distribution and abundance can be expected for the Bras d'Or Lowlands Ecodistrict.

Plants

A total of 33 NS orange listed, 52 NS yellow listed, and 15 undetermined (insufficient data to define status) plants are known from the Bras d'Or Lowlands. There are several sites which harbour notable concentrations of plant species of conservation concern but many areas have not been surveyed in recent years.

River Inhabitants floodplain includes a large wetland complex which harbours a variety of plant species at risk. Species recorded here in the Cleveland area include the orange-listed plants broad-glumed brome (*Bromus latiglumis*) and stout wood reed-grass (*Cinna arundinacea*), as well as the yellow-listed species triangular-valve dock (*Rumex salicifolius*), Canada wood nettle (*Laportea canadensis*), alder-leaved buckthorn (*Rhamus alnifolia*), and climbing false buckwheat (*Polygonum scandens*). Stalked bulrush (*Scirpus pedicellatus*), listed undetermined is also recorded from the floodplain area. False mermaidweed (*Floerkea proserpinacoides*, yellow) also occurs along the River Inhabitants intervale from Glendale and Glenora to Cleveland. Two additional yellow-listed species, northern bog violet (*Viola nephrophylla*), and pale jewelweed (*Impatiens pallida*) are also found in intervale habitat at Glenora.

River Denys intervale also harbours a number of plants of conservation concern including two orange-listed species, smooth sweet cicely (*Osmorhiza longistylis*) and Richardson's rush (*Juncus alpinoarticulatus*)), two yellow-listed species, blunt-leaved pondweed (*Potamogeton obtusifolius*) and Canada lily (*Lilium canadense*), as well as one undetermined species, three-leaved pondweed (*Stuckenia filiformis*).

Loch Lomond area is noteworthy due to the recorded presence of several orange-listed plants including shining ladies'-tresses (*Spiranthes lucida*) found along the shores of the lake as well as oval-leaved bilberry (*Vaccinium ovalifolium*), and inverted bladderwort (*Utricularia resupinata*) also recorded in the vicinity. Yellow-listed plants recorded for the area include lance-leaf

grape-fern (*Botrychium lanceolatum*), New Jersey rush (*Juncus caesariensis*), and moor rush (*Juncus stygius*). New Jersey rush is an Atlantic Coastal Plain species known in Canada only from bogs and fens in south eastern Cape Breton. These wetland sites comprise over 50% of the world's population. Although most of these sites occur within Ecodistrict 810, one site is found in the Bras d'Or Lowlands ecodistrict. Growing on the edge of bogs and fens, New Jersey rush is locally abundant at only a few locations. Land use activities that disrupt the integrity of the edge of these bogs could compromise the survival of this species

The area of the Mira River drainage is also notable for a number of records of plant species of conservation concern. These include orange-listed species few-flowered spikerush (*Eleocharis quinqueflora*) recorded at Rock Elm and oval-leaved bilberry (*Vaccinium ovalifolium*) recorded from near Mira Gut. Other plants of conservation concern from this area are Brook lobelia (*Lobelia kalmia*; orange), yellow-listed species boreal aster (*Symphyotrichum boreale*), and southern mudwort (*Limosella australis*). Wild chives (*Allium schoenoprasum*; orange) is recorded from Marion Bridge and Fernald serviceberry (*Amelanchier fernaldii*; undetermined) is recorded near MacIntyre Lake.

In the vicinity of Sydney, both prototype quillwort (*Isoetes prototypus*; yellow) and Acadian quillwort (*Isoetes acadiensis*; yellow) are recorded from Pottle Lake and area. In the Georges River drainage just to the west, two orange-listed plants, Bebb's sedge (*Carex bebbii*) and western hairy rock cress (*Arabis hirsuta*) have been recorded. Just to the south in the Johnson Lake to Ball Creek area, showy lady's slipper (*Cypripedium reginae*; orange) and three yellow listed species, Brook lobelia (*Lobellia kalmii*;), yellow lady's slipper (*Cypripedium parviflorum*;), and shite-stemmed pondweed (*Potamogeton praelongus*) have also been recorded. Further south in the Sydney River drainage, water beggarticks (*Megalodonta beckii*; yellow) and white-stemmed Pondweed (*Potamogeton praelongus*; yellow) are recorded for Blacketts Lake.

Prototype quillwort is considered a regional endemic with almost all of its global population located in Canada. The species is an aquatic perennial with very specific habitat requirements limiting its occurrence in Canada to about 12 small unconnected lakes, nine of which are in Nova Scotia. The species is found in nutrient-poor, cold, spring-fed lakes. Although several sites have been shown to contain large numbers of plants, one half of the documented sites contain small populations. A wide range of potential limiting factors could impact the species, including changes in water quality, boating, and shoreline development. Cape Breton populations are afforded some protection within the Pottle Lake watershed as this is a designated watershed under the Nova Scotia Environment Act.

Also in the Sydney area, southern mudwort (*Limosella australis*; yellow) has been recorded at Edwardsville and American false pennyroyal (*Hedeoma pulegioides*; yellow) has been found at Westmount. South across Sydney Harbour, three orange listed species, wild celery (*Vallisneria americana*), wild chives (*Allium schoenoprasum*), and Wiegand's wild rye (*Elymus wiegandii*;) are recorded at Sydney. Bulbous rush (*Juncus bulbosus*; undetermined) is recorded for the Grand Lake drainage. Oval-leaved bilberry (*Vaccinium ovalifolium*; orange) is found at several sites along the headlands from New Waterford to Donkin.

On Boularderie Island, two yellow-listed plants have been recorded including Philadelphia fleabane (*Erigeron philadelphicus*) at Groves Point and lesser rattlesnake-plantain (*Goodyera repens*) at Black Brook. Small-flowered bitter-cress (*Cardamine parviflora*; yellow) has been recorded on both of the Bird Islands off Cape Dauphine. Also on Cape Dauphine at New Campbellton, two yellow-listed plants, bog bedstraw (*Galium labradoricum*), and flat-stemmed pondweed (*Potamogeton zosteriformes*) have been found.

At the northern extreme of Ecodistrict 510, a fairly rich assemblage of plant species of conservation concern have been recorded in the Tarbotvale area within the Barrachois River drainage. Orange-listed species include showy lady's slipper (*Cypripedium reginae*) and chestnut-coloured sedge (*Carex castanea*).

Yellow-listed species found here are hyssop-leaved fleabane (*Erigeron hyssopifolius*), Robinson's hawkweed (*Hieracium robinsonii*), soapberry (*Shepherdia canadensis*), Labrador bedstraw (*Galium labradoricum*), northern commandra (*Geocaulon lividum*), and rattlesnake plantain (*Goodyera oblongifolia*). At North River just to the southwest, two yellow-listed plants, Robinson's hawkweed (*Hieracium robinsonii*) and northern birch (*Betula borealis*) are recorded.

In the Big Harbour to Plaister Mines area, several yellow-listed plants associated with gypsum outcrops have been found. These include bristle-leaved sedge (*Carex eburnea*), hyssop-leaved fleabane (*Erigeron hyssopifolius*), and soapberry (*Shepherdia canadensis*).

Baddeck River intervale hosts a rich assemblage of plants of conservation concern based on historical surveys of this area. Orange-listed plants include showy lady's slipper (*Cypripedium reginae*), few-flowered spikerush (*Eleocharis quinqueflora*), large St. John's wort (*Hypericum majus*), slender beakrush (*Rhynchospora capillacea*), and clustered sanicle (*Sanicula odorata*).

Yellow-listed plants here are downy willowherb (*Epilobium strictum*), green spleenwort (*Asplenium trichomanes-ramosum*), smooth woodsia (*Woodsia glabella*), slim-stemmed reed grass (*Calamagrostis stricta*), and white mountain saxifrage (*Saxifraga paniculata*). Thread-leaved pondweed (*Stuckenia filiformis*; undetermined) is also recorded for the area. Two additional undetermined species, pondshore knotweed (*Polygonum raii*) and salt marsh bulrush (*Schoenoplectus robustus*) were recorded at Baddeck on the Bras d'Or Lake.

Calcareous soils in the Little Narrows to Estmere area support a number of notable species. Showy lady's slipper (*Cypripedium reginae*; orange) is found at Ottawa Brook. Yellow-listed species Philadelphia fleabane (*Erigeron philadelphicus*), northern holly-fern (*Polystichum lonchitis*), and Virginia anemone (*Anemone virginiana*) are also recorded in this area. One undetermined species, thread-leaved pondweed (*Stuckenia filiformis*), is also found.

Black ash (*Fraxinus nigra*; yellow) is recorded for a few sites in Ecodistrict 510 including Malagawatch and Coxheath. Orangedale has historical records for two species, brook lobelia (*Lobelia kalmii*; orange) and alder-leaeved buckthorn (*Rhamnus alnifolia*; yellow). Whycocomagh has historical records for two species of conservation concern, Canada lily (*Lilium canadense*; yellow) and smooth sweet-cicely (*Osmorhiza longistylis*; orange).

Investigations of other flora of the Bras d'Or Lowlands have documented four yellow-listed mosses as well as two lichens.

Restricted and Limited Use Lands

Among those areas identified as Restricted and/or Limited Use Lands within Bras d' Or Lowlands are five large Indian reserves (Eskasoni, Chapel Island, Whycocomagh, Wagmatcook, and Malagawatch) as well as one smaller reserve at Caribou Marsh.

Two provincial wilderness areas (North River and Middle River Framboise) fall at least partly within the area of Ecodistrict 510 as well as the Bornish Hill Nature Reserve. One special place, Port Morien Old French coal mine, is located here as well. Bras d'Or Lowlands also features five provincial parks (Mira River, Dominion Beach, Petersfield, and Dalem Lake in Cape Breton County, and Whycocomagh in Inverness County) as well as six operation/non-designated parks and reserves. There are also six protected beaches including five in Cape Breton County and one in Victoria County. One provincial wildlife management area (Bird Islands) and one provincial game sanctuary (Spectacle Island) are located in this ecodistrict as well as one national migratory bird sanctuary at Big Glace Bay Lake.

Three designated water supply lakes (Pottle Lake, MacAskills Brook, and Landrie Lake) and five non-designated water supply areas are also found in this ecodistrict. More than 8% of the provincial Crown lands in the Bras d'Or Lowlands is protected as old forest under DNR's Old Forest Policy. There are three sites in this ecodistrict that are listed in the Atlas of Nova Scotia's Nature Reserves and Sites of Ecological Significance. These include an old growth hemlock forest at Oregon located within the North River Wilderness Area. Also a unique area of karst topography with gypsum-associated plants, old forest, and eagle nests is located at Island Point. Finally, Bird Islands is one of the most important colonial seabird nesting sites in the province, where great cormorants, puffins, kittiwakes, razorbills, and several other species breed.

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 similarcharacteristics.

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.

The analysis identified ecosystems requiring "fine filter" management attention to conserve their uncommon characteristics and sustain the ecological representation of natural conditions.

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

510 Bras d'Or Lowlands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Drumlins and Hummocks (Matrix)	IFKK IMDM WCDM WCHO WCKK WCRD WFDM WMDM WMHO WMKK WMRD WFKK	Gap	red Maple (rM), sugar Maple (sM), yellow Birch (yB)
Spruce Pine Hummocks (Patch)	ICHO IFHO IFRD IMHO IMRD WFHO WFRD	Frequent	black Spruce (bS), white Pine (wP)
Wetlands (Patch)	IMSM WTLD	Open Seral (Frequent)	rM, bS, tamarack (tL)
Spruce Pine Flats (Patch)	ICSM IFSM WMSM	Frequent	bS, wP, jack Pine (jP)
Salt Marsh (Patch)	XXMS	Open Seral	
Coastal Beach (Patch)	XXCB	Not available	
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 TopographicPattern

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

Appendix 3, Table 2, identifies rare and under-represented ecosystems. Within the Bras d'Or Lowlands Ecodistrict, 16 ecosections are under-represented: IMRD, IMSM, IMDM, ICHO, IFRD, IFSM, IFDM, WFDM, XXMS, WFRD, ICSM, WCRD, WCKK, WMSM, WCDM, and XXCB. Each comprises less than 2% of the ecodistrict area. These 16 under-represented ecosections combined to form 9% of the ecodistrict.

Of these 16 ecosections, IMSM, ICSM, XXMS, and XXCB have the highest land use pressures, with XXCB and XXMS being under the most stress from human development. Coastal beaches such as Port Morien, Big Glace Bay Beach, and Florence Beach are examples of beaches that are under constant human pressure in the form of off-highway vehicle use. Salt marshes are wetland complexes that are often perceived to be in the way of human development and there appears to be an ever increasing trend to infill them to create more useable land.

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

- Conservation of uncommon forest species for which genetic viability may be threatened as indicated by DNR's General Status of Wildlife rating system. Many of these species are also listed under the Nova Scotia Endangered Species Act (NSESA) or the federal Species at Risk Act (SARA) and many of these have recovery plans in place to direct conservation actions.
- Implementation of fine filter management opportunities related to conservation of significant habitats.
- Further review of uncommon community conditions (e. g. old age, large live and dead trees, and species associations).

Ecological Representivity (Appendices 4, 5)

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

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

Three provincial parks, the Middle River Framboise Wilderness Area, and five protected beaches are the legal reserves under the IUCN (the International Union for the Conservation of Nature and Natural Resources) I, II or III, representing 5,532 hectares, or 2% of this ecodistrict. The Provincial Old Growth Policy protects another 5,003 hectares of forest stands on Crown land under policy reserve.

In total, this amounts to 10,535 hectares, or 4% of the ecodistrict, with legal reserve or policy reserve protection.

ELA Summary

Element Interpretation (All appendices and maps)

This ecodistrict occurs entirely on Cape Breton Island and includes the lowland areas of the Bras d'Or Lake watershed, the Sydney coalfield, Boularderie Island, and most of the watersheds of the Salmon and Mira rivers.

Bras d'Or Lake, an inland sea with a mixture of saltwater and freshwater, occupies nearly 260 square kilometres in the centre of Cape Breton Island. West Bay is a wide extension on the southwest side and East Bay extends 40 kilometres in a northeasterly direction. These bays and channels have been carved mainly from the easily erodible Windsor sediments. Locally, thick deposits of gypsum, anhydrite, and salt occur. The bays and channels are elongate, parallel to ridges of gypsum-dominated bedrock, with good examples of this feature near the community of Iona.

Throughout the ecodistrict, white gypsum cliffs and red sandstone can be observed, especially along the shoreline of the lakes. The eastern half is covered predominately with shallow, stony, moderately coarse-textured glacial till derived from the underlying sandstones. The western half of the ecodistrict is dominated by imperfectly drained, loam to clay loam soils. Freshwater, excluding the Bras d'Or Lake, makes up nearly 3% of the ecodistrict.

The dominant species on the lowlands include black and white spruce and balsam fir. On steeper slopes, white pine can be found, while red spruce and hemlock will be found in the valley canyons, steep ravines, and along some watercourses coming off the uplands.

The better-drained hills support stands of tolerant hardwoods, such as sugar maple, yellow birch, and beech. The clearing of land by early settlers and then subsequent abandonment of the fields and pastures has given rise to large areas of old field white spruce forests. Natural disturbances include losses to blowdown in exposed areas along the lakes and coast, as well as fire and insects, most notably the spruce budworm.

Tolerant Hardwood Drumlins and Hummocks
(Matrix) (IFKK, IMDM, WCDM, WCHO, WCKK, WCRD, WFDM, WMDM, WMHO, WMKK, WMRD and WFKK ecosections) (148,110 ha)

The matrix area has predicted inherent forests of late seral tolerant hardwood composed of a climax mixture of sugar maple, yellow birch, and beech and is shaped predominately by a gap disturbance regime.

The current forest has been strongly influenced by human settlement and subsequent abandonment of marginal agricultural land, along with considerable forestry activity, as well as an extensive history of fire, especially in the eastern portion of the ecodistrict. These factors have reduced the

area of tolerant hardwoods, replacing the tolerant hardwood with softwood and mixedwood stands of early to mid-seral species.

The mixed forest tends to be a mix of trembling aspen, red maple, grey and white birch, with some yellow birch and sugar maple. Balsam fir and white spruce are abundant, with white spruce dominant on abandoned farmland and black spruce and eastern larch on the more poorly drained sites.

On better-drained hills, a tolerant hardwood forest composed of red maple, sugar maple, and yellow birch can be found mixed with some beech, mostly in the understory. In the ravines associated with the streams in this element, it is quite common to find pockets of eastern hemlock and occasionally red spruce.

Flows

Human (timber, recreation, hunting, off-highway vehicles); deer (primary habitat, travel, winter cover); interior birds – goshawk (mature and primary habitat, most often nest in yellow birch, large patches/large trees, open understory); water (catchment, filter, groundwater recharge).

Composition

Bras d'Or Lowlands Ecodistrict 510 (based on statistics up to 2006)

Composition of Tolerant Hardwood Drumlins and Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	29%	18%	53% (34 Mat + 19 OF)	19%
Seral Stage	Early	Mid	Late	Unclassified
	27%	37%	25%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	41%	25%	28%	6%

Desired Condition

Continuity of mature forest with large patches of unfragmented interior conditions.

Issues

- Restore a dominant condition of mature tolerant forest through stand tending, partial harvesting, long rotations, and harvest scheduling to promote patch aggregation.
- Currently portions of the area defined as the matrix contain an overabundance of early seral species in softwood and mixedwood stands.

Spruce Pine Hummocks

(Patch) (ICHO, IFHO, IFRD, IMHO, IMRD, WFHO and WFRD ecosections) (99,091 ha)

The predominantly moderate to fine-textured, imperfectly drained soils which make up this patch are spread all across the ecodistrict and have predicted climax forests of late seral black spruce and white pine. This patch element has predominantly a frequent disturbance regime.

The element currently supports forests of mid- to late seral softwoods, mixedwoods, and hardwoods. Black spruce is prominent in moist areas while balsam fir dominates on better-drained areas.

White spruce is the dominant species found on abandoned farmland, mixed with larch in the moist areas, and while white pine is still found scattered across the patch, usually it is only as scattered trees mixed in with other softwoods.

Mixedwood stands of red maple, white birch, balsam fir, and white spruce as well as mixed poor quality hardwood stands made up of red maple, white and yellow birch, some sugar maple, and beech are found on the better-drained lower slopes. Small stands of eastern hemlock are found in the low hills south of the Salmon River as well as in the vicinity of Coxheath Hills.

Flows

Human (timber, recreation, hunting, off-highway vehicles); deer (primary habitat, travel, winter cover); migratory birds and goshawk (mature - primary habitat, most often nest in yellow birch, large patches/large trees, open understory); water (catchment, filter, groundwater recharge).

Composition

Bras d'Or Lowlands Ecodistrict 510 (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
	26%	18%	56% (32 Mat + 24 OF)	24%
Seral Stage	Early	Mid	Late	Unclassified
	22%	37%	31%	10%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	51%	16%	27%	5%

Desired Condition

Black spruce and white pine-dominated softwood stands with a variety of development classes and lesser amounts of mid- to late seral hardwoods on moderate to fine-textured, imperfectly drained soils.

Issues

- Late seral black spruce and white pine community with the majority of the community in the mature development class.

Wetlands

(Patch) (IMSM and WTLD ecosections) (9,544 ha)

This patch generally supports black spruce mixed with eastern larch. A small portion of the patch has imperfectly drained, moderate-textured soils found along streams and here the climax is predicted to be American elm, sugar maple, and white ash.

Flows

Human (timber, recreation, hunting, OHV); deer (primary habitat, travel, winter cover); migratory birds and goshawk (mature - primary habitat, most often nest in yellow birch, large patches/large trees, open understory); water (catchment, filter, groundwater recharge).

Composition

Bras d'Or Lowlands Ecodistrict 510 (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
	25%	25%	50% (27 Mat + 23 OF)	23%
Seral Stage	Early	Mid	Late	Unclassified
	19%	31%	42%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	70%	8%	16%	6%

Desired Condition

Black spruce with some eastern larch-dominated softwood stands in the mature development class.

Issues

- Late seral black spruce and eastern larch softwood stands in the mature development class.

Spruce Pine Flats

(Patch) (ICSM, IFSM and WMSM ecosections) (1,784 ha)

The predicted climax forest is black spruce with a frequent disturbance regime. About 10% of the area has well-drained, moderate-textured soils that are predicted to have a climax mix of American elm, sugar maple, and white ash.

Currently, most of the patch, which is made up of imperfectly drained fine to coarse-textured soils, supports forests of mid- to late seral softwoods of black spruce and balsam fir, with some mixedwoods and smaller areas of intolerant and tolerant hardwood stands.

Flows

Human (timber, recreation, hunting, OHV); deer (primary habitat, travel, winter cover); interior birds – goshawk (mature - primary habitat, most often nest in yellow birch, large patches/large trees, open understory); water (catchment, filter, groundwater recharge).

Composition

Bras d'Or Lowlands Ecodistrict 510 (based on statistics up to 2006)
Composition of Spruce Pine Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	16%	16%	67% (42 Mat + 25 OF)	25%
Seral Stage	Early	Mid	Late	Unclassified
	15%	37%	43%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	61%	11%	23%	5%

Desired Condition

Black spruce dominated softwood stands with a variety of development classes and lesser amounts of mid to late seral hardwoods on medium to coarse soils.

Issues

- Spruce dominated softwood stands with a variety of development classes and lesser amounts of mid- to late seral hardwoods on well-drained, moderate-textured soils.

Salt Marsh
(Patch) (XXMS ecosection) (418 ha)

Salt Marsh makes up a small but unique habitat patch with areas of salt marsh scattered along the coast, most notably on the north side of Boularderie Island, the mouth of the Baddeck River, the head of Whycocomagh Bay, Little Narrows, and in Malagawatch.

Salt Marsh is also to be found in Waddens Cove near Port Morien.

This patch element, however, is rare in the ecodistrict.

Flows

Humans (fishing, trapping, settlement, roads, camping, hiking); water (coastal ponds, marine estuaries); deer (winter habitat and feeding); furbearers (travel, food, habitat); migratory birds (travel routes, summer habitat).

Composition

Bras d'Or Lowlands Ecodistrict 510 (based on statistics up to 2006)

Composition of Salt Marsh

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	20%	13%	67% (49 Mat + 18 OF)	18%
Seral Stage	Early	Mid	Late	Unclassified
	19%	35%	37%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	59%	8%	28%	5%

Desired Condition

Natural salt marsh ecosystem with a minimum of human intervention.

Issues

- Maintain current salt marshes and restore damaged systems.

Coastal Beach

(Patch) (XXCB ecosection) (307 ha)

Element includes beaches located in Sydney Harbour, Big Glace Bay, Lingan Bay, Port Morien, and Mira Bay. The beaches are mainly dune systems with brackish coastal ponds associated with the beach system. This element is rare in the ecodistrict with only 306.8 hectares present.

Flows

Humans (fishing, trapping, settlement, roads, camping, hiking); water (coastal ponds, marine estuaries); deer (winter habitat and feeding); furbearers (travel, food, habitat); migratory birds (travel routes, summer habitat)

Composition

Bras d'Or Lowlands Ecodistrict 510 (based on statistics up to 2006)

Composition of Coastal Beach

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	19%	16%	65% (36 Mat + 29 OF)	29%
Seral Stage	Early	Mid	Late	Unclassified
	24%	30%	44%	2%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	48%	8%	30%	14%

Desired Condition

Natural beach systems with a minimum of human intervention.

Issues

- Maintain and enhance the integrity of these coastal beaches through proactive ecosystem-based management and through education programs to better inform the public of their values.

Valley Corridors

(Corridor) (Various ecosection) (7,848 ha)

The most evident linear features within this ecodistrict are valleys associated with watercourses. A total of 13 corridors, all associated with rivers or smaller stream systems, have been identified. They are the North and Baddeck Rivers in Victoria County as well as the Mira and Salmon Rivers in Cape Breton County.

The link between the East Bay of the Bras d'Or Lake and Blacketts Lake, which is in turn linked to Sydney Harbour, has long been considered an important historical corridor since the days when the Mi'kmaq first used it as a canoe portage.

In Richmond County, the Grand River, Black River, and River Inhabitants are important corridors, with the latter draining out of the hills of Inverness County. Another significant corridor in Inverness County is the River Denys drainage.

Flows

Human (farming, canoeing, fishing, trapping, settlement, roads, and gravel deposits associated with intervale lands, camping, light recreation associated with river slopes); water (major drainages - permanent and secondary); deer (habitat and feeding); furbearers (travel, food, major habitat); anadromous fish (habitat, migratory routes, spawning beds).

Composition

Bras d'Or Lowlands Ecodistrict 510 (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
	24%	14%	62% (34 Mat + 28 OF)	28%
Seral Stage	Early	Mid	Late	Unclassified
	25%	40%	26%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	45%	18%	32%	5%

Desired Condition

Continuous natural forest conditions, however given the ownership and areas of concentrated human activity will inevitably result in some corridors having significantly altered land use features.

Issues

- Sustain natural forest conditions to provide connective functions.
- Where possible promote late seral species on areas significantly altered by intensive land uses.

Ecosystem Issues and Opportunities (All appendices and maps)

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

- Maintain a balance among the four ecological emphasis classes, attempting to keep EEI above 50.
- Promote and restore tolerant hardwoods in the matrix and intolerant mixedwood elements, with particular emphasis on the eastern portion of the ecodistrict where the original forest has suffered more from man's intrusions.
- Manage forest communities in relation to the natural disturbance regimes (NDR), development class, and seral stages.
- Land use has tended to reduce the extent of late seral hardwood and softwood stands with replacement by early to mid-seral mixedwood stands. Silviculture should promote late seral successional species appropriate to the ecosection type.
- Subject to ownership constraints, enhance connectivity of the corridor elements by maintaining and, where required, restoring natural forest conditions.
- Strategically plan for the construction, maintenance, and abandonment of access roads to conserve the distribution of low road density areas. Of particular importance for lynx habitat areas.

Appendix 1: Flow - Element Interactions

Element	Humans	Water	Deer	Anadromous Fish	Aquatic Furbearers	Reptiles and Amphibians	Migratory Birds	Goshawk
Tolerant Hardwood Drumlins and Hummocks Matrix	Forestry, woods roads, off-highway vehicles (OHVs), outdoor recreation (hunting, fishing, trapping, etc.)	Surface water quality, catchment, filtration, groundwater recharge and discharge	Primary habitat, wintering areas, travel ways	Water quality maintenance, riparian habitat (e.g. stream cooling, undercut banks)	Riparian habitat, denning, travel, woody browse (beaver)	Primary habitat (some species e.g. garter snake)	Breeding habitat (e.g. wood warblers)	Foraging habitat (primary prey habitat i.e. hare and squirrel)
Spruce Pine Hummocks	Forestry, woods roads, OHVs, outdoor recreation (hunting, fishing, trapping, etc.)	Surface water quality, catchment, filtration, groundwater recharge and discharge	Primary habitat, wintering areas, travel ways	Water quality maintenance, riparian habitat (e.g. stream cooling, undercut banks)	Riparian habitat, denning, travel, woody browse (beaver)	Primary habitat (some species e.g. garter snake)	Breeding habitat (e.g. wood warblers)	Foraging habitat (primary prey habitat i.e. hare and squirrel)
Spruce Pine Flats	Forestry, woods, roads, OHVs, outdoor recreation (hunting, fishing, trapping, etc.)	Surface water quality, catchment, filtration, groundwater recharge and discharge	Primary habitat, wintering areas, travel ways	Water quality maintenance, riparian habitat (e.g. stream cooling, undercut banks)	Riparian habitat, denning, travel, woody browse (beaver)	Primary habitat (some species e.g. garter snake)	Breeding habitat (e.g. wood warblers)	_____
Wetlands	Woods roads, outdoor recreation (hunting, trapping OHVs, etc.)	Water quality, catchment, filtration, groundwater recharge, discharge, nutrient enrichment	Foraging habitat, fawning areas	Water quality maintenance, nursery areas, cover	Primary habitat, foraging habitat, travel ways	Primary habitat (some species e.g. green frog)	Breeding habitat (e.g. waterfowl)	_____
Salt Marsh	_____	Nutrient enrichment through primary production (photosynthesis)	Minor foraging	Nutrient enrichment through primary production (photosynthesis), prey habitat	Foraging areas (e.g. mink, otter)	_____	Breeding, foraging and staging habitat (e.g. willet)	_____
Coastal Beach	Outdoor recreation (e.g. swimming, OHVs)	_____	_____	Temporary barrier to some species (e.g. Big Glace Bay Beach)	_____	_____	Breeding, foraging and staging habitat (e.g. shorebirds)	_____

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 Drumlins and Hummocks	Matrix	High	Old forest areas	Dominant feature of the landscape	Gap	sM, yB, Be	Spruce Pine Hummocks, watercourses, wetlands, coastal beaches or salt marsh	Some loss and fragmentation due to local development and roading.	Conservation of deer wintering areas, and other sensitive habitats (e.g. eagle nesting areas)	_____
Spruce Pine Hummocks	Patch	High	Old forest areas	Dominant feature of the landscape, second only to the tolerant hardwood matrix	Frequent	bS, wP	Tolerant Hardwood Drumlins and Hummocks, watercourses and wetlands	Fragmentation due to settlement, urbanization, farming forestry, and road construction and development	Conservation of deer wintering areas, and other sensitive habitats (e.g. Goshawk nesting areas).	_____
Spruce Pine Flats	Patch	Low		Minor feature of the landscape	Frequent	bS	Tolerant Hardwood Drumlins and Hummocks, Black Spruce Patch, watercourses and wetlands	Fragmentation due to settlement, farming, forestry, and road construction, and gypsum quarry development	Conservation of deer wintering areas, and other sensitive habitats	_____
Wetlands	Patch	Moderate		Minor feature of the Landscape	Frequent	bS, eL	Tolerant Hardwood Drumlins and Hummocks, Black Spruce Patch, watercourses and wetlands	_____	_____	_____

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Salt Marsh	Patch	Low	Larger areas of salt marsh at Port Morien and Malagawatch	Isolated local patches of unique habitat	Open seral	Salt marshes typically dominated by Spartina grasses	Late seral softwood (wS, bS, bF), coastal beaches	Water flow obstructions (fresh water and salt water), alteration of marsh and adjoining habitat, sedimentation, water quality	Incremental loss and degradation	
Coastal Beach	Patch	Moderate	Along the northern border of ecodistrict with larger sand beaches at Big Glace Bay and Port Morien	Stretch across northern border of ecodistrict	Open seral	Sand dune barrier beaches	Late seral softwood (wS, bS)	Local losses due to development; impacts due to OHVs and other disturbance	Beach aggregate extraction, OHV damage, human developments, channel openings	
Water	Patch	High	Mira River, Grand River, and Gabarus-Belfry-McCuish Lake system	Few large rivers, many smaller streams; lakes of various sizes are a prominent feature across the ecodistrict	_____	_____	Late seral softwood (wS, bS, bF) and wetlands	Overall minor and/or local impacts form development or roads	Water quality degradation related to road building and forestry or construction activities	

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

Appendix 3: Special Occurrences (Ecodistrict 510)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered	N/A
Piping Plover melodus ssp	*Charadrius melodus melodus*	Endangered	Endangered	Endangered
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	Special Concern	N/A
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	Threatened	N/A
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Peregrine Falcon - anatum/tundrius	*Falco peregrinus pop. 1*	Vulnerable	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	Threatened	N/A
Harlequin Duck - Eastern population	*Histrionicus histrionicus pop. 1*	Endangered	Special Concern	Special Concern
Bank Swallow	*Riparia riparia*	N/A	Threatened	N/A
Buff-breasted Sandpiper	*Tryngites subruficollis*	N/A	Special Concern	N/A
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS				
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
FERNS AND THEIR ALLIES				
Prototype Quillwort	*Isoetes prototypus*	Vulnerable	Special Concern	Special Concern
FISH	-			
Atlantic Sturgeon	*Acipenser oxyrinchus*	N/A	Threatened	N/A
American Eel	*Anguilla rostrata*	N/A	Threatened	N/A
GYMNOSPERMS				
Eastern White Cedar	*Thuja occidentalis*	Vulnerable	N/A	N/A
INSECTS	-			
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
LICHENS				
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Boreal Felt Lichen - Atlantic population	*Erioderma pedicellatum (Atlantic pop.)*	Endangered	Endangered	Endangered

Appendix 3: Special Occurrences (Ecodistrict 510)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
MAMMALS				
Canadian Lynx	*Lynx canadensis*	Endangered	Not at Risk	N/A
American Marten	*Martes americana*	Endangered	N/A	N/A
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	N/A
MOLLUSKS				
Yellow Lampmussel	*Lampsilis cariosa*	Threatened	Special Concern	Special Concern
MONOCOTS				
New Jersey Rush	*Juncus caesariensis*	Vulnerable	Special Concern	Special Concern
REPTILES	-			
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 510)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS	-		
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS	-		
Northern Goshawk	*Accipiter gentilis*	Secure (Green)	S3S4
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Razorbill	*Alca torda*	Sensitive (Yellow)	S1B,S4N
Northern Pintail	*Anas acuta*	May Be At Risk (Orange)	S2B
Northern Shoveler	*Anas clypeata*	May Be At Risk (Orange)	S2B
Blue-winged Teal	*Anas discors*	May Be At Risk (Orange)	S3B S2B
Gadwall	*Anas strepera*	May Be At Risk (Orange)	S3S4B
American Bittern	*Botaurus lentiginosus*	Sensitive (Yellow)	S2B,S5N
Common Goldeneye	*Bucephala clangula*	Secure (Green)	S3N
Purple Sandpiper	*Calidris maritima*	Sensitive (Yellow)	S1B,S5M
Least Sandpiper	*Calidris minutilla*	Secure (Green)	S3M
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3S4B,S5N
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4
Black Guillemot	*Cepphus grylle*	Secure (Green)	S1S2B,S5M
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S3S4B
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Blackpoll Warbler	*Dendroica striata*	Sensitive (Yellow)	S3S4B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S1B,S4S5N
Atlantic Puffin	*Fratercula arctica*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3B,S4N
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S1?B,S5N
Ring-billed Gull	*Larus delawarensis*	Secure (Green)	S3M
Hudsonian Godwit	*Limosa haemastica*	Sensitive (Yellow)	S3B,S5N
Red-breasted Merganser	*Mergus serrator*	Secure (Green)	S3B
Northern Mockingbird	*Mimus polyglottos*	Secure (Green)	SHB,S5M
Northern Gannet	*Morus bassanus*	Secure (Green)	S3M
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Sensitive (Yellow)	S3S4
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3B
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3
Great Cormorant	*Phalacrocorax carbo*	Sensitive (Yellow)	S2S3M
Red Phalarope	*Phalaropus fulicarius*	Sensitive (Yellow)	S2S3M
Red-necked Phalarope	*Phalaropus lobatus*	Sensitive (Yellow)	S3?B,S5N
Pine Grosbeak	*Pinicola enucleator*	May Be At Risk (Orange)	

Appendix 3: Special Occurrences (Ecodistrict 510)

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***
American Golden-Plover	*Pluvialis dominica*	Sensitive (Yellow)	S3M
Pied-billed Grebe	*Podilymbus podiceps*	Sensitive (Yellow)	S3B
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3
Black-legged Kittiwake	*Rissa tridactyla*	Sensitive (Yellow)	S2B,S4S5N
Common Tern	*Sterna hirundo*	Sensitive (Yellow)	S3B
Arctic Tern	*Sterna paradisaea*	May Be At Risk (Orange)	S3B S3B,S5M
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S2S3B
Willet	*Tringa semipalmata*	May Be At Risk(Orange)	S1?B,S4S5M
Solitary Sandpiper	*Tringa solitaria*	Secure (Green)	S3S4B
Eastern Kingbird	*Tyrannus tyrannus*	Sensitive (Yellow)	S3S4B
Wilson's Warbler	*Wilsonia pusilla*	Sensitive (Yellow)	
BRYOPHYTES			
Giant Spear Moss	*Calliergon giganteum*	Sensitive (Yellow)	S2S3
Hooked Scorpion Moss	*Scorpidium scorpioides*	Sensitive (Yellow)	S2?
a Moss	*Syntrichia ruralis*	Sensitive (Yellow)	S2?
Fragile Twisted Moss	*Tortella fragilis*	Sensitive (Yellow)	S2S3
DICOTS			
Silver Maple	*Acer saccharinum Agrimonia*	May Be At Risk (Orange)	S1
Hooked Agrimony	*gryposepala Amelanchier*	Secure (Green)	S3
Fernald's Serviceberry	*fernaldii Amelanchier*	Undetermined	S2?
Running Serviceberry	*stolonifera Anemone*	Secure (Green)	S3?
Virginia Anemone	*virginiana var. alba Angelica*	Sensitive (Yellow)	S1S2
Purple-stemmed Angelica	*atropurpurea*	Secure (Green)	S3S4
Western Hairy Rockcress	*Arabis hirsuta var. pycnocarpa*	May Be At Risk (Orange)	S1S2
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3
Swamp Milkweed	*Asclepias incarnata ssp. pulchra*	Undetermined	S2S3
Maritime Saltbush	*Atriplex acadiensis*	Undetermined	S1?
Frankton's Saltbush	*Atriplex franktonii*	Secure (Green)	S3S4
Yellow Bartonia	*Bartonia virginica*	Secure (Green)	S3
Northern Birch	*Betula borealis*	Sensitive (Yellow)	S2
Small-flowered Bittercress	*Cardamine parviflora var. arenicola*	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
Red Pigweed	*Chenopodium rubrum*	May Be At Risk (Orange)	S1?

Appendix 3: Special Occurrences (Ecodistrict 510)

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***
Bastard's Toadflax	*Comandra umbellata*	May Be At Risk (Orange)	S2
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
Labrador Bedstraw	*Galium labradoricum*	Sensitive (Yellow)	S2
Northern Comandra	*Geocaulon lividum*	Sensitive (Yellow)	S3
Spurred Gentian	*Halenia deflexa*	Sensitive (Yellow)	S2S3
American False Pennyroyal	*Hedeoma pulegioides*	Sensitive (Yellow)	S2S3
Kalm's Hawkweed	*Hieracium kalmii*	Undetermined	S2?
Robinson's Hawkweed	*Hieracium robinsonii*	Sensitive (Yellow)	S2
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
Southern Mudwort	*Limosella australis*	Sensitive (Yellow)	S3
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
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
Alpine Bistort	*Polygonum viviparum*	May Be At Risk (Orange)	S1
Canada Cinquefoil	*Potentilla canadensis*	Undetermined	S3?
Glaucous Rattlesnakeroot	*Prenanthes racemosa*	May Be At Risk (Orange)	S1
Marsh Mermaidweed	*Proserpinaca palustris*	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
Northern Dewberry	*Rubus flagellaris*	Undetermined	S1?
Triangular-valve Dock	*Rumex salicifolius var. mexicanus*	Sensitive (Yellow)	S2

Appendix 3: Special Occurrences (Ecodistrict 510)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
Bog Willow	*Salix pedicellaris Salix*	Sensitive (Yellow)	S2
Meadow Willow	*petiolaris Sanguinaria*	Secure (Green)	S3
Bloodroot	*canadensis Sanicula*	Secure (Green)	S3S4
Clustered Sanicle	*odorata Scrophularia*	May Be At Risk (Orange)	S1
Lance-leaved Figwort	*lanceolata Senecio*	Undetermined	S1
Seabeach Ragwort	*pseudoarnica Shepherdia*	Sensitive (Yellow)	S2
Soapberry	*canadensis Stellaria*	Sensitive (Yellow)	S2
Fleshy Stitchwort	*crassifolia Stellaria*	May Be At Risk(Orange)	S1
Long-leaved Starwort	*longifolia Suaeda*	Sensitive (Yellow)	S3
Horned Sea-blite	*calceoliformis*	Secure (Green)	S2S3
Boreal Aster	*Symphyotrichum boreale*	Sensitive (Yellow)	S2?
Canada Germander	*Teucrium canadense*	Sensitive (Yellow)	S3
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow)	S2
Humped Bladderwort	*Utricularia gibba*	Secure (Green)	S3S4
Inverted Bladderwort	*Utricularia resupinata*	May Be At Risk(Orange)	S1S2
Blue Vervain	*Verbena hastata*	Secure (Green)	S3
Thyme-Leaved Speedwell	*Veronica serpyllifolia ssp. humifusa*	Sensitive (Yellow)	S2S3
Northern Bog Violet	*Viola nephrophylla*	Sensitive (Yellow)	S2
FERNS AND THEIR ALLIES			
Maidenhair Spleenwort	*Asplenium trichomanes*	Sensitive (Yellow)	S2
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive	S2S3
Mingan Moonwort	*Botrychium minganense*	(Yellow)	SH
Bulblet Bladder Fern	*Cystopteris bulbifera*	Extirpated	S3S4
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Dwarf Scouring-Rush	*Equisetum scirpoides*	Secure (Green)	S3S4
Variegated Horsetail	*Equisetum variegatum*	Secure (Green)	S3
Northern Clubmoss	*Lycopodium complanatum*	Secure (Green)	S3S4
Sitka Clubmoss	*Lycopodium sitchense*	Secure (Green)	S3?
Appalachian Polypody	*Polypodium appalachianum*	Secure (Green)	S3?
		Undetermined	
FISH			
Striped Bass	*Morone saxatilis*	May Be At Risk (Orange)	S1
Atlantic Salmon	*Salmo salar*	May Be At Risk (Orange)	S2
INSECTS			
Milbert's Tortoiseshell	*Aglais milberti*	Secure (Green)	S2

Appendix 3: Special Occurrences (Ecodistrict 510)

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***
Eastern Red Damsel	*Amphiagrion saucium*	Secure (Green)	S3
Arctic Fritillary	*Boloria chariclea*	Sensitive (Yellow)	S2
Ocellated Darner	*Boyeria grafiana*	Sensitive (Yellow)	S3
Hoary Elfin	*Callophrys polios*	Secure (Green)	S3S4
Baltimore Checkerspot	*Euphydryas phaeton*	Secure (Green)	S3
Harlequin Darner	*Gomphaeschna furcillata*	Sensitive (Yellow)	S3
Harpoon Clubtail	*Gomphus descriptus*	Sensitive (Yellow)	S2
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Elfin Skimmer	*Nannothemis bella*	Secure (Green)	S3
Compton Tortoiseshell	*Nymphalis l-album*	Secure (Green)	S1S2
Jutta Arctic	*Oeneis jutta*	May Be At Risk(Orange)	S1
Brook Snaketail	*Ophiogomphus aspersus*	May Be At Risk(Orange)	S1
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Short-tailed Swallowtail	*Papilio brevicauda*	Sensitive (Yellow)	S1S2
Mustard White	*Pieris oleracea Polygonia*	Sensitive (Yellow)	S2
Green Comma	*faunus Polygonia gracilis*	Secure (Green)	S3
Hoary Comma	*Polygonia interrogationis*	Sensitive (Yellow)	S1
Question Mark	*Polygonia progne*	Secure (Green)	S3B
Grey Comma	*Polygonia satyrus*	Secure (Green)	S3S4
Satyr Comma	*Somatochlora forcipata*	Sensitive (Yellow)	S1
Forcipate Emerald	*Somatochlora williamsoni*	May Be At Risk (Orange)	S2
Williamson's Emerald	*Sympetrum danae*	May Be At Risk (Orange)	S1
Black Meadowhawk		Sensitive (Yellow)	S3
LICHENS			
Tree Pelt Lichen	*Peltigera collina*	Sensitive (Yellow)	S2S3
Bloody Beard Lichen	*Usnea mutabilis*	Sensitive (Yellow)	S2S3
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
Long-tailed Shrew	*Sorex dispar*	Sensitive (Yellow)	S1
MOLLUSKS			
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
Tidewater Mucket	*Leptodea ochracea*	Sensitive (Yellow)	S1

Appendix 3: Special Occurrences (Ecodistrict 510)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
MONOCOTS			
Wild Chives	*Allium schoenoprasum*	May Be At Risk (Orange)	S2
Wild Chives	*Allium schoenoprasum var. sibiricum*	May Be At Risk (Orange)	S2
Short-awned Foxtail	*Alopecurus aequalis*	Sensitive (Yellow)	S2S3
Broad-Glumed Brome	*Bromus latiglumis*	May Be At Risk (Orange)	S1
Slim-stemmed Reed Grass	*Calamagrostis stricta ssp. stricta*	Sensitive (Yellow)	S1S2
Silvery-flowered Sedge	*Carex argyrantha*	Secure (Green)	S3S4
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined	S2
Bebb's Sedge	*Carex bebbii*	May Be At Risk (Orange)	S1S2
Hidden-scaled Sedge	*Carex cryptolepis*	Secure (Green)	S3?
Bristle-leaved Sedge	*Carex eburnea*	Sensitive (Yellow)	S3
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	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
Blunt Broom Sedge	*Carex tribuloides*	Secure (Green)	S3?
Greenish Sedge	*Carex viridula var. elatior*	May Be At Risk (Orange)	S1
Wiegand's Sedge	*Carex wiegandii*	May Be At Risk (Orange)	S1
Sweet Wood Reed Grass	*Cinna arundinacea*	May Be At Risk (Orange)	S1
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Red-stemmed Spikerush	*Eleocharis erythropoda*	.1 Extirpated ()	SH
Ovate Spikerush	*Eleocharis ovata*	Sensitive (Yellow)	S2?
Few-flowered Spikerush	*Eleocharis quinqueflora*	May Be At Risk (Orange)	S2
Wiegand's Wild Rye	*Elymus wiegandii*	May Be At Risk (Orange)	S1
Russet Cotton-Grass	*Eriophorum chamissonis*	Secure (Green)	S3S4
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Richardson's Rush	*Juncus alpinoarticulatus ssp. nodulosus*	May Be At Risk (Orange)	S1S2
Bulbous Rush	*Juncus bulbosus*	Undetermined	S1
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Moor Rush	*Juncus stygius ssp. americanus*	Sensitive (Yellow)	S1S2
Woods-Rush	*Juncus subcaudatus var. planisepalus*	Sensitive (Yellow)	S3
Highland Rush	*Juncus trifidus*	Sensitive (Yellow)	S2
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Small-flowered Woodrush	*Luzula parviflora*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 510)

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***
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Small Round-leaved Orchid	*Platanthera orbiculata*	Secure (Green)	S3
Fries' Pondweed	*Potamogeton friesii*	May Be At Risk (Orange)	S2
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	Sensitive (Yellow)	S2S3
White-stemmed Pondweed	*Potamogeton praelongus*	Sensitive (Yellow)	S3?
Flat-stemmed Pondweed	*Potamogeton zosteriformis*	Sensitive (Yellow)	S2S3
Slender Beakrush	*Rhynchospora capillacea*	May Be At Risk (Orange)	S1
Stalked Bulrush	*Scirpus pedicellatus*	Undetermined	S1
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Shining Ladies'-Tresses	*Spiranthes lucida*	May Be At Risk (Orange)	S2
Thread-leaved Pondweed	*Stuckenia filiformis ssp. alpina*	Undetermined	S2S3
GaspƟ Arrowgrass	*Triglochin gaspensis*	Undetermined	S1?
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

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

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

Appendix 3: Special Occurrences (Ecodistrict 510)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Deer wintering areas (DWA)	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	
Bat hibernacula	Caves and mine adits	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act; Nova Scotia Endangered Species Act
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, salt marshes and coastal waters	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Seabird nesting colonies	Coastal headlands, cliffs and islands	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Shorebird breeding and staging areas	Beaches, salt marshes, and mudflats	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act
Piping plover nesting areas	Beaches and dunes	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act; Nova Scotia Endangered Species Act
Great blue heron rookeries	Forest habitat	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Migratory Birds Convention Act

Appendix 3: Special Occurrences (Ecodistrict 510)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
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
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
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
Ducks Unlimited Projects	Wetlands	Significant Habitats of Nova Scotia Database	Legal agreement
Karst areas	Upland and wetland sites	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	N/A
Provincial Game Sanctuaries	Provincial Game Sanctuary	Significant Habitats of Nova Scotia Database; Atlantic Canada Conservation Data Centre database	Nova Scotia Wildlife Act
Provincial Wildlife Management Areas	Provincial Wildlife Management Area	DNR Restricted Land Use Database	Nova Scotia Wildlife 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

Appendix 3: Special Occurrences (Ecodistrict 510)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Operational/Non-Designated Parks and Reserves	Ecosystem /recreation	DNR Restricted Land Use Database	Nova Scotia Parks Act
Protected Beaches	Ecosystem	DNR Restricted Land Use Database	Nova Scotia Beaches Protection Act
Designated Water Supply Areas	Designated Water Supply	DNR Restricted Land Use Database	Nova Scotia Environment Act
Non-Designated Water Supply Areas	Non-Designated Water Supply	DNR Restricted Land Use Database	Nova Scotia Environment Act
North River IBP Site	International Biological Program Site	DNR Restricted Land Use Database	N/A
Federal Migratory Bird Sanctuary	National Wildlife Sanctuary	DNR Restricted Land Use Database	Migratory Birds Convention Act

Appendix 3: Special Occurrences (Ecodistrict 510)
Table 1d – Heritage Features

Feature	Type	Information Source
Indian Burial Grounds –	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge Nova Scotia DNR Database
Native Artifacts –	Cultural/Community Heritage	Aboriginal Traditional Knowledge Local Knowledge Nova Scotia DNR Database
Abandoned Mines (e.g. Port Morien Old French Coal Mine)	Geological and Cultural Heritage	NS Abandoned Mines Database
First Nations Reserve Lands – Caribou Marsh, Chapel Island, Eskasoni, Malagawatch, Wagmatcook, Whycocomagh	Cultural	Nova Scotia DNR Restricted Land Use Database
National Historic Site – St. Peters Canal	Cultural/Community Heritage	Nova Scotia DNR Restricted Land Use Database
Significant Geological Feature – fossils cliffs	Geological and Cultural Heritage	Local Knowledge

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS wP	2,870	1.1	112,202	40.2	58 to 61	17.0	55,665	6.6	234,959	28.0	2,870	1.1
ICSM	bS	522	0.2	8,582	3.1	63 to 66	11.9	4,858	0.6	98,073	11.7	522	0.2
IFDM	bS	908	0.4	8,582	3.1	58 to 63	12.7	3,010	0.4	98,073	11.7	908	0.4
IFHO	bS wP	27,470	11.0	112,202	40.2	62 to 68	8.7	80,338	9.6	234,959	28.0	27,470	11.0
IFKK	sM yB Be eH wP	11,910	4.8	10,232	3.7	58 to 65	12.5	22,279	2.7	10,232	1.2	11,910	4.8
IFRD	bS wP	2,474	1.0	112,202	40.2	61 to 55	11.5	14,050	1.7	234,959	28.0	2,474	1.0
IFSM	bS	1,449	0.6	8,582	3.1	64 to 67	9.3	10,331	1.2	98,073	11.7	1,449	0.6
IMDM	sM yB Be	3,097	1.2	125,595	45.0	59 to 65	11.0	5,022	0.6	205,110	24.4	3,097	1.2
IMHO	bS wP	49,408	19.7	112,202	40.2	62 to 67	12.1	163,103	19.4	234,959	28.0	49,408	19.7
IMRD	bS wP	5,119	2.0	112,202	40.2	66 to 71	4.6	16,644	2.0	234,959	28.0	5,119	2.0
IMSM	wetlands	3,534	1.4	0	0.0	58 to 61	18.2	12,116	1.4	0	0.0	3,534	1.4
WCDM	sM yB Be	314	0.1	125,595	45.0	63 to 66	22.4	318	0.0	205,110	24.4	314	0.1
WCHO	sM yB Be	8,296	3.3	125,595	45.0	41 to 43	33.7	53,700	6.4	205,110	24.4	8,296	3.3
WCKK	sM yB Be	362	0.1	125,595	45.0	31 to 36	45.2	45,025	5.4	205,110	24.4	362	0.1
WCRD	sM yB Be	444	0.2	125,595	45.0	46 to 53	24.8	6,331	0.8	205,110	24.4	444	0.2
WFDM	sM yB Be	608	0.2	125,595	45.0	44 to 53	7.0	776	0.1	205,110	24.4	608	0.2
WFHO	bS wP	7,447	3.0	112,202	40.2	51 to 56	13.8	18,773	2.2	234,959	28.0	7,447	3.0
WFKK	bS wP	15,130	6.0	112,202	40.2	55 to 61	13.0	70,719	8.4	234,959	28.0	15,130	6.0
WFRD	bS wP	603	0.2	112,202	40.2	26 to 34	35.1	3,417	0.4	234,959	28.0	603	0.2
WMDM	sM yB Be	26,027	10.4	125,595	45.0	59 to 65	7.9	27,710	3.3	205,110	24.4	26,027	10.4
WMHO	sM yB Be	20,991	8.4	125,595	45.0	50 to 54	22.3	78,353	9.3	205,110	24.4	20,991	8.4
WMKK	sM yB Be	44,249	17.7	125,595	45.0	47 to 53	21.0	75,415	9.0	205,110	24.4	44,249	17.7
WMRD	sM yB Be	8,488	3.4	125,595	45.0	51 to 56	16.2	10,365	1.2	205,110	24.4	8,488	3.4
WMSM	bS	339	0.1	8,582	3.1	63 to 66	8.1	363	0.0	98,073	11.7	339	0.1
WTLD	wetlands	8,159	3.3	0	0.0	70 to 72	5.7	13,729	1.6	0	0.0	8,159	3.3

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
IMHO	bS wP	51,160	26.7	3,097	3	287	0	3,384	6.6	3	0.0	3,388	6.6
WMKK	sM yB Be	47,717	15.8	1	36	172	0	173	0.4	36	0.1	208	0.4
IFHO	bS wP	29,096	15.9	0	58	563	0	563	1.9	58	0.2	622	2.1
WMDM	sM yB Be	27,507	33.2	1,119	0	378	0	1,497	5.4	0	0.0	1,497	5.4
WMHO	sM yB Be	22,119	10.6	263	23	323	3	586	2.7	26	0.1	612	2.8
WFKK	bS wP	16,098	24.0	0	0	272	0	272	1.7	0	0.0	272	1.7
IFKK	sM yB Be eH wP	12,789	11.6	0	0	125	0	125	1.0	0	0.0	125	1.0
XXWA	NONE	12,223	0.1	0	0	0	0	0	0.0	0	0.0	0	0.0
WMRD	sM yB Be	9,305	18.3	0	8	110	0	110	1.2	8	0.1	118	1.3
WCHO	sM yB Be	9,083	7.0	241	0	48	0	289	3.2	0	0.0	289	3.2
WFHO	bS wP	8,417	10.7	24	0	14	0	38	0.5	0	0.0	39	0.5
WTLD	wetlands	8,353	31.2	909	0	53	0	963	11.5	0	0.0	963	11.5
IMRD	bS wP	5,176	21.7	0	0	62	0	62	1.2	0	0.0	62	1.2
IMSM	wetlands	3,678	7.3	21	0	13	0	33	0.9	0	0.0	33	0.9
IMDM	sM yB Be	3,557	5.6	0	0	1	0	1	0.0	0	0.0	1	0.0
ICHO	bS wP	3,016	10.5	1	0	29	0	30	1.0	0	0.0	30	1.0
IFRD	bS wP	2,847	3.1	0	0	47	0	47	1.7	0	0.0	47	1.7
IFSM	bS	1,553	19.5	0	1	0	0	0	0.0	1	0.0	1	0.0
IFDM	bS	908	20.8	0	0	0	0	0	0.0	0	0.0	0	0.0
WFDM	sM yB Be	776	2.4	0	0	0	0	0	0	0	0.0	0	0.0
XXMS	salt marsh	772	0.1	0	0	10	0	10	1.2	0	0.0	10	0.0
WFRD	bS wP	751	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	bS	561	0.0	0	0	14	0	14	0.0	0	0.0	14	0.0
WCRD	sM yB Be	469	0.1	13	6	4	0	17	0.0	6	0.0	24	0.1
WCKK	sM yB Be	386	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMSM	bS	363	0.4	0	0	4	22	4	0.0	22	0.1	26	0.1
WCDM	sM yB Be	318	0.4	0	0	111	0	111	0.4	0	0.0	111	0.4
XXCB	coastal beach	301	0.2	24	32	8	0	32	0.1	32	0.1	63	21.1
Total		**279,298**		**5,714**	**167**	**2,647**	**25.1**	**8,361**		**193**		**8,554**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act Designation	Area by Ownership		Policy Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	5,483	0	Old Forest	5003	0
Areas under the Special Places Act	192	0	Designated Provincial Parks and Park Reserves	216	0
Protected Beaches	28	99	Operational Non Designated Parks and Reserves	207	0
Sites of Ecological Significance Under Moratorium	27	0	Bras d'Or Preservation Society	0	25
Designated Provincial Parks and Park Reserves	22	0			
Canadian Heritage Rivers	0	10			
Operational Non Designated Parks and Reserves	5	0			

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

Appendix 6: Description of Road Density Index

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

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

Efficient access systems can be strategically designed to minimize environmental impacts by incorporating factors such as harvest scheduling, life expectancy, location, road class requirements, decommissioning, and mitigation measures (Lindenmayer & Franklin 2002, Forman, 2004). Selection of transportation routes should incorporate knowledge of landscape functions to improve compatibility with natural ecosystem flows and connectivity (Forman & Hersperger, 1996). Furthermore, 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.

The 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	2,467
Utility corridors	3	902
Gravel Roads and active railways	6	2,545
Paved streets and roads collectors	10	1,519
Highways	15	175

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	85,599	30.6
Forest Resource	7 to 15	98,250	35.2
Mixed Rural	16 to 24	63,829	22.9
Agriculture Suburban	25 to 39	25,645	9.2
Urban	40 to 100	5,974	2.1
Total		**279,297**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Drumlins and Hummocks	148,110	8
Valley Corridors	7,849	15
Spruce Pine Flats	1,784	13
Spruce Pine Hummocks	99,091	8
Wetlands	9,543	9
Coastal Beach	307	32
Salt Marsh	418	28
Total	**267,102**	**9**

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

Appendix 8: Development Classes and Seral Stages

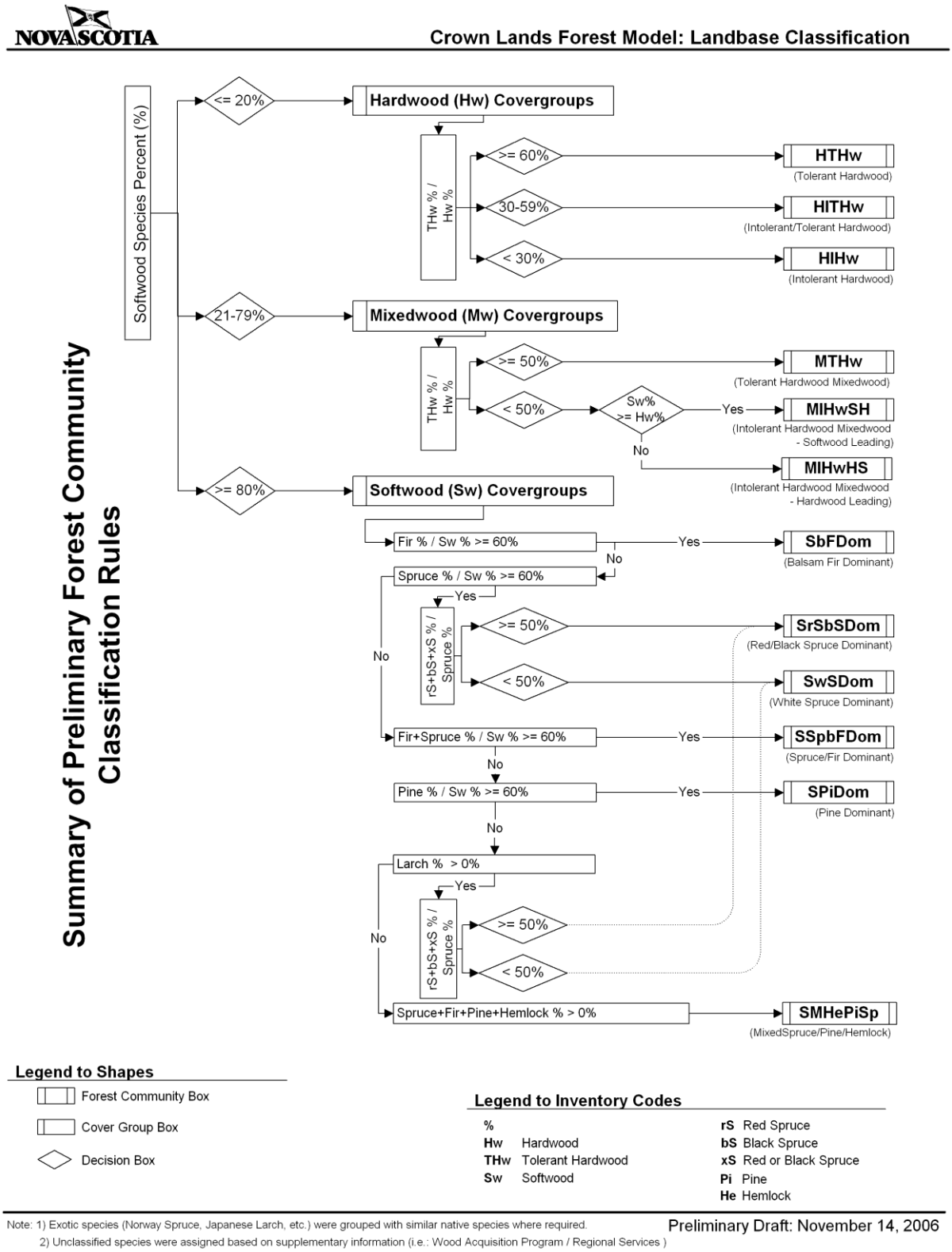
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade intolerant "pioneer" species • peak seed production by forbs and shrubs • 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 > 11m) • stands dominated by upper canopy with full differentiation into dominance classes • self-thinning process reduced • tree seed production prominent and regular • individual tree mortality creates canopy gaps that are soon closed by neighbouring tree growth • increased light initiates regeneration and early understory development • approximate age 40 to 125 years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneer species • over maturity initiates canopy breakup and understory development Mid Seral Species (Score 24 to 37) • climax species in mixture with pioneers in the overstory • often reflecting a transition to climax domination following a period of sub canopy development Late Seral Species (Score 38 to 50) • canopy dominated by climax species • over maturity initiates gap dynamic processes leading to multi-aged and old growth conditions
4. Multi-aged and old growth forest (Varying height and age and Old Growth ID) • dominant overstory exhibiting a variety of crown sizes and canopy densities • canopy gaps promote development of multi-layered understory and recruitment to overstory	Early Seral Species (Score 10 to 23) • canopy likely to break up and be replaced by developing understory Mid Seral Species (Score 24 to 37) • pioneer dominated-overstory with canopy recruitment from a climax species-dominated understory Late Seral Species (Score 38 to 50) • climax species-dominated overstory maintained through gap dynamic processes.

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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



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

Preliminary Draft: November 14, 2006

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Bras d'Or Lowlands 510)

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 Drumlins and Hummocks Matrix	WMKK (32.2%) WMDM (18.5%) WMHO (14.9%) WFKK (10.9%) IFKK (8.6%) WMRD (6.3%) WCHO (5.0%) IMDM (2.4%) WFDM (<1%)	Softwood	bS wP bS	Frequent	15,433; 10.4	Early	2,777	4,005	1,163	1,433	9,378	46,028; 40.5	EARLY	30840; 27.1
						Mid	1,984	3,215	2,691	4,757	12,647			
						Late	3,089	4,413	5,582	5,860	18,944			
						Uncl	5,059	0	0	0	5,059			
		Mixedwood				Early	4,220	3,029	1,924	1,511	10,684	32,141; 28.2	MID	41615; 36.6
						Mid	2,758	2,703	5,087	4,848	15,396			
						Late	337	352	1,730	1,240	3,659			
						Uncl	2,402	0	0	0	2,402			
		Hardwood	sM yB Be sM yB Be eH wP	Gap	131,609; 88.9	Early	1,945	2,002	3,875	436	8,258	28,716; 25.2	LATE	28338; 24.9
						Mid	759	1,132	10,656	1,026	13,573			
						Late	40	119	5,336	240	5,735			
						Uncl	1,150	0	0	0	1,150			
		Unclassified				Early	2,231	54	235	0	2,520	6,892; 6.1	UNCL	12,983; 11.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	4,372	0	0	0	4,372			
Total					**148,110***	**# ha**	**33,121**	**21,025**	**38,280**	**21,351**	**113,776**			
						%	**29.1%**	**18.5%**	**33.6%**	**18.8%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Bras d'Or Lowlands 510)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish - ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	IMSM (24.2%) WCHO (20.6%) IMHO (17.7%) ICHO (11.2%) WTLD (7.8%) IFSM (4.9%) WMSM (3.6%) WMDM (1.6%) WCRD (1.3%)	Softwood	bS wP bS	Frequent	3396; 43.4	Early	73	164	81	104	422	2,013; 44.9	EARLY	1,127; 25.1
						Mid	58	132	223	241	653			
						Late	76	144	270	244	733			
						Uncl	204	0	0	0	204			
		Mixedwood				Early	116	61	70	97	343	1,421; 31.7	MID	1,791; 39.9
						Mid	143	66	193	374	777			
						Late	7	7	125	112	251			
						Uncl	50	0	0	0	50			
		Hardwood	sM yB Be aE sM wA	Gap	2353; 29.9	Early	42	25	149	38	255	810; 18.1	LATE	1,175; 26.2
						Mid	53	44	210	54	361			
						Late	4	4	182	1	191			
						Uncl	4	0	0	0	4			
		Unclassified				Early	101	0	7	0	108	235; 5.2	UNCL	385; 8.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	127	0	0	0	127			
Total					**7,848***	**# ha**	**1,058**	**646**	**1,510**	**1,265**	**4,479**			
						%	**23.6%**	**14.4%**	**33.7%**	**28.2%**	**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 (Bras d'Or Lowlands 510)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish - ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats	IFSM (65.3%) ICSM (30.3%) WMSM (4.5%)	Softwood	bS	Frequent	1,116; 62.6	Early	11	15	23	43	92	818; 61.3	EARLY	206; 15.4
						Mid	20	55	71	90	237			
						Late	13	94	227	126	460			
						Uncl	30	0	0	0	30			
		Mixedwood				Early	36	10	8	6	60	305; 22.9	MID	495; 37.1
						Mid	30	35	75	50	191			
						Late	7	4	26	17	54			
						Uncl	0	0	0	0	0			
		Hardwood	aE sM wA	Frequent	194; 10.9	Early	7	4	9	0	20	144; 10.8	LATE	571; 42.8
						Mid	1	0	66	1	67			
						Late	0	0	57	0	57			
						Uncl	0	0	0	0	0			
		Unclassified				Early	30	0	4	0	34	67; 5.0	UNCL	63; 4.7
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	33	0	0	0	33			
Total					**1,784***	**# ha**	**219**	**217**	**566**	**333**	**1,334**			
						%	**16.4%**	**16.2%**	**42.4%**	**25.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Bras d'Or Lowlands 510)

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 (50.2%) IFHO (29.3%) WFHO (8.5%) IMRD (5.2%) IFRD (2.8%) ICHO (2.2%) WFRD (0.8%)	Softwood	bS wP bS	Frequent	97,955; 98.8	Early	1,849	1,936	1,034	1,204	6,023	38,250; 51.3	EARLY	16,252; 21.8
						Mid	1,948	2,495	2,084	4,161	10,688			
						Late	1,964	4,475	5,203	6,515	18,157			
						Uncl	33,783	0	0	0	33,783			
		Mixedwood				Early	2,089	1,114	1,008	785	4,996	20,320; 27.2	MID	27,518; 36.9
						Mid	1,831	1,629	4,209	3,308	10,976			
						Late	81	208	1,722	842	2,853			
						Uncl	1,495	0	0	0	1,495			
		Hardwood				Early	930	895	1,720	269	3,813	12,227; 16.4	LATE	23,132; 31.0
						Mid	231	551	4,554	518	5,855			
						Late	1	89	1,880	152	2,122			
						Uncl	438	0	0	0	438			
		Unclassified	sM yB Be	Frequent	1,136; 1.1	Early	1,268	47	105	0	1,420	3,674; 4.9	UNCL	7,569; 10.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2,253	0	0	0	2,253			
Total					**99,091***	**# ha**	**50,160**	**13,439**	**23,517**	**17,754**	**104,870**			
						%	**47.8%**	**12.8%**	**22.4%**	**16.9%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Bras d'Or Lowlands 510)

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 (81.4%) IMSM (18.6%)	Softwood	bS	None	2863; 30.0	Early	75	102	49	77	303	2924; 70.3	EARLY	782; 18.8
						Mid	133	207	189	303	833			
						Late	115	582	451	507	1,654			
						Uncl	135	0	0	0	135			
		Mixedwood				Early	161	50	43	5	260	677; 16.3	MID	1,270; 30.5
						Mid	48	49	140	50	287			
						Late	14	7	38	17	76			
						Uncl	55	0	0	0	55			
		Hardwood	aE sM wA	None	355; 3.7	Early	38	16	77	7	137	315; 7.6	LATE	1750; 42.1
						Mid	14	21	110	6	150			
						Late	0	1	16	4	21			
						Uncl	7	0	0	0	7			
		Unclassified				Early	77	0	5	0	82	245; 5.9	UNCL	359; 8.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	163	0	0	0	163			
Total					**9,544***	**# ha**	**1,033**	**1,035**	**1,119**	**974**	**4,161**			
						%	**24.8%**	**24.9%**	**26.9%**	**23.4%**	**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 (Bras d'Or Lowlands 510)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Salt Marsh		Softwood				Early	4	4	9	0	17	93; 58.5	EARLY	31; 19.4
						Mid	5	2	11	7	24			
						Late	2	5	25	14	46			
						Uncl	6	0	0	0	6			
		Mixedwood				Early	2	3	1	3	8	45; 28.2	MID	56; 35.1
						Mid	3	5	12	5	24			
						Late	0	0	9	1	10			
						Uncl	2	0	0	0	2			
		Hardwood				Early	0	0	3	0	3	13; 8.4	LATE	59; 36.9
						Mid	0	2	6	0	7			
						Late	0	0	3	0	3			
						Uncl	0	0	0	0	0			
		Unclassified				Early	2	0	0	0	2	8; 4.9	UNCL	14; 8.7
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	6	0	0	0	6			
Total					**418***	**# ha**	**32**	**20**	**78**	**29**	**159**			
						%	**19.9%**	**12.6%**	**49.1%**	**18.3%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Bras d'Or Lowlands 510)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Coastal Beach	XXCB	Softwood				Early	0	0	0	0	0	32; 48.1	EARLY	16; 24.4
						Mid	0	0	0	3	4			
						Late	2	7	16	3	28			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	3	0	3	6	20; 30.0	MID	20; 29.7
						Mid	0	1	2	11	13			
						Late	0	0	1	0	1			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	2	0	3	6; 8.3	LATE	29; 43.8
						Mid	0	0	3	0	3			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	8	0	0	0	8	9; 13.6	UNCL	1; 2.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
Total					**307***	**# ha**	**13**	**11**	**24**	**19**	**67**			
						%	**18.9%**	**16.2%**	**36.1%**	**28.8%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Drumlins and Hummocks Matrix	IFKK IMDM WCHO WFDM WMHO WMDM WMKK WFKK WMRD	Gap Gap Gap Gap Gap Gap Gap Frequent Gap	sM yB Be eH wP sM yB Be sM yB Be bS wP sM yB Be sM yB Be bS wP bS wP sM yB Be	S	SrSbSDom	21,888	20.5%	L	**Well-drained** Early - ltA, tA, wB, rM, gB, bF Mid - rM, bF, yB, wP Late - rM, yB, sM, Be, eH, wP, rS (rare) **Moist** bS, bF, tL, wP, rM, yB, wA
				S	SwSDom	9,213	8.6%	E	
				S	SsbFDom	8,268	7.7%	E	
				S	SSpbFDom	6,256	5.9%	E/M	
				S	SPiDom	207	0.2%	L	
				S	SMHePiSp	197	0.2%	L	
				M	MIHwSH	16,904	15.8%	M	
				M	MIHwHS	12,879	12.0%	M	
				M	MTHw	2,357	2.2%	L	
				H	HIHw	15,060	14.1%	M	
				H	HITHw	7,422	6.9%	M/L	
				H	HTHw	6,233	5.8%	L	
Total						**106,884**	**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 Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Flats	ICSM IFSM WMSM	Frequent Frequent Frequent	Bs Bs Bs	S	SrSbSDom	558	44.1%	L	**Well-drained** Early – wS, tA, bP, wA, rM Mid – aE, bP, wA, sM Late – aE, sM, wA **Moist** bS, bF, wP, rM, tL **Wet** wetlands and bogs, scattered bS, tL, rM
				S	SSpbFDom	118	9.3%	E	
				S	SwSDom	104	8.2%	E	
				S	SsbFDom	30	2.4%	E	
				S	SMHePiSp	7	0.6%	L	
				M	MIHwSH	183	14.5%	M	
				M	MIHwHS	100	7.9%	M	
				M	MTHw	22	1.8%	L	
				H	HTHw	72	5.7%	L	
				H	HIHw	41	3.3%	M	
				H	HITHw	31	2.4%	M/L	
Total						**1,267**	**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

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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 IFDM IFHO IFRD IMHO IMRD WFHO WFRD	Frequent Frequent Frequent Frequent Frequent Frequent Frequent Frequent	bS wP bS bS wP bS wP bS wP bS wP bS wP bS wP	S	SrSbSDom	24,820	35.1%	L	**Well-drained** Early - ltA, tA, wB, rM, gB, bF Mid - rM, bF, yB, wP Late - rM, yB, sM, Be, eH, wP, rS(rare) **Moist** bS, bF, wP, rM, tL **Wet** wetlands and bogs, scattered bS,tL,rM
				S	SSpbFDom	4,595	6.5%	E	
				S	SwSDom	4,435	6.3%	E	
				S	SbFDom	4,178	5.9%	E	
				S	SMHePiSp	165	0.2%	L	
				S	SPiDom	57	0.1%	L	
				M	MIHwSH	10,238	14.5%	M	
				M	MIHwHS	7,696	10.9%	M	
				M	MTHw	2,386	3.4%	L	
				H	HIHw	7,177	10.1%	M	
				H	HITHw	2,729	3.9%	M/L	
				H	HTHw	2,321	3.3%	L	
Total						**70,797**	**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 Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	IMSM WTLD			S	SrSbSDom	2,292	58.5%	L	**Moist** bS, wP, bF, (rM), (tL) **Wet** wetlands and bogs, scattered bS, tL, rM
				S	SSpbFDom	334	8.5%	E	
				S	SsbFDom	147	3.8%	E	
				S	SwSDom	130	3.3%	E	
				S	SMHePiSp	19	0.5%	L	
				S	SPiDom	2	0.1%	L	
				M	MIHwSH	368	9.4%	M	
				M	MIHwHS	281	7.2%	M	
				M	MTHw	28	0.7%	L	
				H	HIHw	227	5.8%	M	
				H	HITHw	54	1.4%	M/L	
				H	HTHw	34	0.9%	L	
Total						**3,916**	**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 Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Valley Corridors	ICHO	Frequent	bS wP	S	SrSbSDom	946	22.3%	L	
	ICSM	Frequent	bS	S	SwSDom	479	11.3%	E	
	IFHO	Frequent	bS wP	S	SbFDom	299	7.0%	E	
	IFKK	Gap	sM yB Be eH wP	S	SSpbFDom	279	6.6%	E	
	IFSM	Frequent	bS	S	SMHePiSp	8	0.2%	L	
	IMHO	Frequent	bS wP	S	SPiDom	3	0.1%	L	
	IMSM	NONE		M	MIHwSH	679	16.0%	M	
	WCDM	Gap	sM yB Be	M	MIHwHS	489	11.5%	M	
	WCHO	Gap	sM yB Be	M	MTHw	253	6.0%	L	
	WCRD	Gap	sM yB Be	H	HIHw	476	11.2%	M	
	WFHO	Frequent	bS wP	H	HTHw	204	4.8%	L	
	WFRD	Frequent	bS wP	H	HITHw	130	3.1%	M/L	
	WMDM	Gap	sM yB Be						
	WMHO	Gap	sM yB Be						
	WMKK	Gap	sM yB Be						
	WMRD	Gap	sM yB Be						
	WMSM	Frequent	bS						
	WTLD	None							
	XXMS	None	salt marsh						
Total						**4,244**	**100.0%**		

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

Appendix 10: Table 2: Composition of Forest Communities (in Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Salt Marsh	XXMS	None	salt marsh	S	SrSbSDom	50	33.4%	L	
				S	SwSDom	18	12.3%	E	
				S	SSpbFDom	14	9.1%	E	
				S	SbFDom	11	7.1%	E	
				M	MIHwSH	36	24.3%	M	
				M	MIHwHS	8	5.0%	M	
				H	HIHw	10	6.9%	M	
				H	HTHw	3	1.8%	L	
Total						**150**	**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 Bras d'Or Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Coastal Beach	XXCB	NONE	coastal beach	S	SwSDom	20	35.2%	E	
				S	SrSbSDom	12	21.0%	L	
				M	MIHwSH	14	25.3%	M	
				M	MIHwHS	5	8.7%	M	
				H	HIHw	3	5.3%	M	
				H	HITHw	3	4.6%	M/L	
Total						**56.6**	**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	125,595	45.0%	205,110	24.4%
bS wP	112,202	40.2%	234,959	28.0%
sM yB Be eH wP	10,232	3.7%	10,232	1.2%
bS	8,582	3.1%	98,073	11.7%
aE sM wA	1,056	0.4%	8,937	1.1%
Total	**257,666**	**92.4%***	**557,310**	**66.4%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Drumlins and Hummocks	138,051	3,009	90,651	2,074	25,725	16,593	75,663 to 83,960	55 to 61
Spruce Pine Hummocks	94,110	4,088	68,541	1,359	11,103	9,019	57,554 to 62,011	62 to 67
Wetlands	9,364	965	7,174	32	748	445	6,464 to 6,687	69 to 71
Valley Corridors	7,258	380	5,133	42	1,199	505	4,374 to 4,627	60 to 64
Spruce Pine Flats	1,651	37	1,333	7	164	111	1,066 to 1,121	65 to 68
Salt Marsh	398	9	318	0	52	18	252 to 261	63 to 66
Coastal Beach	280	63	150	0	57	10	178 to 183	64 to 65
Total	**251,112**	**8,550**	**173,299**	**3,513**	**39,048**	**26,702**	**146,080 to 159,429**	**58 to 63**

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

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

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

EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
ICHO	2,870	30	2,082	25	514	219	1,652 to 1,762	58 to 61
ICSM	522	14	410	4	67	26	329 to 342	63 to 66
IFDM	908	0	655	38	115	101	526 to 576	58 to 63
IFHO	27,471	622	20,834	487	2,532	2,996	17,118 to 18,616	62 to 68
IFKK	11,910	125	8,436	58	1,601	1,691	6,889 to 7,734	58 to 65
IFRD	2,474	47	1,863	13	329	223	1,503 to 1,615	61 to 65
IFSM	1,449	1	1,201	2	145	101	927 to 978	64 to 67
IMDM	3,097	1	2,277	61	392	367	1,815 to 1,998	59 to 65
IMHO	49,408	3,388	34,927	701	6,191	4,201	30,809 to 32,909	62 to 67
IMRD	5,120	62	4,192	43	236	587	3,363 to 3,656	67 to 71
IMSM	3,534	33	2,642	9	669	182	2,062 to 2,153	58 to 61
WCDM	315	111	109	0	71	23	199 to 210	63 to 67
WCHO	8,297	289	4,358	94	3,062	493	3,704 to 3,951	45 to 48
WCKK	362	0	141	0	175	46	118 to 141	32 to 39
WCRD	444	24	234	6	116	64	217 to 249	49 to 56
WFDM	608	0	401	13	54	140	339 to 409	56 to 67

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

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
WFHO	7,447	39	5,426	76	1,160	746	4,314 to 4,687	58 to 63
WFKK	15,130	272	10,863	68	2,087	1,841	8,896 to 9,817	59 to 65
WFRD	603	0	224	0	264	115	197 to 254	33 to 42
WMDM	26,027	1,497	18,379	651	2,171	3,329	16,276 to 17,941	63 to 69
WMHO	20,991	612	13,120	337	4,930	1,991	11,035 to 12,030	53 to 57
WMKK	44,249	208	27,506	626	10,012	5,897	22,468 to 25,417	51 to 57
WMRD	8,488	118	5,785	173	1,512	901	4,725 to 5,176	56 to 61
WMSM	339	26	263	2	29	19	228 to 238	67 to 70
WTLD	8,159	963	6,331	27	475	364	5,809 to 5,990	71 to 73
Total	**250,219**	**8,481**	**172,659**	**3,513**	**38,905**	**26,661**	**145,518 to 158,849**	**58 to 63**

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

Appendix 13:

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

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

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

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

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

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

Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old growth. Mature forests include multi-aged and old growth. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes, and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old growth.
Memorandum of understanding (MOU)	An agreement between ministers defining the roles and responsibilities of each ministry in relation to the other or others with respect to an issue over which the ministers have concurrent jurisdiction.
Mixed stand	A stand composed of two or more tree species.
Multiple use	A system of resource use where the resources in a given land unit serve more than one user.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.
Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand-initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand-initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand-initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.

Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.
Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure.)
Pre-commercial thinning	A silviculture treatment to reduce the number of trees in young stands before the stems are large enough to be removed as a forest product. Provides increased growing space and species selection opportunities to improve future crop tree growth.
Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain, or standing water body.
Road deactivation	Measures taken to stabilize roads and logging trails during periods of inactivity, including the control of drainage, the removal of sidecast where necessary, and the re-establishment of vegetation for permanent deactivation.
Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms which are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened, and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.

Threatened species	A species that is likely to become endangered if the factors affecting its vulnerability are not reversed. A species declared as threatened under the federal or Nova Scotia species at risk legislation (NS Endangered Species Act or federal SARA).
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vernal pool	A seasonal body of standing water that typically forms in the spring from melting snow and other runoff, dries out in the hotter months of summer and often refills in the autumn.
Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

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