Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CHIGNECTO RIDGES ECODISTRICT 560

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2014-560

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 560: Chignecto Ridges

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Chignecto Ridges 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 (1995) – 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 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 Chignecto Ridges 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).

Red and Black Spruce Hummocks is the matrix element comprising more than sixty percent of the ecodistrict and dominated by late successional softwood stands of red and black spruce, with scattered jack pine and white pine.

The largest patch is **Jack Pine Hummocks and Ridges**, distinctive because of the jack pine and parallel ridges. The **Wetlands** element is a series of small, medium, and large wetland patches that are extremely important for water collection, filtering, groundwater recharge, and moose habitat.

Tolerant Mixedwood Hills is the only large patch where a significant amount of shade-tolerant sugar maple is found. **Tolerant Mixedwood Slopes** has a mixedwood covertype but is now dominated by softwoods and some mature hardwoods. **Spruce Pine Flats** has several small softwood patches, dominated by black spruce, red spruce, and white pine.

Connecting the matrix with the patches is the **Valley Corridors** element, which features several prominent river corridors.

Two tiny elements, Floodplain and Salt Marsh, are also part of the ecodistrict.

Flow – Element Interactions (Appendix 1; Map 2)

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

Some of these species act as surrogates for other species. For example, if in some cases moose are not mentioned, that does not mean they are not being considered.

As an example of the flow-element interactions, moose use the large softwood matrix as its primary habitat. This element has been shaped in the past by frequent fires that resulted in large patches containing significant amounts of browse.

Improved fire suppression and decreased harvesting in the Chignecto Game Sanctuary has altered the matrix to predominately mature softwood species.

The ecodistrict is dominated by the Red and Black Spruce Hummocks matrix, which supports the potential for natural movement of species and water throughout. Some of the more concentrated flow phenomena are shown in Map 2. One of the more prominent flow areas appears on a small knoll between the Kelley River and Atkinson Brook, where a naturally constricted area of the matrix occurs.

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

Landscape Connectivity

(Appendices 2a, 2b; Map 2)

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

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

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

River corridors may promote connectivity.

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.

In Chignecto Ridges, river valleys are well-defined hydrologically and topographically and function as corridor elements providing linkages to the Cumberland Hills and Parrsboro Shore ecodistricts. However, forests within the Two Rivers, River Hébert, Southampton River, and the Maccan River corridors have been significantly altered by human land use, such as settlement, farming, and transportation systems (Map 2).

Forests within river corridors, in areas such as River Hébert, have been significantly altered by human use.

Overall, Chignecto Ridges is dominated by forests that have a fairly natural structure and representation of forest communities.

Forests within the Two Rivers, River Hébert, and the Maccan River corridors have been significantly altered by human land use and transportation systems, which may reduce the connective function of the corridors for some species, and may increase the barrier effect of the corridors for species that must move across (Map 5).

An additional concern in ecological planning is the maintenance of connectivity among conservation areas, including wilderness, old forest, provincial parks, and ecological reserves that are often not ecologically related. At the landscape scale of planning, connectivity among these areas in Chignecto Ridges is supported by the dominant forest structure.

Connectivity may be sustained by applying the natural disturbance regime (NDR) guidelines for landscape composition by development class, seral stage, and covertype, and recognizing natural

linkage opportunities. Other aspects of landscape management may also need to be considered to promote connectivity for particular resource values.

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

Three of the landscape flows – people, water, and deer – are identified with major linkages to adjacent areas or ecodistricts (Map 2).

The hydrological system provides the most obvious physical connection between Chignecto Ridges and its surroundings. This plain tends to be a catchment area containing numerous small wetlands, and only one large lake, Harrison Lake, along with scattered small lakes, such as Round and Long, linked to small streams.

The major corridors are along the Maccan River and River Hébert which flow north into the Chignecto Bay and are influenced by the tides that extend inland for 10 to 15 kilometres. Although the Kelley River is fairly large, it is considered a tributary that runs into River Hébert. This river flows through an intolerant hardwood corridor for some distance but is generally a low lying area surrounded by bogs and black spruce forests.

People and transportation links in the Southampton area.

Other smaller corridors are Two Rivers, Apple and Shulie rivers, which are located on the north coast of the ecodistrict and also flow toward Chignecto Bay.

Deer move in and off the ridges, moving south in winter out of the Atkinson Brook, Kelley River, and Apple River area toward their wintering area along the Parrsboro Shore, away from the harsh winter climate found along the Chignecto Bay.

Jack pine, and to a lesser extent red pine, occur across the western ecodistricts of the Northumberland / Bras d'Or Ecoregion, including the Chignecto Ridges. These fire-associated ecosystems are currently succeeding to black spruce due primarily to improved fire suppression.

People provide a link between the neighbouring ecodistricts of the Cumberland Marshes, Cumberland Hills, and the Parrsboro Shore to Chignecto Ridges through their activities, such as recreation, transportation, fishing, forest management, development, and settlements. The main links are located in the Southampton area, Parrsboro, Boars Back Road, Maccan, Joggins, and Apple River area.

Transportation linkages from the Chignecto Ridges, Cumberland Marshes, Cumberland Hills, and the Parrsboro Shore bring international tourists to the Joggins Fossil Cliffs, along the Glooscap Trail into the community of Parrsboro as well as the Cape Chignecto Provincial Park.

Future management activities should 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 Chignecto Ridges

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Floodplain	*FP5, FP6*		*FP3*		***FP1***	
Red and Black Spruce Hummocks	IH1, IH4, IH5, IH6, SP10	5.0	MW4, MW5, SH5, SH6, SH7, SH8, SH10, SP4, SP6, SP8	32.0	SH1, SH2, **SH3**, SH4, **SP5**, SP7	58.0
Spruce Pine Flats	IH4, IH6, OW2, SP1, SP2, SP10	2.0	SH9, SP6, SP8	17.0	SP5, **SP7**	81.0
Jack Pine Hummocks and Ridges	IH1, IH6, OW1, OW2, SP1, SP2	5.0	SP3, SP4, SP6, SP8	32.0	SP5	58.0
Tolerant Mixedwood Hills	IH3, IH5, IH6	3.0	MW2, MW4, MW5, SH5, SH6, SH8, SH10	43.0	**MW1, MW3,** SH1, SH2, SH3, TH1, TH2, TH3, TH8	52.0
Tolerant Mixedwood Slopes	IH3, IH5, IH6	10.0	MW2, MW4, MW5, SH5, SH6, SH8, SH10	31.0	**MW1, MW3,** SH1, SH2, SH3, TH1, TH2, TH3, TH4, TH8	56.0
Salt Marsh	*Grasslands of* Spartina spp.					
Wetlands	CE1, WC1, WC2, WC3, WC4, WC5, WC6, WC7, WD2, WD3, WD5, WD6, WD8					

View forest groups and vegetation types at
http://novascotia.ca/natr/forestry/veg-types/veg-navigation.asp
To help with identification of vegetation types, the 14 forest groups in Nova Scotia designated by DNR are: Cedar (CE), Coastal (CO), Flood Plain (FP), Highland (HL), Intolerant Hardwood (IH), Karst (KA), Mixedwood (MW), Old Field (OF), Open Woodland (OW), Spruce Hemlock (SH), Spruce Pine (SP), Tolerant Hardwood (TH), Wet Coniferous (WC), Wet Deciduous (WD)
Bolded vegetation types indicate typical late successional community
[1] Forest Ecosystem Classification for Nova Scotia (2010)
*Percentage of element in each successional stage. Percentages may not total 100 due to unclassified lands (such as clearcuts and regenerating stands) not being included.

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

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

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

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

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

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

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

In Chignecto Ridges, 76% is in the extensive class, 4% in intensive, 13% in converted, and 3% in reserve.

The overall EEI rating for this ecodistrict is in the range of 64 to 70. This rating is an indication that overall land use intensities have a low conservation risk status.

The areas in the different conservation classes in this ecodistrict are shown in Map 3.

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 - 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.

Currently, Chignecto Ridges has an overall average Road Index value of 9 (Table 3 in Appendix 7) that falls within the "Forest Resource Index" range of 7 to 15, which is considered to be in the light road group with forest access roads and trails. A little over half of the ecodistrict falls within this category. A little over one-fifth of the ecodistrict has a remote road index value between 0 and 6 (Table 2 in Appendix 7).

These areas with few roads are in the Remote range, distributed in patches across the district and are mostly associated with wetlands, wetland complexes, barrens, and forest lands with relatively low stocking levels. These areas may be particularly important to sensitive species such as moose that appear to need more isolated habitat.

As expected, the highest road densities occur around the settlements or main transportation systems found in the Barnhill River, River Hébert, and the Maccan River areas. Indices in these areas are in the mixed rural and agriculture/suburban category (Table 2 in Appendix 7 and Map 5). The road index also highlights the area along the Maccan River to Southampton where high densities of roads bisect the ecodistrict, potentially contributing to habitat fragmentation.

Opportunities for work on road and trail access in the design phase include:

- Conserving the distribution of present low road density areas through strategic scheduling of new access, and decommissioning where possible. Road and trail plans should include life expectancies for roadbeds, drainage, and stream crossings in order to develop appropriate construction, maintenance, and decommissioning strategies.
- Scheduling access systems for regular maintenance or decommissioning, particularly where connectivity or additional reserves are to be established.
- Including analysis of road density impacts in land management planning that involves

access systems.

- Any off-highway vehicle trails should be strategically located, away from sensitive areas for wetlands, special management zones, rare and unique wildlife habitat.
- Seeking to improve the distribution and connectivity between low road density areas (west side of Highway 302 near Southampton) where this may improve connectivity among natural areas and linkages to the neighbouring ecodistrict of Cumberland Hills (Map 5).

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

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

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

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

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

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

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

Species at Risk

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

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

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

As of 2013 in the Chignecto Ridges Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: two endangered, three threatened, and two vulnerable. In addition to the listed species, the national general status process also identifies 11 orange status species, 26 yellow status species, and 13 green status species for a total of 50 other species of conservation concern in this ecodistrict.

Designated species at risk found within the ecodistict include wood turtle, Atlantic salmon, moose, black ash, monarch butterfly, and several bird species (olive-sided flycatcher, eastern wood-pewee, bobolink, bank swallow, and Canada warbler).

Other species of conservation concern known in Chignecto Ridges include eastern lampmussel and triangle floater (mollusks); spotted sandpiper, yellow bellied flycatcher, and Tennessee warbler (birds); bog birch, blue cohosh, and Canada lily (plants); Jutta arctic and Quebec emerald (ferns and their allies); and fisher (mammals).

Birds

As of 2013, five species of birds found to be present in the ecodistrict are designated at risk. Four of these are listed under the NSESA: Canada warbler as endangered; the olive-sided flycatcher as threatened; and the eastern wood-pewee and bobolink as vulnerable. Nationally, two species are listed under SARA: the olive-sided flycatcher and Canada warbler as threatened.

Generally, there has been a nationwide decline in aerial insectivores, such as the olive-sided flycatcher and eastern wood-pewee, which is commonly attributed to a decline in flying insects. The bobolink is associated with large open grasslands and hayfields and declines are due to mortality from agricultural practices, habitat loss, fragmentation, and bird control methods. Habitat loss and land use practices, particularly on wintering grounds, are believed to have contributed to the widespread decline of the Canada warbler and olive-sided flycatcher. Availability of nesting habitat for bank swallow is also thought to be a threat to the species.

Plants

Black ash is the only documented plant species at risk in the Chignecto Ridges Ecodistrict. In 2013, black ash was listed under the NSESA as threatened; there are an estimated 1,000 individuals and only 12 mature trees provincially. The only known occurrence of black ash in Chignecto Ridges is identified along the northeastern fringe of this ecodistrict.

Fish

The Maccan and River Hébert are the two major rivers in the ecodistrict. Both are tidal rivers that flow north into Chignecto Bay. Historically, Atlantic salmon have utilized these rivers for spawning and continue to make some use of the available habitat they present. The Inner Bay of Fundy salmon population has steadily declined over the last 20 years and has been designated as endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and protected under the federal Species at Risk Act.

The decline in Atlantic salmon is not well understood but evidence suggests that low marine survival is a primary cause that may be due to ecological changes in the Bay of Fundy. Other threats to this species include environmental contaminants, habitat loss and degradation, lack of riparian buffers along waterways, water passage obstruction, and lack of pools.

Insects

Monarch butterflies are designated by COSEWIC and listed under SARA as special concern but have no provincial listing. They are grouped with the milkweed butterflies of the family Danaidae, which also includes the viceroy. The monarch is the most common of this group, occurring throughout the U.S. and southern Canada and is also one of the few butterflies that are migratory.

Monarch habitat in Nova Scotia includes fields, meadow, abandoned farmland, and roadsides that have a presence of milkweed. Monarchs will only lay their eggs on the leaves of milkweed, which is the primary food source for the developing caterpillars. Adults may occasionally be observed after the breeding season in the Chignecto Ridges Ecodistrict as they may in other areas of the province. Only three reports are known for this area, two in East Apple River and one near Springhill Junction.

Mammals

Endangered mainland moose have been reported in low numbers in the the Chignecto Ridges Ecodistrict.

Moose on the mainland of Nova Scotia have been listed as endangered under the Nova Scotia Endangered Species Act (2003). Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy. The Chignecto Ridges Ecodistrict falls within a large area that has been identified as a significant concentration area for mainland moose. This area is considered to be “occupied moose habitat” (an area with recurrent observations of moose over time) and they are reported to occur throughout in low numbers.

Moose are commonly associated with forested landscape habitats that have frequently been altered by a disturbance regime, such as fire, wind, disease, and timber harvesting. Historically in this ecodistrict, fire played an important role in beneficial habitat provisions for the moose population. Now, because of our modern approach to fire management, the role of fire as a natural disturbance is no longer providing conditions for moose habitat.

Timber harvesting practices, as well as other forms of land use, such as pipeline development, play an important role in creating a change in the forest landscape. This change provides food for moose, such as the succulent twigs, stems, and foliage of young deciduous trees and shrubs.

The habitat requirements of moose are largely dependent on successional forest stages. Early succession hardwood trees and shrubs provide important browse while mature conifer cover is available for shelter, thermal cover, and protection in winter and summer. Secluded wetland areas with an abundance of emergent vegetation are used for both feeding and cooling during the summer. The availability of suitable habitat for endangered mainland moose is important in maintaining its future presence.

Special management practices for mainland moose are applied for forestry activities on Crown land in designated concentration areas. (See http://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_Mainland_Moose.pdf).

Application of these practices during forest management planning specifically aim to conserve calving areas, aquatic feeding areas, and thermal refugia. The Forest / Wildlife Guidelines and Standards provide minimal habitat specifications for moose on Crown land through the 8% retention for old growth, maintenance of reasonable age class distribution.

Reptiles

Wood turtle is listed as threatened under both the federal SARA and the provincial NSESA. Based on species occurrence information, the Chignecto Ridges Ecodistrict is not likely to support a large number of wood turtle. Infrequent sighting reports are associated with River Hébert and the Maccan River. Wood turtles are uncommon province-wide, with the majority of observations occurring at a few main concentration areas, none of which are located within this ecodistrict.

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

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

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

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

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

560 Chignecto Ridges Ecodistrict			
Landscape Element and Type	**Ecosections* and Proportion of Element**	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Red and Black Spruce Hummocks (Matrix)	ICHO IFHO IMHO WCHO	Frequent	red Spruce (rS), black Spruce (bS) and white Pine (wP)
Jack Pine Hummocks and Ridges (Patch)	ICRD WCRD	Frequent	bS, wP, jack Pine (jP), red pine (rP)
Wetlands (Patch)	WTLD	Open Seral (Frequent)	
Tolerant Mixedwood Hills (Patch)	WCKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be), rS
Tolerant Mixedwood Slopes (Patch)	WCDS WFDS	Gap	rS, wP, yB, sM, Be
Spruce Pine Flats (Patch)	ICSM	Frequent	bS, wP, jP, rP
Floodplain (Patch)	*IFSM* *IMSM*	*Gap*	*american Elm (aE), sM, white Ash (wA)*
Salt Marsh (Patch)	*XXSM*	*Open Seral*	
Valley Corridors (Corridor)	Various	Various	Various

***Ecosection Explanations**: For example, in **ICHO**, **I** stands for Imperfectly drained under Soil Drainage **C** stands for Coarse-textured under Soil Texture and **HO** stands for Hummocky under Topographic Pattern

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

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

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

On the ridged ecosections, repeated wildfires resulted over time in the natural development of stands of jack pine, black spruce, red maple, and white birch. With suppression or prevention of fire, many of these stands over time would progress to more long-lived tree species including red spruce, white pine, and hemlock.

The landscape analysis identified ecosystems requiring fine filter management attention – directed toward particular habitats or individual species that might fall through the coarse filter – to conserve their uncommon characteristics and sustain the ecological representation of natural conditions.

Table 2 of Appendix 3 identifies rare ecosections – those that form less than 2% of the

ecodistrict or ecoregion area or have been extensively affected by human activities – that may occur. Within Chignecto Ridges, four ecosections, ICSM, IFSM, IMSM, and WFDS, are considered rare (Map 7).


Old forest stands have been identified on 7% of Crown lands.

Of these four ecosections, IFSM and IMSM, located along the river corridors of the Maccan and River Hébert and Southampton, have the highest land use pressures, with 22% and 24% respectively converted to human settlement, farming, and other development activities. These same ecosections also form less than 2% of the ecoregion and for the most part are under the same land use pressures. No ecosection is more than one-quarter converted to non-forest uses in this ecodistrict.

Old forest stands have been identified on 2,286 hectares, or 7% of the Crown lands.

In 2012, DNR released an Old Forest Policy, under which staff will identify old growth and the best old forest restoration opportunities on at least eight percent of publicly owned forested land in each of the province's 38 ecodistricts. (http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf)

The climax community type of elm, sugar maple, and white ash forms only a little over 1% of the ecodistrict.

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.

About 2,290 hectares are defined as *policy* reserves, including old forest sites set aside under the Provincial Old Forest Policy along with wildlife habitat sites under the Eastern Habitat Joint Venture Program. These two reserves account for about 3% of the area of Chignecto Ridges (Appendix 4, Appendix 5, and Map 3). At the time of writing, there are only a few small legally protected beaches, sites of ecological significance, and special places. New candidate wilderness areas will be proposed as part of the 12% protected area goal under the 2007 Environmental Goals and Sustainability Prosperity Act.

ELA Summary

Element Interpretation (All appendices and maps)

The ridging in this ecodistrict is easily observed on aerial photographs. This folding of the underlying strata, made up of grey sandstones, siltstones and shale, can be found throughout the Chignecto Game Sanctuary.

Another interesting glacial landform in this ecodistrict is the esker (a linear to meandering ridge consisting of sorted sand and gravel deposits created by water flowing beneath a glacier. The Boars Back Road through the sanctuary has been constructed on top of an esker.

Occupying most of northern Cumberland County, this ecodistrict is a plain tilting towards Chignecto Bay. Elevation seldom exceeds 120 metres above sea level. The western boundary is the Bay of Fundy and although there is a moderate coastal influence on forest growth, this effect is not reflected very far inland. Overall the climate is similar to the Cumberland Hills Ecodistrict.

Underlying this ecodistrict is the coal-bearing Carboniferous strata, with coal seams at Joggins, Springhill, River Hebert, and Maccan. The strata include coarse and fine grained sandstones, which are exposed in some locations (Chignecto Game Sanctuary) and overlain by sandy tills to the east of the River Hébert. For the most part, this ecodistrict is characterized by shallow, imperfectly drained soils derived from sandstones. In many of the soil landscapes, drainage is influenced by the haphazard arrangement of the bedrock which creates a pattern of imperfectly and poorly drained soils. On the ridged ecosections, repeated wildfires have resulted in stands of jack pine, black spruce, red maple, and white birch. Many of these stands over time would progress to include red spruce, white pine, and hemlock. Fire and glacial activity have resulted in large area of thin soils and exposed bedrock in this ecodistrict.

The steep slopes along the Bay of Fundy and the better-drained, deeper soils inland support stands of red spruce. On upper slopes and crests of well-drained ecosections, stands of tolerant hardwoods include sugar maple and yellow birch.

Red and Black Spruce Hummocks
(Matrix) (ICHO, IFHO, IMHO and WCHO ecosections) (47,329 ha)

This element is now dominated by mature late seral softwood stands of red, black and hybrid spruce located on imperfectly drained, fine to coarse-textured soils. Jack pine, black spruce, and white pine also occur throughout the matrix. About one-fifth of this element type also supports early to mid-successional hardwood stands and hardwood-dominated mixedwood.

The Ecological Emphasis Index range of 62 to 70 may suggest a low conservation risk, but DNR will consider other measures of landscape integrity in integrated management planning.

Red and Black Spruce Hummocks is made up of ecosections characterized by climax forests of primarily red and black spruce located on imperfectly drained rolling terrain. The dominant disturbance type for all ecosections in this element would be frequent stand-initiating events, such as insect infestations and forest fires.

Flows

Human (forestry, recreation, hunting); moose (primary habitat, travel, thermal cover); goshawk (mature - primary habitat, nest in pines also hardwoods, large patches/large trees, open understory); water (catchment, filter groundwater recharge); furbearers (mature climax species with course woody material serves as the primary range and denning area for fishers); deer (summer range and cover).

Composition

ChignectoRidges Ecodistrict 560 (based on statistics up to 2006)

Composition of Red and Black Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	31%	18%	51% (46 Mat + 5 OF)	5%
Seral Stage	Early	Mid	Late	Unclassified
	5%	32%	58%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	58%	22%	18%	2%

Desired Condition

The desired condition for this element would be spruce-dominated softwood stands in a variety of patch sizes and development stages.

Inclusion of both tolerant and intolerant hardwood and mixedwood knolls would be favoured, along with improved connectivity of mature softwood stands among reserves, wetlands, and river corridors.

Issues

- Mid seral species of white birch and red maple dominate the mixedwood and hardwood

stands.

- IFHO ecosection is fairly uncommon representing only 3.3% of the total area of the ecosection.
- Four climax community types may require additional representation under the Old Growth Forest Policy (black spruce, white pine) (jack pine, black spruce, white pine) (red spruce, eastern hemlock, white pine, sugar maple, yellow birch, beech), and (sugar maple, yellow birch, beech).

Jack Pine Hummocks and Ridges

(Patch) (ICRD and WCRD ecosections) (14,097 ha)

This element is a prominent well-drained patch with shallow soils over bedrock ridges, supporting mid and late seral softwood communities of red, black and hybrid spruce, white pine, and jack pine.

Heath-like vegetation, black spruce, and mid-successional hardwoods in the young development class are found on the imperfectly drained sites between the ridges. The jack pine, red spruce, and white pine community is fairly rare within the ecodistrict.

This element features two ecosections of similar size. The dominant natural stand replacement agent in Jack Pine Hummocks and Ridges is frequent stand-initiating caused by insect infestation and fire.

Flows

Water (collection); moose (habitat, food); furbearers (cat and hare - travel, food, and shelter).

Composition

Chignecto Ridges Ecodistrict 560 (based on statistics up to 2006)

Composition of Jack Pine Hummocks and Ridges

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	23%	39%	37% (31 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	5%	32%	58%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	58%	22%	18%	2%

Desired Condition

The desired condition for this element would be late seral-dominated softwood stands of red and black spruce and white pine and softwood-dominated mixedwood stands of spruce, pine, red maple, and white birch with a variety of development classes.

Issues

- Element has an unbalanced development class, with only 37% of the area in the mature and multi-aged development classes.
- High percentage of mixedwood and hardwood in this softwood element type
- Concerns regarding future forest succession in the jack pine, black spruce, and white pine community, considering fire plays a reduced role in forest succession.
- A very small percentage of these ecosections with these community types are present on Crown lands. Area set aside for representation is less than 2% (Appendix 4).

Wetlands
(Patch) (WTLD ecosection) (2,733 ha)

A series of small, medium, and large wetland patches are extremely important in this ecodistrict. With few lakes, these wetland complexes have a high importance in water collection, filtering, groundwater recharge, moose habitat - calving, thermal protection, and feeding.

Tompkin Plains, Muddy Plains, Bear Den Road, and around Long and Round lakes are the largest wetland patches. These wetland patches are characterized by imperfect to poorly drained soils, with stunted black spruce, white pine and jack pine, intolerant hardwoods, heath-like vegetation, and red spruce on some of the better-drained small knolls. Old forest representation is present around these complexes.

Flows

Human (peat, off-highway vehicles, rare plants); water (collection, filter, groundwater recharge); moose (feeding, thermal, calving).

Composition

Chignecto Ridges Ecodistrict 560 (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
	30%	31%	39% (30 Mat + 9 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	3%	11%	78%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	86%	5%	5%	4%

Desired Condition

The favoured condition would be to have the element comprise a series of wetlands and wetland complexes all interconnected to hydrological system.

Issues

- There are some connectivity issues between and among the wetland complexes.
- Need for education of public on the potential damage to these ecosystems by the use of off-highway vehicles.
- Approximately 4.6% of these wetlands have policy reserves – additional representation required (Appendix 4).

Tolerant Mixedwood Hills

(Patch) (WCKK ecosection) (2,395 ha)

This patch element is inherently a well-drained coarse-textured knoll of red spruce, sugar maple, yellow birch site that now is shifting to softwood species. Forty percent of the patch is softwood with red spruce, black spruce, and white pine dominating.

At the time of the data collection, the forest composition was in an unbalanced state with an overabundance of young and mid seral communities and a shortage of late seral hardwood in the mature and multi- aged development class. This climax community represents only 2.7% of the ecodistrict.

This is the only large patch where a significant amount of tolerant sugar maple is found.

This forest type would naturally be replaced with individual trees dying due to insects or mortality, creating gaps in the forest.

Flows

Human (timber, recreation off-highway vehicles, hunting); water (catchment, filter, ground water recharge); moose (cover, thermal); interior birds (goshawk - mature - primary habitat, nest in pines also hardwoods, large patches/large trees, open understory); furbearers (mature climax forest with coarse woody material serve as the primary range and denning area for fishers); deer (summer range and cover).

Composition

ChignectoRidges Ecodistrict 560 (based on statistics up to 2006)

Composition of Tolerant Mixedwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	10%	18%	72% (67 Mat + 5 OF)	5%
Seral Stage	Early	Mid	Late	Unclassified
	3%	43%	52%	2%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	41%	35%	22%	2%

Desired Condition

The desired condition for the Tolerant Mixedwood Hills element would be forest stands of mainly mature hardwood and mixedwood with a sustained community of late seral species of sugar maple, red spruce, and yellow birch.

Issues

- A hardwood community type that is shifting to a softwood/mixedwood covertype.
- Unbalanced seral stages. Young mid seral species account for 43% of the total area. Late seral species only account for 52% of the total on this gap-disturbed patch type.
- A sugar maple, yellow birch, and beech community that has 3 to 4% of its area in reserve status (Appendix 4).

Tolerant Mixedwood Slopes

(Patch) (WCDS and WFDS ecosections) (337 ha)

This element historically contained a mixture of well-drained, mature tolerant hardwood and late seral softwoods. Tolerant Mixedwood Slopes, a relatively small patch element, is found in two locations, Sand River and the Joggins area.

The patch still maintains a mixedwood covertype but it is now dominated by red spruce, black spruce, and white pine in the late seral stage along with mid seral hardwoods in the mature development class. The present forest composition is in a slightly unbalanced state with an overabundance in establishment and young development classes and 41% of the forest stands in the mature category. Natural disturbances would be infrequent, with species usually replacing themselves through natural mortality.

Flows

Human (forestry, hunting, trapping, recreation); water (Catchment, filter, groundwater recharge); moose (limited moose habitat, feeding); furbearers (fisher – late seral cavity trees that have fallen – denning sites); deer (general summer habitat).

Composition

Chignecto Ridges Ecodistrict 560 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Slopes

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	20%	25%	55% (41 Mat + 14 OF)	14%
Seral Stage	Early	Mid	Late	Unclassified
	10%	31%	56%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	49%	26%	15%	10%

Desired Condition

The favoured condition for this element would be a mixedwood community of late seral species with the major portion of the community in the mature development class.

Issues

- Present development class is unbalanced with a high percentage of the forest in the establishment and young class (Appendix 10).
- There is a high percentage of the forest in the mid seral species, such as white birch and red maple especially in the hardwood stands and mixedwood stands.
- There is no old forest selection in this community type.
- There is no representation for this rare community type within this ecodistrict.

Spruce Pine Flats

(Patch) (ICSM ecosection) (216 ha)

This element comprises several small softwood patches located on imperfectly drained coarse-textured soils, dominated by late seral softwood of black spruce, red spruce, and white pine, intermixed with small wetland patches. Mature mid seral hardwoods are scattered throughout the patch element.

Approximately half of the total area is forested with the remaining area as wetlands. The present forest composition is in an unbalanced state with an overabundance in establishment and young development classes and only 19% of the forest in the mature and multi-aged classes.
The dominant disturbance regime would be frequent stand-initiating events such as insect outbreaks and fire.

Flows

Human (hunting, trapping, forestry, recreation); water (catchment, filter, groundwater recharge); moose (winter shelter, feeding); goshawk (no present use – habitat will improve with late seral mature forest)**;** furbearers (habitat – rivers important, denning in large coarse woody material)**;** deer (lower elevation – browse, habitat).

Composition

ChignectoRidges Ecodistrict 560 (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
	49%	33%	18% (10 Mat + 8 OF)	8%
Seral Stage	Early	Mid	Late	Unclassified
	2%	17%	81%	0%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	74%	9%	16%	1%

Desired Condition

The favoured condition for this element would be late seral softwood stands and softwood dominated mixedwood with a variety of development classes and seral stages.

Issues

- This element has an unbalanced development class with a high percentage of area in the establishment class.
- This patch element is very fragmented and could benefit from increased connectivity.
- This community type is rare and represents less than 1% of the area of the ecodistrict. Representation is required.
- Only 20% of this ecosection with this community type is under the provincial Crown ownership.

Valley Corridors

(Corridor) (Various ecosections) (6,853 ha)

This corridor element is the most varied of the ecodistrict and contains a variety of ecosections.

These corridors generally contain late seral softwood dominated by mixedwood of black spruce, red spruce, and white pine, intermixed with intolerant and tolerant hardwoods. Mid seral hardwoods dominate the hardwood community.

Overall, the development classes are fairly well-balanced in relation to the natural disturbance regimes. The forests within the Two Rivers, River Hébert, Southampton River, and the Maccan River corridors have been significantly altered by concentrated human activity that has created agricultural fields, settlement, intersecting roads, power lines, recreational trails, and other linear features.

These land use changes reduce the connective function of the corridors for some species, and may also increase the barrier effect of the corridors for species that must move across or through them.

The dominant disturbance regime would be frequent stand-initiating events such as insect outbreaks and fire.

Flows

Human (farming, canoeing, fishing, trapping, settlement, roads, and gravel deposit associated with intervale lands - Hebert, Maccan, and Newville, fishing, camping, light recreation associated with river slopes - Kelley, Shulie, and Atkinson rivers, Research - sediment at Kelley); water (major drainages - permanent and secondary, fish habitat); moose (summer habitat and thermal protection); furbearers/fisher (travel, food, major habitat, fisher is in and out of these corridors, otter are in the lower reaches); wood turtle (major habitat along the Hebert, Maccan, and Newville systems).

Composition

ChignectoRidges Ecodistrict 560 (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
	21%	22%	57% (50 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	6%	28%	57%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	60%	20%	17%	3%

Desired Condition

Series of well-connected slopes and intervales in a natural forest condition with some altered land use features.

Issues

- The connective function of some of these corridor systems has been altered.
- Restoration of late seral species where opportunity exists.
- Design of access systems that minimize environmental impacts.
- Elm, sugar maple, and white ash is a distinct floodplain community type within the element and conversion to non-forest use exceeds 20% in the ecodistrict and ecoregion.
- Inadequate representation of the community types with these ecosections.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Chignecto Ridges 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:

- Both red and jack pine do not regenerate well without fire disturbances; therefore, artificial regeneration maybe required to maintain these species within the ecosystems.
- Future management activities should recognize significant links to neighbouring ecodistricts and manage the forests in these areas to enhance and sustain connectivity.
- Connectivity will be sustained by applying the NDR guidelines for landscape composition by development class, seral stage, and covertype, and by recognizing natural linkage opportunities. Species specific connectivity issues will be addressed through other mechanisms.

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

- Forest species of conservation concern have been identified using the General Status Ranks of Wild Species in Nova Scotia system; they include Yellow and Red listed species.
- Fine filter management opportunities related to conservation of significant habitats.
- Uncommon community conditions (e.g. old age, large live and dead trees, and species associations). Increase representivity in the uncommon old forest communities as above.
- Implement restorative measures in the elm, sugar maple, and ash stands along the river corridors of the Maccan, River Hébert, and Southampton.

Opportunities to improve representation in the design stage include work on the following:

- Uncommon climax community types, such as jack pine, black spruce, and white pine on the ridged ecosection (ICRD), representing 11.8% in the ecodistrict. This ecosection is found in the Red and Black Spruce Hummocks, Jack Pine Hummocks and Ridges, and Valley Corridors element areas.
- Eco sections that form less than 2% of the ecodistrict, ICSM, IFSM, IMSM, WFDS, found in the Spruce Pine Flats, Valley Corridors, and Tolerant Mixedwood Slopes element areas.
- Additional old forest area in WCRD, IFHO, IMHO, found in the Jack Pine Hummocks and Ridges, Red and Black Spruce Hummocks, and Valley Corridors element areas.
- Connectivity between and among wetlands and river corridors.

Appendix 1: Flow – Element Interactions

Element	People	Water	Moose	Furbearers Fisher	Deer	Goshawk	Wood Turtle
Matrix **Red and Black Spruce Hummocks 1. Mature Climax Softwood**	Timber, Roads Hunting, ATVs/Snowmobiles	Catchment, Filter, Groundwater Recharge	Primary habitat, travel	Fisher denning, prey primary range Mature and Coarse woody Debris	Summer range cover	Mature - primary habitat - nest in pines also hardwoods - large patches/ large trees - medium stocking - open understory	_____
2. Regenerating - Sapling Mixedwood	Hunting, Silviculture	Catchment, Filter, Groundwater Recharge	Regen - food	Regen - beaver 100 metres to water	Food	_____	_____
3. Dissections - Sand River and Two Rivers	Timber	Drainage	Summer habitat thermal	Travel, food, shelter - major habitat fisher in and out of corridors Otter - lower reaches beaver - habitat disposal	_____	_____	_____
Patches **1. Wetlands**	Rare plants Poaching, Peat Snowmobile recreation	Collection, filtering, storage	Feeding, Thermal, calving	_____	_____	_____	_____

Appendix 1: Flow – Element Interactions

Element	People	Water	Moose	Furbearers Fisher	Deer	Goshawk	Wood Turtle
2. Jack Pine Hummocks and Ridges	_____	collection	Habitat food Deer exclusion	cat/hare	_____	_____	_____
3. Tolerant Mixedwood Hills	Timber, Hunting Roads, ATVs/ Snowmobiles, Aesthetics - Harrison Settlement, Boars Back, Welton Lake roads	Catchment, Filter, Groundwater Recharge, vernal pools, seeps	Cover, thermal	Fisher denning, prey primary range Mature and Coarse woody material	Summer range cover	Mature - primary habitat - nest in pines also hardwoods - large patches/large trees - medium stocking - open understory	_____
4. Tolerant Mixedwood Slopes	Hunting, Trapping, Forestry, recreation	Catchment, Filter Groundwater Recharge	Winter shelter feeding	Habitat – rivers important, denning in large coarse woody material	Lower elevation – browse, habitat	No present use Habitat will improve with late seral mature forest	_____
5. Spruce Pine Flats	Forestry, Hunting, trapping, recreation	Catchment, Filter Groundwater Recharge	Limited moose habitat. Feeding	Late seral cavity trees that have fallen – denning sites	General summer habitat	Limited	_____
Corridor **Valley Corridors 1. Prominent intervals-Hebert, Maccan, Newville**	Farming, Canoeing, Roads**,** Fishing, Forage, Trapping, Settlement, Gravel deposits	Major drainages-permanent/ secondary	Summer habitat thermal	Travel, food, shelter - major habitat fisher in and out of corridors Otter - lower reaches Beaver - habitat dispersal	Deer yards, summer habitat permanent use	_____	Major habitat

Appendix 1: Flow – Element Interactions

Element	People	Water	Moose	Furbearers Fisher	Deer	Goshawk	Wood Turtle
2. Slopes - Kelley, Shulie, and Atkinson rivers	Fishing, Trapping, Camping, Light Recreation Research - Sediment (Kelley)	Drainage	Summer habitat thermal	Travel, food, shelter - major habitat fisher in and out of corridors Otter - lower reaches Beaver - habitat disposal	Travel seasonal migration		suspected / potential habitat

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
Red and Black Spruce Hummocks	Matrix	High	Kelley River for multiple values - Sand River IBP - IBP Red Pine Old forest	Large prominent softwood matrix extending over the entire ecodistrict old forest – variety of small and medium patches	Frequent – fire Origin	Mature late seral softwood rS bS with scattered jP, wP, tolerant and intolerant hardwood	- Predominately rS/bS - Mixedwood/ hardwood neighbouring Cumberland Hills	Natural disturbance - fire, insects disease - converted land use - fragmentation	Small patch structure - high percentage of mid seral hardwood - Roadless areas	- Promote large patch structure and interior conditions - focus management activities on mid seral stands to promote late seral species - increase old forest selection to a minimum of 8% - maintain and improve connectivity
Jack Pine Hummocks and Ridges	Patch	Moderate	Porter Brook Little Shulie River ICRD, WCRD	Linear ridges Fine scale – promote travel to ridges	Frequent Fire	Ericaceous vegetation, black spruce, white birch, red maple, and pine	Shulie River - predominately softwood neighbour, hybrid spruce. Porter Brook IH neighbour	- forest succession	lack of fires and succession leading to a loss of open areas	none
Wetlands	Patch	High	Tompkin Plains, Muddy Plains, Bear Den, Long and Round lakes	Landscape Medium to Large Patches isolated - with small intervening bogs	Open Seral	Sphagnum bogs open stunted trees on low ridges raised bog - Tompkin Plains	Poorly drained rS/ericaceous vegetation Jack Pine old forest - Round and Long lakes		- Intervening forest of rS well connected - Poor connection to hydrological system - Major barrier between rivers	Maintain natural conditions, intact buffer areas, and natural levels of isolation from other permanent openings. See Deptartment of Environment Wetland Policy (http://www.gov.ns.ca/nse/wetland/conservation.poli cy.asp)
Tolerant Mixedwood Hills	Patch	High	- north of Harrison Lake - Boars Back Ridge west	large areas widely distributed and well-connected	Gap	predominately well-drained mixedwood and hardwood	within rS/bS matrix	major river drainages - River Hébert, and highway	loss to softwood succession	– maintain and promote tolerant hardwood stands through small patch retention techniques

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Spruce Pine Flats	Patch	moderate	Joggins Sand River	Two small patches disconnected	Infrequent	rS/bS and mid seral hardwoods	rS/bS	Natural disturbance - scale	Connectivity Percentage of mid seral species - lack of fires	- focus management activities on mid seral stands to promote late seral species
Tolerant Mixedwood Slopes	Patch	low	East Apple River Clam Cove	Small disconnected patches	Frequent – fire	Imperfectly drained - softwood-dominated mixedwood rS bS wP bF IH TH	bS/rS	Small scale	connectivity	– maintain and promote tolerant hardwood stands through small patch retention techniques
Valley Corridors	Corridors	High	Kelley, Shulie, Atkinson	long continuous corridors crossing entire ecodistrict - moderate rivers	Frequent fires	Shulie - IH, Spruce Kelley and Atkinson – Pine Shulie - predominately softwood and IH at disturbance older spruce on steep slopes, old forests	within rS/bS matrix	none - intact corridor	intact corridor (positive issue)	Maintain continuity

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 560)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Bank Swallow	*Riparia riparia*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
FISH	-			
Atlantic Salmon - Inner Bay of Fundy population	*Salmo salar pop. 1*	N/A	Endangered	Endangered
INSECTS	-			
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS	-			
Moose	*Alces americanus*	Endangered	N/A	N/A
REPTILES	-			
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 560)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
BIRDS	-		
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Cape May Warbler	*Dendroica tigrina*	Sensitive (Yellow)	S3?B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3S4
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	S3S4B
DICOTS			
Bog Birch	*Betula pumila var. pumila*	Sensitive (Yellow)	S2S3
Marsh Bellflower	*Campanula aparinoides*	Sensitive (Yellow)	S3
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2
Chinese Hemlock-parsley	*Conioselinum chinense*	Sensitive (Yellow)	S2
Purple-veined Willowherb	*Epilobium coloratum*	Sensitive (Yellow)	S2?
Northern Comandra	*Geocaulon lividum*	Sensitive (Yellow)	S3
Whorled Water Milfoil	*Myriophyllum verticillatum*	Sensitive (Yellow)	S2
Smooth Sweet Cicely	*Osmorhiza longistylis*	May Be At Risk (Orange)	S2
Halberd-leaved Tearthumb	*Polygonum arifolium*	Sensitive (Yellow)	S2
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow) Secure	S3
Meadow Willow	*Salix petiolaris*	(Green)	S3
Northern Blueberry	*Vaccinium boreale*	May Be At Risk (Orange)	S2
FERNS AND THEIR ALLIES			
Variegated Horsetail	*Equisetum variegatum*	Secure (Green)	S3
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?
Harvester	*Feniseca tarquinius*	Secure (Green)	S3S4
Northern Pearly-Eye	*Lethe anthedon Oeneis*	Secure (Green)	S3
Jutta Arctic Riffle	*jutta Ophiogomphus*	May Be At Risk (Orange)	S1
Snaketail Maine	*carolus Ophiogomphus*	Secure (Green)	S3
Snaketail Spot-	*mainensis Pantala*	May Be At Risk (Orange)	S1
Winged Glider	*hymenaea*	Sensitive (Yellow)	S2B
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
Grey Comma Quebec	*Polygonia progne*	Secure (Green)	S3S4
Emerald Delicate	*Somatochlora brevicincta*	May Be At Risk (Orange)	S1
Emerald Kennedy's	*Somatochlora franklini*	Sensitive (Yellow)	S1
Emerald Clamp-Tipped	*Somatochlora kennedyi*	May Be At Risk (Orange)	S1S2
Emerald	*Somatochlora tenebrosa*	Secure (Green)	S3
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 560)

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***
Ebony Boghaunter	*Williamsonia fletcheri*	May Be At Risk (Orange)	S1
MAMMALS			
Fisher	*Pekania pennanti*	Sensitive (Yellow)	S2
MOLLUSKS			
Triangle Floater	*Alasmidonta undulata*	Secure (Green)	S2S3
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
Tidewater Mucket	*Leptodea ochracea*	Sensitive (Yellow)	S1
MONOCOTS			
Wild Leek	*Allium tricoccum*	May Be At Risk (Orange)	S1
Slim-stemmed Reed Grass	*Calamagrostis stricta ssp. stricta*	Sensitive (Yellow)	S1S2
Lesser Brown Sedge	*Carex adusta*	Sensitive (Yellow)	S2S3
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Tuckerman's Sedge	*Carex tuckermanii*	May Be At Risk (Orange)	S1
Wiegand's Sedge	*Carex wiegandii*	May Be At Risk (Orange)	S1
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Russet Cotton-Grass	*Eriophorum chamissonis*	Secure (Green)	S3S4
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Tuckerman's Panic Grass	*Panicum tuckermanii*	Sensitive (Yellow)	S2S3

*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 560)
Table 1c: Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Osprey Nest	Bird Habitat/Species	Local Knowledge	Wildlife Act
Lakes - Beaver Dam, Harrison, Forty Puzzle, Round Long, Shulie	Ecosystems	Service Nova Scotia	Environment Act Forest Act (Wildlife Habitat and Watercourse Protection Regulations)
Muddy Plains Bog	Ecosystems	Local knowledge	Environment Act
Red Oak	Species	NSDNR Forest Inventory	
IBP Site	Ecosystems	NSDNR Database	Special Places Protection Act
Deer Wintering Area - Kelley River and Atkinson Brook	Ecosystems	NSDNR Database	
Apple River Bar	Ecosystems	NSDNR Database	Beaches Act
In 2012, Crown lands of the Kelley River and Raven Head areas, parts of which fall in the Chignecto Ridges Ecodistrict, received provincial designation as wilderness areas.			

Appendix 3: Special Occurrences (Ecodistrict 560)
Table 1d: Heritage Features

Feature	Type	Information Source
Coastal Scenic	Heritage	Local Knowledge
Old Mine Openings - Joggins	Heritage	NSDNR Database
Joggins Fossil Cliffs	Heritage	NSDNR Database
Stewart MacDonald Memorial	Heritage	Cumberland County Historical Society Historical Society
Sugar Camp (Thunder Hill)	Heritage	NSDNR Database

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS	31,927	42.8	23,937	32.1	63 to 71	2.6	49,697	10.6	71,925	15.3	61 to 69	5.9
WCHO	rS	16,264	21.8	27,273	36.6	63 to 66	7.4	40,921	8.7	133,581	28.4	56 to 61	14.9
ICRD	jP bS wP	8,806	11.8	11,628	15.6	68 to 71	1.2	8,806	1.9	27,619	5.9	68 to 71	1.2
WCRD	bS wP	5,510	7.4	5,510	7.4	68 to 72	0.8	5,723	1.2	105,037	22.3	66 to 70	3.3
WTLD	wetlands	2,735	3.7	0	0.0	72 to 74	0.4	6,745	1.4	0	0	71 to 74	1.3
IFHO	rS	2,485	3.3	27,273	36.6	57 to 61	18.2	41,970	8.9	133,581	28.4	51 to 57	22.1
WCKK	sM yB Be	2,491	3.3	1,993	2.7	73 to 74	1.3	43,054	9.1	37,003	7.9	58 to 63	10
IMHO	jP bS wP	1,620	2.2	11,628	15.6	56 to 70	0.7	111,490	23.7	27,619	5.9	56 to 64	12.5
IMSM	aE sM wA	1,217	1.6	902	1.2	55 to 57	23.9	8,282	1.8	4,353	0.9	52 to 56	24.2
WFDS	rS eH wP sM yB Be	337	0.5	337	0.5	66 to 69	1.6	337	0.1	337	0.1	66 to 69	1.6
ICSM	jP bS wP	216	0.3	11,628	15.6	68	0.6	3,332	0.7	27,619	5.9	48 to 52	30.3
IFSM	aE sM wA	236	0.3	902	1.2	55 to 57	22.3	3,549	0.8	4,353	0.9	55 to 61	17.2

*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)
ICHO	bS	31,906	45.1	7	0	1,459	0	1,465	4.6	0	0.0	1,465	4.6
WCHO	rS	16,258	36.9	15	4	357	0	372	2.3	4	0.0	376	2.3
ICRD	jP bS wP	8,842	56.4	0	0	186	0	186	2.1	0	0.0	186	2.1
WCRD	bS wP	5,508	52.6	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	2,700	81.5	0	0	126	0	126	4.6	0	0.0	126	4.6
WCKK	sM yB Be	2,524	95.2	1	0	82	0	83	3.3	0	0.0	83	3.3
IFHO	rS	2,484	30.7	0	7	15	0	16	0.6	7	0.3	23	0.9
IMHO	jP bS wP	1,621	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IMSM	aE sM wA	1,214	12.4	0	0	66	0	66	5.4	0	0.0	66	5.4
XXWA		614	0.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WFDS	rS eH wP sM yB Be	337	54.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFSM	aE sM wA	236	0.3	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	jP bS wP	215	44.3	0	0	0	0	0	0.0	0	0.0	0	0.0
XXMS	salt marsh	91	17.5	0	0	0	0	0	0.0	0	0.3	0	0.3
Total		**74,551**		**23**	**11**	**2,290**	**0**	**2,313**		**11**		**2,324**	

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)
Protected Beaches	11	11	Old Forest	2,287	0
Sites of Ecological Significance Under Moratorium	12	0	Eastern Habitat Joint Venture	>1	0
Areas Under Special Places Act	0	5			

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

Appendix 6: Description of Road Density Index

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

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

Efficient access systems can be strategically designed to minimize environmental impacts by incorporating factors such as harvest scheduling, life expectancy, location, road class requirements, decommissioning, and mitigation measures (Lindenmayer & Franklin 2002, Forman, 2004). Selection of transportation routes should incorporate knowledge of landscape functions to improve compatibility with natural ecosystem flows and connectivity (Forman & Hersperger, 1996). Furthermore, areas without roads and/or few roads are important for biodiversity conservation and should be considered during planning (USDA Forest Service 1999).

The GIS-based “Road Index” procedure calculates and maps the spatial influence of the transportation network. It is a management tool designed to help planners gauge the relative influence of man-made linear features within landscapes. It was designed to help integrate the transportation system into an ecological landscape analysis process. In addition to mapping, the index provides a numerical indicator of road influence that can be used to monitor temporal changes and compare different landscapes.

Main Concepts

The influence of the transportation network on the ecological landscape varies with three main factors: 1) the type of transportation feature (e.g. highway, power line, trail, etc.); 2) the density of linear features in a given area; and 3) the distance of an area from transportation features (Forman 2004, Lindenmayer & Franklin 2002, Forman & Deblinger 2000). The Road Index is a weighting of these three factors reflecting their relative influence on ecosystem function.

Road density has a well-documented influence on many factors, including wildlife movements, fragmentation, human access, hydrology, and fire patterns (Forman and Hersperger, 1996). Forman & Deblinger (2000) report great variance in road effect zones, with average cumulative effects extending 300 metres from road edges, and some impacts penetrating up to a kilometre. Consequently, Index values are determined by assessing the transportation network within a one kilometre radius. The Index algorithm is applied to a grid of one hectare squares representing

the landscape in question. The calculation provides a measure of the density of the transportation network and the specific distance to the transportation features.
The resulting index values are scaled to provide a potential range of 0 to 100. For the purpose of map interpretation, these values have been grouped into benchmark ranges that reflect characteristic patterns of land use in Nova Scotia.

In Nova Scotia, as in most populated jurisdictions, transportation networks are continuously changing as new roads and utilities are constructed and unused roads and trails deteriorate. As such, any analysis of the current state of these features must be based on reasonably up-to-date data. In this province, the Geomatics Centre, administered by Service Nova Scotia and Municipal Relations, is responsible for mapping transportation features which they include in their 1:10000 topographic series mapping.

On a provincial level, this work is updated on a ten-year repeat cycle and includes changes to existing features and the delineation of new features. Before undertaking road analysis, the Geomatics Centre should be contacted to ensure that the most current data is used to calculate the Road Index values. This data should be further updated using Landsat satellite imagery to add significant new roads and utilities that are over 500 metres in length on lands currently with a remote or forest resource index value.

DNR Forestry Branch maintains a table relating the topographic series attribute coding used by the Geomatics Centre to the feature categories used in the Road Index calculations, along with ArcView programs allowing the data to be formatted correctly. An inventory of recent Landsat satellite images is also available.

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	983
Utility corridors	3	23
Gravel Roads and active railways	6	238
Paved streets and roads collectors	10	115
Highways	15	0

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	15,078	21
Forest Resource	7 to 15	38,089	51
Mixed Rural	16 to 24	14,862	20
Agriculture Suburban	25 to 39	6,218	8
Urban	40 to 100	4	0
Total		**74,251**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Red and Black Spruce Hummocks	47,329	9
Valley Corridors	6,852	17
Tolerant Mixedwood Hills	2,394	7
Tolerant Mixedwood Slopes	337	5
Jack Pine Hummocks and Ridges	14,097	8
Wetlands	2,732	6
Spruce Pine Flats	216	10
Total	**73,957***	**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

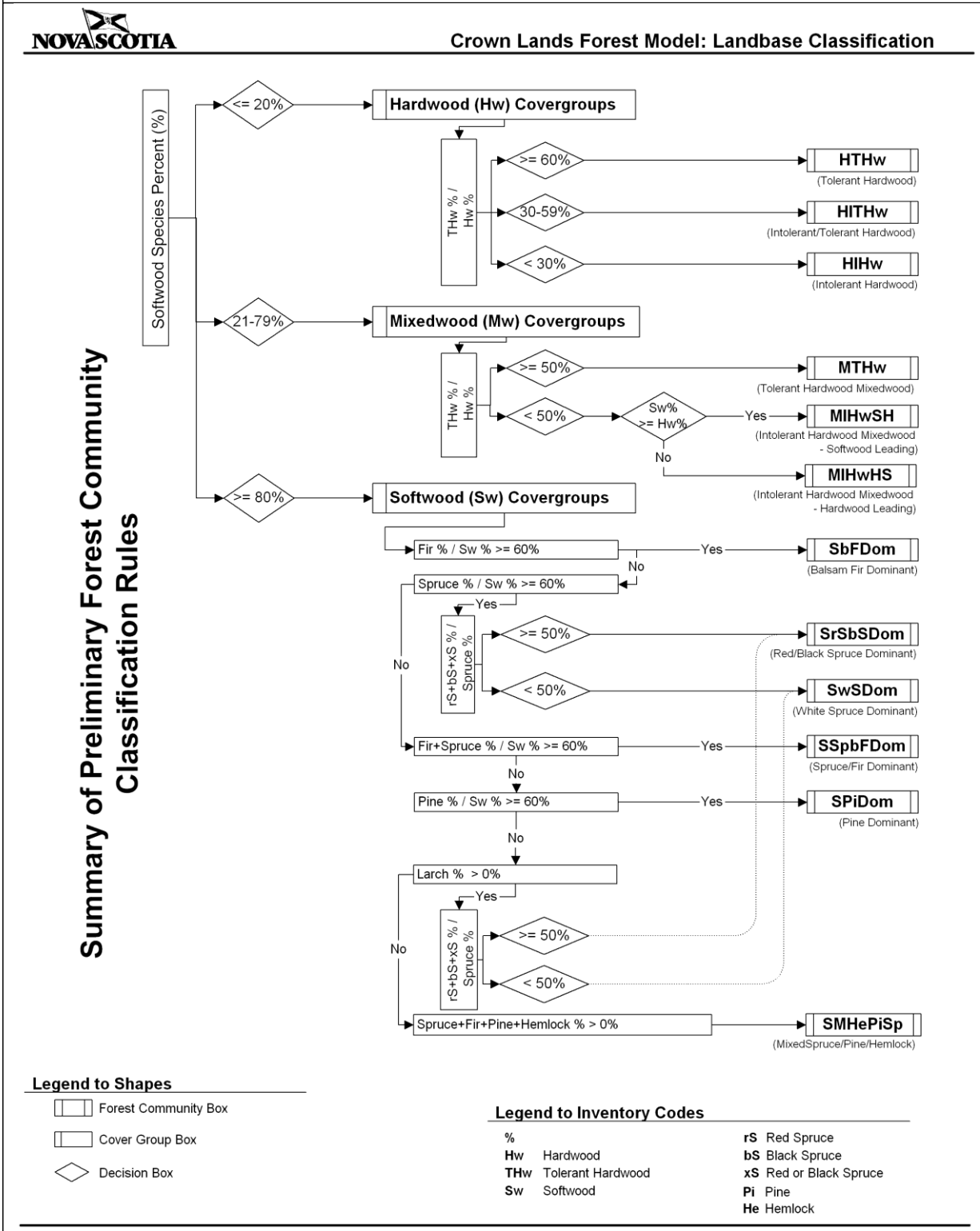
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-lived shade-intolerant "pioneer" species • peak seed production by forbs and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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Chignecto Ridges 560)

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)				
Red and Black Spruce Hummocks	ICHO WCHO IFHO IMHO	Softwood	rS Bs jP bS wP	Frequent	47,329; 100.0	Early	225	311	198	20	754	23,537; 56.0	EARLY	3,060; 7.0
						Mid	738	546	362	82	1,728			
						Late	3,142	4,090	9,061	1,066	17,359			
						Uncl	3,854	0	0	0	3,854			
		Mixedwood				Early	26	51	42	20	139	7,582; 18.0	MID	12,423; 30.0
						Mid	990	709	1,742	260	3,701			
						Late	510	469	1,846	402	3,227			
						Uncl	512	0	0	0	512			
		Hardwood				Early	43	137	430	25	635	7,913; 19.0	LATE	23,440; 51.0
						Mid	281	1,104	5,385	221	6,991			
						Late	0	5	176	0	181			
						Uncl	106	0	0	0	106			
		Unclassified				Early	1,526	2	5	0	1,533	2,793; 7.0	UNCL	5,568; 13.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1,261	0	0	0	1,261			
Total					**47,329***	**# ha**	**13,214**	**7,424**	**19,247**	**2,096**	**41,981**			
						%	**31.5%**	**17.7%**	**45.8%**	**5.0%**	**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 (Chignecto Ridges 560)

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)			
Jack Pine Hummocks and Ridges	WCRD ICRD	Softwood	bS wP jP bS wP	Frequent	14,097; 100.0	Early	152	72	23	1	248	7,339; 58.0	EARLY 670; 5.0
						Mid	136	188	119	10	453		
						Late	1,145	2,353	2,108	547	6,153		
						Uncl	484	0	0	0	484		
		Mixedwood				Early	26	26	12	2	66	2,280; 18.0	MID 4,061; 32.0
						Mid	323	336	303	79	1,041		
						Late	96	591	357	77	1,121		
						Uncl	51	0	0	0	51		
		Hardwood				Early	0	35	88	11	134	2,716; 22.0	LATE 7,276; 58.0
						Mid	165	1,350	971	80	2,566		
						Late	0	0	0	0	0		
						Uncl	16	0	0	0	16		
		Unclassified				Early	223	0	0	0	223	307; 2.0	UNCL 634; 5.0
						Mid	0	0	0	0	0		
						Late	0	0	0	0	0		
						Uncl	83	0	0	0	83		
Total					**14,907***	**# ha**	**2,900**	**4,951**	**3,981**	**807**	**12,639**		
						%	**22.9%**	**39.2%**	**31.5%**	**6.4%**	**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 (Chignecto Ridges 560)

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	Softwood	jP bS wP rS bS	Open seral	1,096; 40.0	Early	10	11	0	0	21	1,207; 86.0	EARLY	36; 3.0
						Mid	30	24	9	5	68			
						Late	218	392	347	97	1,054			
						Uncl	63	0	0	0	63			
		Mixedwood				Early	0	0	0	1	1	67; 5.0	MID	153; 11.0
						Mid	16	3	9	0	28			
						Late	11	5	15	6	37			
						Uncl	1	0	0	0	1			
		Hardwood	aE sM wA	Frequent	273; 10.0	Early	0	0	0	0	0	61; 5.0	LATE	1,095; 78.0
						Mid	3	3	41	10	57			
						Late	0	0	4	0	4			
						Uncl	0	0	0	0	0			
		Unclassified				Early	14	0	0	0	14	61; 4.0	UNCL	112; 8.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	48	0	0	0	48			
Total					**2,733***	**# ha**	**414**	**438**	**425**	**119**	**1,396**			
						%	**29.7%**	**31.4%**	**30.4%**	**8.5%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Chignecto Ridges 560)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Hills	WCKK	Softwood	bS rS	Frequent	1,397; 58.0	Early	13	3	1	0	17	944; 41.0	EARLY	69; 3.0
						Mid	37	36	4	0	77			
						Late	72	204	528	44	848			
						Uncl	2	0	0	0	2			
		Mixedwood	rS sM yB Be	Gap	199; 8.0	Early	2	20	2	6	30	508; 22.0	MID	986; 43.0
						Mid	31	34	127	19	211			
						Late	9	37	198	16	260			
						Uncl	8	0	0	0	8			
		Hardwood	sM yB Be	Gap	799; 34.0	Early	0	8	3	0	11	808; 35.0	LATE	1,205; 52.0
						Mid	0	74	604	19	697			
						Late	0	4	89	4	97			
						Uncl	3	0	0	0	3			
		Unclassified				Early	11	0	0	0	11	46; 2.0	UNCL	47; 2.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	35	0	0	0	35			
Total					**2,395***	**# ha**	**223**	**420**	**1,556**	**108**	**2,307**			
						%	**9.7%**	**18.2%**	**67.4%**	**4.7%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Chignecto Ridges 560)

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	ICSM (100.0%)	Softwood	jP bS wP	Frequent	108; 50.0	Early	1	1	0	0	2	141; 74.0	EARLY	4; 2.0
						Mid	5	2	0	0	7			
						Late	65	45	10	12	132			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	0	0	0	0	29; 16.0	MID	31; 17.0
						Mid	4	2	3	0	9			
						Late	13	3	3	1	20			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	0	0	0	15; 9.0	LATE	152; 81.0
						Mid	1	8	3	3	15			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	2	0	0	0	2	2; 1.0	UNCL	0; 0.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**216***	**# ha**	**91**	**61**	**19**	**16**	**187**			
						%	**48.7%**	**32.6%**	**10.2%**	**8.6%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Chignecto Ridges 560)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Slopes	WFDS WCDS	Softwood				Early	0	0	0	0	0	163; 49.0	EARLY	31; 10.0
						Mid	0	0	0	0	0			
						Late	14	65	52	24	155			
						Uncl	8	0	0	0	8			
		Mixedwood	rS eH wP yB Be rS sM yB Be	Gap	337; 100.0	Early	0	0	0	0	0	50; 15.0	MID	101; 31.0
						Mid	5	2	15	0	22			
						Late	0	1	18	7	26			
						Uncl	3	0	0	0	3			
		Hardwood				Early	0	0	0	0	0	84; 26.0	LATE	185; 56.0
						Mid	5	15	46	13	79			
						Late	0	0	4	0	4			
						Uncl	0	0	0	0	0			
		Unclassified				Early	31	0	0	0	31	31; 10.0	UNCL	11; 3.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**337***	**# ha**	**66**	**83**	**135**	**44**	**328**			
						%	**20.1%**	**25.3%**	**41.2%**	**13.4%**	**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 (Chignecto Ridges 560)

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	ICHO WCHO WCRD ICRD IMHO	Softwood	rS bS wP	Frequent Frequent Frequent	5,693 (83%)	Early	67	45	74	9	195	**3,130 (60%)**	EARLY	**335 (6%)**
						Mid	46	48	73	11	178			
						Late	325	682	1,295	177	2,479			
						Uncl	278	0	0	0	278			
		Mixedwood	rS sM yB Be	Gap	18 <1%	Early	7	11	69	4	91	**873 (17%)**	MID	**1,470 (28%)**
						Mid	68	79	179	42	368			
						Late	59	92	217	67	435			
						Uncl	27	0	0	0	27			
		Hardwood	aE sM wA sM yB Be	Gap	691 (10%)	Early	9	25	20	5	59	**1,024 (20%)**	LATE	**2,954 (57%)**
						Mid	27	175	681	39	922			
						Late	0	4	35	0	39			
						Uncl	4	0	0	0	4			
		Unclassified				Early	40	0	0	0	40	**179 (3%)**	UNCL	**448 (9%)**
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	140	0	0	0	140			
Total					**6,852***	**# ha**	**1,097**	**1,161**	**2,643**	**354**	**5,255**			
						%	**20.9%**	**22.1%**	**50.3%**	**6.7%**	**100.0%**			

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Appendix 10: Table 2: Composition of Forest Communities (Chignecto Ridges 560)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Red and Black Spruce Hummocks	ICHO IFHO IMHO WCHO	Frequent Frequent Frequent Frequent	bS rS jP bS wP rS	S	SrSbSDom	16,623	50.9%	L	**Moist sites** Black spruce, Pine **Well-drained** Early - successional – pioneer species Mid - Successional - Red maple, white birch Late – successional - Red spruce, Hemlock, Pine
				S	SpiDom	103	0.3%	L	
				S	SspbFDom	348	1.1%	L	
				S	SwSDom	189	0.6%	E	
				S	SMHePiSp	201	0.6%	L	
				S	SbFDom	312	1.0%	E	
				M	MIHwSH	2,780	8.5%	M	
				M	MIHwHS	4,253	13%	M	
				M	MTHw	65	0.2%	L	
				H	HIHw	7,502	22.9%	M	
				H	HITHw	272	0.8%	M/L	
				H	HTHw	42	0.1%	L	
Total						**32,690**	**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 (Chignecto Ridges 560)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Hills	WCKK	Gap	SpiDom	S	SrSbSDom	812	37.0%	L	Early – Red maple, Aspen, White birch Mid – Red Spruce, Balsam Fir Late – Yellow birch, Red spruce, Red Maple, Sugar Maple
				S	SPiDom	14	0.6%	L	
				S	SbFDom	40	1.8%	M	
				S	SMHePiSp	15	0.7%	L	
				S	SspbFDom	5	0.2%	L	
				M	MIHwSH	281	12.8%	M	
				M	MIHwHS	214	9.8%	M	
				M	MTHw	5	0.2%	L	
				H	HIHw	631	28.7%	M	
				H	HITHw	123	5.6%	M/L	
				H	HTHw	52	2.4%	L	
Total						**2,194**	**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 (Chignecto Ridges 560)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Jack Pine Hummocks and Ridges	ICRD WCRD	Frequent Frequent	jP bS wP bS wP	S	SrSbSDom	5,725	59.3%	L	**Moist sites** Black spruce, Pine
				S	SpiDom	94	1.0%	L	
				S	SspbFDom	117	1.2%	L	
				S	SwSDom	9	0.1%	E	**Well-drained** Early - successional – pioneer species
				S	SMHePiSp	51	0.5%	L	
				S	SbFDom	14	0.1%	E	
				M	MIHwSH	143	1.5%	M	
				M	MIHwHS	789	8.2%	M	Mid - Successional - Red maple, white birch
				M	MTHw	8	0.1%	L	
				M	HIHw	2,696	27.9%	M	
				H	HITHw	3	0.0%	M/L	Late - successional - Red spruce, Hemlock, Pine
Total						**9,649**	**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 (Chignecto Ridges 560)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Slopes	WCDS WFDS	Gap Gap	rS eH wP sM yB	S	SrSbSDom	146	52.7%	L	Early – Red maple, Aspen, White birch Mid – Red spruce, Balsam fir
				S	SpiDom	1	0.4%	L	
				M	MIHwSH	29	10.5%	E	
				M	MIHwHS	18	6.5%	E	
				H	HIHw	81	29.2%	E	Late – Yellow birch, Red Spruce, Red Maple, Sugar Maple
				H	HITHw	2	0.7%	E/L	
Total						**277**	**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 (Chignecto Ridges 560)

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	Frequent	jP bS wP	S	SrSbSDom	113	63.0	L	Black Spruce, Pine
				S	SpiDom	22	12.3	L	
				S	SspbFDom	0	0.2	L	
				S	SwSDom	1	0.6	E	
				M	MIHwSH	7	3.9	M	
				M	MIHwHS	22	12.3	M	
				H	HIHw	10	5.6	M	
				H	HTHw	4	2.2	M/L	
Total						**179**	**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 (Chignecto Ridges 560)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	WTLD	Open Seral	jP bS wP	S	SrSbSDom	1,038	88.4	**L**	**Moist sites** Black spruce, Pine **Well-drained** Early - successional – pioneer species Mid - Successional - Red maple, white birch Late - successional - Red spruce, Hemlock, Pine **Wet --** Wetlands of shrubs and stunted trees
				S	SpiDom	3	0.3	L	
				S	SspbFDom	4	0.3	L	
				S	SMHePiSp	4	0.3	L	
				S	SwSDom	3	0.2	E	
				M	MIHwSH	49	4.2	M	
				M	MIHwHS	16	1.4	M	
				H	HIHw	50	4.3	M	
				H	HITHw	8	0.6	M/L	
Total						**1,174**	**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 (Chignecto Ridges 560)

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 ICRD IFSM IMHO IMSM WCHO WCRD ICSM IFHO WCKK WCRD	Frequent Frequent Gap Frequent Gap Frequent Frequent Frequent Frequent Gap Frequent	bS jP bS wP aE sM wA jP bS wP aE sM wA rS bS wP jP bS wP rS sM yB Be bS wP	S	SrSbSDom	2,270	51.8%	L	**Moist sites** Black spruce, Pine **Well-drained** Early - successional – pioneer species Mid - Successional - Red maple, white birch Late - successional - Red spruce, Hemlock, Pine
				S	SpiDom	21	0.5%	L	
				S	SbFDom	76	1.7%	E	
				S	SwSDom	55	1.3%	E	
				S	SMHePiSp	47	1.1%	L	
				S	Sp bF	32	0.7%	L	
				M	MIHwSH	592	13.5%	M	
				M	MIHwSH	248	5.7%	M	
				M	MTHw-	21	0.5%	L	
				H	HIHw	886	20.2%	M	
				H	HITHw	115	2.6%	M/L	
				H	HTHw	21	0.5%	L	
Total						**4,384**	**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
rS	18,742	25.1%	133,581	28.4%
bS	31,906	42.8%	71,925	15.3%
jP bS wP	10,678	14.3%	27,619	5.9%
bS wP	5,508	7.4%	105,037	22.3%
sM yB Be	2,524	3.4%	37,003	7.9%
aE sM wA	1,450	1.9%	4,353	0.9%
rS sM yB Be	1	0.0%	31,488	6.7%
rS eH wP sM yB Be	337	0.5%	337	0.1%
Total	**71,146**	**95.4%***	**411,343**	**87.5%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Red and Black Spruce Hummocks	47,330	1,320	34,190	2,025	2,227	7,568	29,360 to 33,144	62 to 70
Jack Pine Hummocks and Ridges	14,097	185	11,923	730	147	1,112	9,588 to 10,143	68 to 72
Wetlands	2,732	126	2,377	91	11	127	1,963 to 2,026	72 to 74
Tolerant Mixedwood Hills	2,394	83	2,195	24	30	62	1,751 to 1,782	73 to 74
Tolerant Mixedwood Slopes	337	0	277	13	5	42	222 to 242	66 to 72
Spruce Pine Flats	216	0	188	25	1	2	148	69
Valley Corridors	6,742	608	4,664	329	608	533	4,321 to 4,588	64 to 68
Total	**73,848**	**2,323**	**55,814**	**3,237**	**3,029**	**9,446**	**47,353 to 52,076**	**64 to 70**

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	31,906	1,464	22,560	1,269	808	5,805	201,153 to 23,055	63 to 72
ICRD	8,842	186	7,418	458	107	673	6,032 to 6,369	68 to 72
ICSM	215	0	187	26	1	2	147 to 148	68 to 69
IFHO	2,484	23	1,778	39	452	192	1,414 to 1,510	57 to 61
IFSM	236	0	155	19	53	9	123 to 127	52 to 54
IMHO	1,621	0	1,007	14	10	590	906 to 1,127	56 to 74
IMSM	1,214	65	764	28	290	67	661 to 695	55 to 57
WCHO	16,258	376	12,263	977	1,210	1,432	10,176 to 10,891	63 to 67
WCKK	2,523	86	2,308	26	38	65	1,839 to 1,872	73 to 74
WCRD	5,508	0	4,734	284	42	448	3,734 to 3,958	68 to 72
WFDS	337	0	278	13	5	41	222 to 243	66 to 72
WTLD	2,700	126	2,348	90	11	125	1,940 to 2,003	72 to 74
Total	**73,844**	**2,326**	**558,00**	**3,242**	**3,027**	**9,449**	**47,348 to 52,073**	**64 to 71**

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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