Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CLARE ECODISTRICT 730

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2014-730

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 730: Clare

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Clare Ecodistrict that can help landowners and planners understand important characteristics of the landscape. The report details the main elements in the ecodistrict and, of particular interest to woodland owners, vegetation types within forest stands.

Ecological Landscape Analysis (ELA) is a first step in developing an ecosystem approach to managing resource values at a landscape level. It supports planning by landowners wanting to understand how their land fits into the landscape ecosystem. Additional direction will be provided by a landscape planning guide, and internet-based inventory update system, both of which are currently under development.

The ELAs were analyzed and written from 2005 – 2009. They provide baseline information for this period in a standardized framework of ecosystem mapping and data summary designed to support future data updates, forecasts and trends. This document includes Part 1 – *Learning about what makes this ecodistrict distinctive* – and Part 2 – *How woodland owners can apply landscape concepts to their woodland.* Part 3 – *Greater detail for forest planners and analysts* – will be available on request by contacting DNR officials at their regional offices.

Information sources and statistics (benchmark dates) include:

- Forest Inventory (2002) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting & silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads & 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.

A glossary of definitions is provided for words that are underlined. These can be viewed in the electronic versions by "mousing over" the word or phrase.

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This in-depth Ecological Landscape Analysis report is a lightly edited version of the original ELA produced by 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 Department of Natural Resources 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 Clare Ecodistrict – one matrix, five patches and a corridor. A matrix is the dominant element. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts (see connectivity section for full discussion of matrix, patch and corridor concepts).

Tolerant Mixedwood Hummocks is the matrix element. Prior to European settlement, the matrix was mainly long-lived, shade-tolerant softwood species, such as red spruce, eastern hemlock and white pine. Mixedwood and hardwood have increased since then. Red maple is the major hardwood species with smaller amounts of white birch, sugar maple, yellow birch and beech.

Tolerant Mixedwood Drumlins is the largest patch element. Tree species are similar to the matrix, but the landscape is dominated by drumlins. The other patch elements, in order of size, are **Wetlands, Tolerant Hardwood Hills, Pine Oak Hills and Hummocks** and **Spruce Pine Hummocks**.

Valley Corridors is the corridor element, which usually follows riparian areas along the major rivers and inter-connected lakes and passes through numerous element types. *The ecodistrict also contains the tiny elements Coastal Beach and Salt Marsh.*

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: human, resource, water, deer, fish, southern flying squirrel, birds, coastal plain flora, fur bearers and natural disturbance regime.

The forested landscape of Clare is generally intact and permits good movement or percolation throughout. Removal of forested conditions, particularly along or near settled coastal areas, is a barrier to flow for some species. Dam construction on some of the waterways is also an impediment to flow.

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 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.

The matrix in the Clare Ecodistrict, because of its extent and distribution, plays an important connective function. Although there has been a long history of logging, the matrix is currently well forested and does not appear to be unduly fragmented. The ability of many species to move through the matrix has not likely been compromised. However, there have been, since prior to European settlement, changes in characteristics such as species composition, development class and stand size which would have had an impact on the connective function of the matrix.

The extensive riparian zone along the many watercourses, besides providing important habitat in itself, also supports critical connections of ecosystem elements. The many dams in the ecodistrict affect fish migration and have an impact on riparian zone structure and function. A permeable matrix is necessary to connect various riparian zones.

Much of the coastal section of the Clare is a narrow altered strip of land with a more or less continuous string of dwellings and roads. Areas of scrubland, wetlands and abandoned farm land reverting to forest occur sporadically along a largely cleared coast. The connective function of this altered strip has been significantly lessened.

An additional concern in ecological planning is the maintenance of connectivity between conservation areas, such as wilderness, old growth and ecological reserves, which are often not ecologically related.

Connectivity will be sustained by applying the natural disturbance guidelines for landscape composition and recognizing natural linkage opportunities.

Appendices 2a and 2b identify management strategies and practices for various features in the ecodistrict. These strategies attempt to enhance connectivity by sustaining and restoring natural patterns within the ecodistrict.

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

The most obvious linkage is the forest itself. With the exception of the altered coastal areas, this ecodistrict and adjoining ones are generally a mosaic of connected vegetation types allowing for the flow or movement of many species.

The hydrological system, an important component of this ecodistrict, provides significant linkages. Some of the major river systems, such as the Sissiboo and Tusket, have their headwaters (system of lakes, streams and wetlands) originating outside the ecodistrict. These rivers, along with other major systems originating inside the ecodistrict, such as the Meteghan, Salmon and Annis, all provide linkage at their mouths to the Atlantic Ocean. Anadromous fish (salmon, gaspereau, smelts) swim from the oceans up the rivers to spawn.

People, through their activities, provide linkages with neighboring ecodistricts of Southwest Shore, Annapolis Valley, Valley Slope, South Mountain and Sable. Activities include recreation (e.g. ATVs, snowmobiles, hunting, fishing, happing, canoeing, camp use) and industrial pursuits (commercial fishery, forestry, support industries).

Major transportation routes provide outside linkages. Highways 101 and103 provide access along the western and southern portions of the ecodistrict to the towns of Digby and Yarmouth. These highways and their secondary routes provide links to the Southwest Shore, Annapolis Valley, Valley Slope, South Mountain and Sable ecodistricts. Coastal highways 1 and 3, through their connections to the highways, provide similar links. Inland, Highway 203 adjoins the Western Barrens Ecodistrict, and the Sissiboo Road provides a connection to the South Mountain Ecodistrict.

Migratory birds seasonally use the ecodistrict as habitat. Waterfowl, such as common eider, can be found on the coast and in estuaries. Songbirds make use of forested areas in the interior.

Future management activities could recognize significant links to neighbouring ecodistricts and mange 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 NSDNR 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 Ecological Landscape Analysis 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 – 6 m height)
- young competing forest (7 – 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 – 23)
- mid (seral score 24 – 37)
- late (seral score 38 – 50)

A look-up table (see Appendix 8) assigns each species in the forest inventory a value from 1 to 5 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 – 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 & Old Forest**
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, & 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 Clare

Element	Successional Stage					
	Early	%*	Middle	%	Late	%
Pine Oak Hills and Hummocks	IH1, IH4, SP8	43	IH2, IH6, SH9, SP4, SP6	34	SP5, **SP9**, SH4	17
Spruce Pine Hummocks	IH1, SP2, SP8	48	IH2, IH6, SP3, SP4, SP6, SH9	18	**SP5, SP7,** SP9	28
Tolerant Hardwood Hills	IH3, IH5, IH6, OF1, OF3	15	IH7, TH8	41	**TH1, TH2,** TH3, **TH5, TH6**	35
Tolerant Mixedwood Drumlins	OF1, OF2, OF3, OF4, IH3, IH4, IH5	18	IH6, IH7, MW2, MW4, SH5, SH6	39	TH1, TH2, TH5, **MW1, MW3,** SH1, SH2, SH3, SH4	36
Tolerant Mixedwood Hummocks	OF1, OF2, OF3, OF4, IH3, IH4, IH5	18	CE2, IH6, IH7, MW2, MW4, MW5, SH5, SH6	42	TH1, TH2, TH5, **MW1, MW3,** SH1, SH2, SH3, SH4	31
Wetlands	CE1, FP3, WC1, WC2, WC4, WC5, WC6, WC7, WC8, WD1, WD2, WD3, WD4, WD6, WD7, WD8, SP7					

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

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

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

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

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

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

- Reserve, such as parks or wilderness areas
- Extensive, which are lands managed or restored for multiple values using ecosystem-based techniques
- Intensive, optimizing resource production by management techniques that may reduce biological diversity, such as plantations; but also meet the Wildlife Habitat and Watercourses Protection Regulations (NSDNR, 2002) 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 1 hectare grid. The Ecological Emphasis Index (EEI) is determined by assigning a weighting value to each class: Reserve (100), Extensive (75), Intensive (25) and Converted (0). An overall index value may be calculated for any area of interest, such as element, ecosection, ecodistrict or ecoregion, by averaging the index values within the area to provide a relative indication of land use pressure.

The overall ecological emphasis index for the Clare Ecodistrict is 63 to 68 (Appendices 12a and 12b). The EEI is highest, or more natural, in the Tolerant Mixedwood Hummocks matrix element and Tolerant Mixedwood Drumlins, Wetlands and Tolerant Hardwood Hills patch elements. The EEI is lowest, or less natural, in the Valley Corridors, Pine Oak Hills and Hummocks and Spruce Pine Hummocks elements.

NSDNR will evaluate how this EEI rating compares to other measures of conservation risk, developed by NSDNR's Wildlife Division.

Map 3 shows the geographic distribution of ecological emphasis classes within Clare.

About 71% of the land falls in the extensive EEC. This implies land managed for multiple values using ecosystem based techniques that conserve biodiversity and natural ecosystem conditions and practices.

Parts of the ecodistrict, such as this area near Little Brook, have been converted from their natural state to other uses, such as transportation, agriculture and settlement. The traditional pattern of land ownership was for properties to be divided into long, narrow strips, often originating at the shoreline.

About 8% of the ecodistrict has been converted. This is land which has been changed to an unnatural state for human use or areas where practices have significantly degraded site productivity. The largest, most continuous area of converted land occurs in the southwestern

corner of the ecodistrict near Yarmouth. Ribbons of converted land follow transportation routes along the coastline and the major inland routes, such as Highway 340. There may be an opportunity to restore some of the converted land in the ecodistrict to climax species – in particular, old fields no longer used for agriculture.

The reserve class accounts for about 2% of the area.

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

The Tobeatic Wilderness Area and Old Forest Policy contribute over 90% of the Crown land to the reserve class in Clare. An area could be added to the reserve class by adding under-represented, uncommon ecosections or community types.

The intensive EEC represents a little less than 1% of the land, which is managed intensively to optimize resource production from sites maintained in a native forested state. 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 the Forest Code of Practice.

The remaining 9% has not been classified.

NSDNR 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 1 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 – 6): Unpopulated with few roads, trails or other linear features
- Forest Resource (RI 7 – 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 – 39): Suburban settlement and/or open agricultural fields
- Urban (RI 40 – 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.

Clare has an overall Road Index Value of approximately 7 (Appendix 7, Table 3 and Map 5) which falls within the "Forest Resource Index" range of 7 to 15. This value denotes a landscape that has light road coverage with forest access roads and trails.

The majority of the ecodistrict (75.4%) falls within two index values, remote and forest resources (Appendix 7, Table 2). Remote class accounts for 38.9% and forest resource class for 36.5% of the area.

Remote areas are scattered throughout the ecodistrict. The matrix, which represents nearly half the area of Clare, is in the remote class of Road Index value. Higher Road Index values are associated with more settled elements along the coast.

Issues in the management of roads and trails could include:

- For Crown blocks, development of road and trail plans where the long-term implications of construction on the ecological landscape are considered. Proper planning can reduce the effects of construction on fragmentation, aquatic ecosystems, sensitive sites and protected areas.
- Development of road and trail maintenance plans to ensure that deterioration does not cause negative ecological effects.
- Road decommissioning. Road systems should be analyzed to determine where decommissioning might be implemented. Factors such as resource management scheduling, recreational activities, connectivity and closeness to reserve areas might be considered. Decommissioning implies returning the road itself to a natural a state as possible, removal of bridges and culverts, restoration of chainage to measure distance and

establishment of a new forest.

- Minimizing the impact of road and trail construction by ensuring that best management practices are used in all facets of road and trail construction.
- Encouraging the sharing of road networks should lessen the amount of road construction required.

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 are made of many species of plants, animals and other organisms. Each ecodistrict comprises thousands of species. 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 or 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 (http://novascotia.ca/natr/wildlife/biodiversity/at-risk-overview.asp).

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

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

Old Forest

The Interim Old Forest Policy requires a minimum of 8% of Crown land within each ecodistrict be identified and protected. This has taken place in Clare where 2,067 hectares have been located. The stands are selected to provide representation of landscape elements with the best old forest and old forest restoration opportunities. *In 2012, DNR released an updated Old Forest Policy, containing new IRM decision-making procedures.* (http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf).

Atlantic Coastal Plain Flora and Other Plants

A significant occurrence of rare species in the Clare Ecodistrict is the several species of plants belonging to a group known as Atlantic Coastal Plain Flora (ACPF). These plants became established in southwestern Nova Scotia about 10,000 to 14,000 years ago as a result of a land bridge which existed between Nova Scotia and Massachusetts. Sea level was likely about 110 m lower than today, exposing a broad plain along the Atlantic coast, which is now under water. A rise in sea level from melting glaciers eventually cut off the bridge, leaving disjunct populations of plants geographically and genetically isolated from more southern populations.

Nova Scotia has a total of 64 over 90 species considered to be ACPF with over one-third of these plants found nowhere else in Canada. Eleven are listed as species at risk under the federal Species at Risk Act and the provincial NS Endangered Species Act; and 25 are listed as red "at risk" species under the NS General Status Ranks.

The Clare Ecodistrict has 18 ACPF species that are at risk in Nova Scotia, five of which are listed under the Nova Scotia Endangered Species Act. The most important sites of occurrence tend to be along gently sloping, gravelly lake shorelines in the Tusket River and Annis River watersheds.

The lakeshore plants pink coreopsis (*Coreopsis rosea*), Plymouth gentian (*Sabatis kennedyana*) and many-flowered pennywort (*Hydrocotyle umbellata*) have all been designated endangered in Nova Scotia and have been assigned rare status (endangered of threatened) nationally by the COSEWIC. Pink coreopsis and Plymouth gentian have also been given a G3 ranking, which means that they are rare globally. The handful of lakes in the Clare Ecodistrict where these plants occur contain the entire Canadian populations of these species.

Sweet pepperbush (*Clethra alnifolia*) is a shrub species of ACPF found on the shores of three lakes in the ecodistrict, and is listed as vulnerable under the Endangered Species Act. Also listed as vulnerable is Long's bulrush (*Scirpus longii*), a plant which occurs in only one of the ecodistrict's wetlands.

Thirteen other ACPF species occurring in Clare have been assigned red or yellow status by DNR but are not yet listed under the Act. These are: brook-side alder (*Alnus serrulata*), hairy swamp loosestrife (*Decodon verticillatus*), capitate spikerush (*Eleocharis flavescens*), Joe-pye-thoroughwort (*Eupatorium dubium*), grassed-leaved goldenrod (*Euthamia tenuifolia*), grass leaf rush (*Juncus marginatus*), panic grass (*Panicum longifolium*), southern rein orchid (*Platanthera flava*), spotted pondweed (*Potamogeton pulcher*), mermaid-weed (*Proserpinaca pectinata*), coastal plain blue-eyed grass (*Sisyrinchium atlanticum*), northeastern bladderwort (*Utricularia resputinata*) and netted chainfern (*Woodwardia areolata*).

In addition to the ACPF, four other plant species in the Clare Ecodistrict are considered to be at risk. Eastern white cedar (*Thuja occidentalis)*is designated vulnerable under the Endangered Species Act, General Status red and found in lakesides and swamps. Important populations of eastern white cedar occur in swamps and mixedwoods at Hectanooga and Cedar Lake. Northern maidenhair fern (Adiantum pedatum is General Status red and found in intervals; Farwell's

water-milfoil (*Myiophyllum farwellii)* is General Status yellow and found in ponds and streams; and silky willow (*Salix sericea)* is General Status yellow and found on streambanks.

Eastern White Cedar

Eastern white cedar (*Thuja occidentalis*) is listed as vulnerable under the NS Endangered Species Act. Cedar swamps and lakeside forests are associated with wet, nutrient-medium to rich organic soils. Some of the largest stands in the province occur in Clare Ecodistrict, with the largest population being found at Hectanooga, inland from Cape St. Marys at similar latitude.

Fish

Once more common than at present, Atlantic salmon were found in the Salmon, Meteghan, Sissiboo, Annis and Tusket rivers systems. This species is now considered to have only remnant populations in the Tusket and Sissiboo rivers, with severely depleted numbers in the Annis, Meteghan and Salmon rivers. The Atlantic salmon has a red status in Nova Scotia, and has been designated nationally endangered by COSEWIC. Acid rain is believed to be the major cause of salmon declines in the rivers of southwestern Nova Scotia and elsewhere in the province.

Two other fish species using rivers in the Clare Ecodistrict are considered to be at risk in Nova Scotia: striped bass has a red designation and gaspereau a yellow.

An anadromous population of Atlantic whitefish (*Coregonus huntsmani*), listed as endangered in Nova Scotia, was known to occur in the Tusket and Annis rivers. Their current status is not known and the population has likely been extirpated from those rivers.

Moose

In Nova Scotia, the mainland moose has been designated an endangered species under the NS Endangered Species Act. Mainland moose are genetically distinct from those on Cape Breton Island where moose populations are healthy. One of the remnant populations of moose on the mainland is centred in the Tobeatic Wilderness Area, within the adjacent Western Barrens Ecodistrict. Moose are known to occur in the eastern part of the Clare Ecodistrict, with some even venturing to the extreme western and southern parts of the ecodistrict on occasion.

Moose are commonly associated with forested landscape habitats that have been altered by a disturbance regime, such as fire, wind, disease, or timber harvesting. The habitat requirements of moose are largely dependent on successional forest stages. Early successional trees and shrubs provide important browse while mature conifer cover is valuable for shelter and protection in winter and summer.

Prior to the introduction of forest harvesting as a disturbance regime, the availability of moose habitat in this ecodistrict would have historically been tied to natural disturbances. The natural disturbance regimes for this ecodistrict have been determined to be mainly gap and infrequent disturbance. Essentially, this would have meant a lesser availability of early successional hardwoods than in ecodistricts with frequent disturbance where fire would have played a major

role in altering forest composition. It would be expected then, that the best moose habitat would have been patchy and not extensive in size.

Forestry / Wildlife Guidelines and Standards provide minimum habitat specifications for moose on Crown Land through the 8% retention for old growth, maintenance of a 20m minimum buffer zone along water courses and through the maintenance of reasonable age class distribution. Additional measures to provide for specific habitat needs of moose have been identified and special management practices addressing thermal refugia, aquatic feeding sites, calving areas and clump size, are used on Crown land where appropriate. These may be required to some extent in Crown land harvests on the western side of the ecodistrict adjacent to the Tobeatic WPA.

As of July 2012, interim Mainland Moose Special Management Zones have been identified for the province. Land use practices in support of moose are mandatory on Crown lands within these zones.

It is important to note that because moose occur in low numbers throughout a wide range in southwestern Nova Scotia, large areas of Crown land have been designated C2 because of a potential need for moose considerations in forest harvesting. The intent is to ensure that considerations for moose enter into management decisions at appropriate locations.

American Marten

The Clare Ecodistrict has recently received attention as an important area for American marten (*Martes americana*) in Nova Scotia. Formerly called pine marten, they were once more widespread throughout Nova Scotia but had declined to a few scattered populations by 1900. A reintroduction program based in Kejimkujik National Park occurred between 1987 and 1994.

In recent years several projects undertaken by DNR's Wildlife Division have aimed at shedding some light on current distribution, abundance and habitat selection of marten in southwestern Nova Scotia. Although historically described as a species of mature softwood, information so far suggests that they are also occupying mixed wood forests and younger aged softwood stands, possibly related to the relatively moderate winter weather in this part of the province.

Food in the way of mice, voles, and red squirrels (*Tamiasciuris hudsonicus*) would be available to marten in these stands, but denning requirements will likely have to be met within mature softwood stands. Most of the ecosections in Clare likely have the capability to supply habitat for marten, so it will be important to address marten habitat considerations in Crown land forest management decisions.

American marten in Clare are most likely descendants of New Brunswick marten released in Kejimkujik National Park in the 1980s, but it is possible that these may have mixed with some remnants of the original southwest Nova Scotia population.

The American marten has been designated a red species in Nova Scotia. The Cape Breton population is also listed as endangered, but more information on the status of marten in southwest Nova Scotia is needed before mainland marten receive a possible designation under the Endangered Species Act.

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.

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

730 Clare Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Mixedwood Hummocks (Matrix)	IMDM IMHO WMHO	Infrequent	sugar Maple (sM), yellow Birch yB), beech (Be), red Spruce (rS), eastern Hemlock (eH), white Pine (wP)
Tolerant Mixedwood Drumlins (Patch)	WMDM	Gap	sM, yB, Be, rS, eH, wP
Wetlands (Patch)	WTLD IMSM ICSM	Open seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Tolerant Hardwood Hills (Patch)	WMDS WMKK	Gap	sM, yB, Be
Pine Oak Hills and Hummocks (Patch)	WCHO	Frequent	wP, red Oak (rO)
Spruce Pine Hummocks (Patch)	ICHO	Frequent	bS, wP
Valley Corridors (Corridor)	Various	Various	Various

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

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

Soil Texture: **C** – Coarse textured soils (e.g. gravel) **M** – Medium textured soils (e.g. loam) **F** – Fine textured soils (e.g. clay)

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

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

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

Appendix 3, Table 2 identifies rare (less than 2% of the ecodistrict or ecoregion) and any under-represented ecosections (more than 75% of the area of an ecosections has been removed from a forested state) that are present.

Clare contains six ecosections that fall in the rare category – WMKK, WCHO, ICHO, IMDM, WMDS and ICSM. WCHO and ICHO are more common on an ecoregion basis at 11.3% and 14.9% respectively. These largely coastal ecosections are the most converted (49.2% and 43.2%) in this ecodistrict but relatively little has been converted on the eocregion scale (3.6% and 1.1%).

ICSM contains a number of wetlands. This ecosection is 25.5% converted at the ecodistrict level and 2.5% converted in the ecoregion.

Ecosections IMDM, WMKK and WMDS each occupy less than 2% of the ecodistrict and ecoregion. IMDM is located around the coastal community of Mavillette and may see increased pressure from human habitation. WMDS occurs along the steep-sided slopes of portions of the Sissiboo River and is largely inaccessible to resource extraction. WMKK can be found in the northern part of Clare near Porter's Lake as well around the coastal community of Sanford and a few isolated inland areas in Yarmouth County.

The climax community type of red oak and white pine, which could occur on WCHO, is not currently present. Forest covertype GIS information, based on aerial photography, indicates that red oak is present as a minor component in a few stands while white pine is more prevalent but does not occur often. While this community type may be more common at the ecoregional level, it is difficult to regenerate red oak in forestry practices.

Issues in the management of the ecodistrict could include:

- conservation of species that are threatened, as indicated by DNR's General Status of Species – yellow and red listed
- conservation of significant habitats
- attempts to restore, where feasible, climax communities in locations where they have significantly declined, such as coastal ecosections (WCHO, WMKK) containing red oak, white pine or tolerant hardwood climax types
- identification and mapping cultural sites of importance
- identification of other species and habitats that may be of concern in conservation efforts
- development of extension programs to inform and educate those who have an impact on rare, uncommon, threatened species, sites and habitats

Ecological Representivity (Appendices 4, 5)

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

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

Legally protected reserves include wilderness areas (a portion of the Tobeatic Wilderness Area), protected beaches (Majors Point, Church Point and Bartlett's Beach), sites of ecological significance under moratorium (Cape St. Marys, Gilfillan Lake) and areas under the Special Places Act (Tusket River Ecological Site).

Policy protected reserves are under the integrated resource management classification and include old forest (CZE) set aside under the Provincial Old Growth Policy, designated provincial parks and Park Reserves (6 in the ecodistrict) and operational non-designated parks and reserves (2 in the ecodistrict).

Opportunities to improve representation in the design phase might include:

- ecosections that form less than 2% of the ecodistrict and ecoregion with little or no representation - WMKK, WMDS and IMDM
- red oak - white pine climax community type if one can be located

ELA Summary

Element Interpretation (All appendices and maps)

The Clare Ecodistrict is located on an undulating to gently rolling, drumlin till plain underlain by greywacke, slate, quartzite and schists. The soils that have developed on the slate and quartzite till plain are predominantly well-drained, stony, sandy loams on the gentle hummock topography and the drumlin till plains. Imperfectly drained soils are found in the depressions between drumlins and hummocks, as well as in those areas where internal drainage has been restricted due to glacial soil compaction. The ecodistrict has many lakes and rivers.

The forest associated with the various landforms has been changed by the long period of European settlement. However, the zonal forest comprises productive forests of shade-tolerant species, such as hemlock, red spruce, beech, sugar maple and yellow birch, with white ash and ironwood on the most fertile sites. As the soils get progressively wetter on the level terrain the proportion of black spruce and tamarack increases until red maple dominates the forested wetlands.

In this ecodistrict, natural disturbances appear to occur infrequently. Several agents are at work, including hurricanes, fire and insects. However, the infrequency of stand initiating events allows the development of climax Acadian Forests of tolerant hardwoods and softwoods in both pure and mixed associations on the well-drained ecosites of the ecodistrict. Many of these stands develop into old growth with gap dynamics providing breaks in the canopy and allowing the development of uneven-aged stands.

Tolerant Mixedwood Hummocks

(Matrix) (IMDM, IMHO, WMHO ecosections) (90,481 ha)

Historically, this element was dominated by tolerant softwoods (red spruce, white pine, hemlock). Tolerant hardwood (sugar maple, yellow birch, beech) was present on hilltops. Black spruce was common in the flat, more poorly drained areas.

Abandoned agricultural lands, particularly along coastal areas and in the south of the ecodistrict, have had a profound impact on species composition. The character of the forest has likewise changed in the interior of the ecodistrict, through a long history of various logging practices.

The topography of this element, a series of small rounded hills with gentle slopes interspersed with flatter areas, coupled with past harvesting and the small land ownership parcels provide for a generally diverse landscape characterized by many and varied forest stand types.

Almost half of the area is classified as mature forest. The mature forest has near equal areas of softwood, mixedwood and hardwood covertypes.

Red spruce is the most common softwood. Intolerant hardwoods (red maple, white birch) dominate the mixedwood and hardwood types. Tolerant hardwoods as pure stands or as a component of mixedwoods or intolerant types occur on approximately 11% of the area.

Abandoned agricultural land has usually reverted back to red spruce in the north and white spruce in the south of the ecodistrict.

The matrix is currently fairly well connected and not overly fragmented. Forest management should attempt to ensure that this characteristic is maintained.

Flows

Recreation (hunting, ATV); Forest Products; Water (catchment, filter, ground water recharge); Southern Flying Squirrel; Birds (birds of prey, grouse); Fur Bearers (American marten, fisher).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007) **Composition of Tolerant Mixedwood Hummocks**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	15%	12%	73% (49 Mat + 24 OF)	24%
Seral Stage	Early	Mid	Late	Unclassified
	18%	42%	31%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	42%	17%	39%	2%

Desired Condition

Mature and uneven-aged tolerant hardwood occupying hilltops, primarily mature uneven-aged tolerant softwood with some variation in development class and seral stages on the lower slopes and flats. The more imperfectly drained areas containing black spruce, with significant variation in development and seral stage conditions.

Issues

Forest management should strive to ensure that the range of development classes, seral stages and covertypes appropriate to the natural disturbance regime are present. Since tolerant softwoods and hardwoods are the climax species in the better drained areas of this element, efforts could be directed at encouraging them.
Black spruce could be promoted on the flatter areas.

The percentage of tolerant softwood and hardwood could be maintained or increased by employing partial cutting techniques to favour these species in forest stands with a tolerant component. Tolerant species could be favoured in silviculture thinnings.

The amount of mature forest could be increased by lengthening the rotation age. Old field sites on which white spruce has been harvested could be planted to a climax species - red spruce.

Wildlife habitat requires a range of patch sizes based on covertype and successional species. Because large patch size is lacking patch aggregation could be encouraged.

Tolerant Mixedwood Drumlins

(Patch) (WMDM ecosection) (48,211 ha)

The topography of this well-drained patch type is characterized by clusters of drumlins (patterns of elongated landforms caused by glacial action). In the past, a mixedwood tolerant forest prevailed.

Similar to the matrix, centuries of harvesting and land ownership patterns have had a significant influence on the forest. Presently a mature forest (59%) is the leading development class. There are near equal amounts of softwood, mixedwood and hardwood covertypes with mid and late seral

species in the majority. Intolerant hardwoods are a leading or significant component of several vegetation communities. White or red spruce has colonized abandoned farm land.

Flows

Recreation (hunting); Forest Products; Deer (feeding areas, cover); Southern Flying Squirrel (primary habitat); Birds of Prey (goshawk nesting); Fur Bearers (American marten, upland species habitat); Water (percolation, nutrient source).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Tolerant Mixedwood Drumlins

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	16%	8%	76% (59 Mat + 17 OF)	17%
Seral Stage	Early	Mid	Late	Unclassified
	18%	39%	36%	7%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	28%	34%	36%	2%

Desired Condition

Continuous mature, uneven-aged, mixedwood forest of late seral red spruce, eastern hemlock, white pine, sugar maple, yellow birch and beech.

Issues

Where possible, in mature stands, tolerant softwood and hardwood regeneration could be encouraged by the use of partial cuts. Increase the amount of late seral tolerant species through an expanded pre-merchantable and merchantable thinning program favouring these tolerant species.

Foresters could look into the possibility of under-planting intolerant hardwoods with red spruce or white pine and planting harvested white spruce stands with red spruce. To benefit wildlife, patch aggregation could be considered.

Wetlands

(Patch) (WTLD, IMSM, ICSM ecosections) (18,936 ha)

This patch is characterized by wetlands, usually marshes dispersed through a forest developing on generally imperfectly to poorly drained soils.

Softwood and mixedwood take up 59% and 29%, respectively. Black spruce, a climax species, is well represented, as are intolerant hardwoods. Tolerant softwood and hardwood occur on some of the low hills. About 42% of the forest is mature. About 80% is in mid or late seral species.

Some of the larger wetlands in the ecodistrict are located east of Gaspereau Lake, feeding the Salmon River, northwest of Salmon River Lake and north of Hoopers Lake. The wetlands play an important role in water collection, filtering and ground water recharge.

Flows

Human (hunting, trapping); Resource (peat); Water (storage, filtration, quality, flood regulation, groundwater discharge); Deer (cover); Birds (birds of prey – northern harrier, red-tailed hawk); Fur Bearers (habitat for beaver, mink, muskrat, otter, raccoons); Natural Disturbance Regime (frequent, open seral).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	12%	20%	68% (42 Mat + 26 OF)	26%
Seral Stage	Early	Mid	Late	Unclassified
	14%	39%	41%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	59%	10%	29%	2%

Desired Condition

Relatively undisturbed and well-connected wetlands amidst a black spruce dominated forest with a variety of developmental and seral stages.

Issues

Because of the important ecological functions which they perform, the integrity of the wetlands in this element must be maintained. Any activity on the wetlands themselves must not contravene the Nova Scotia Environment and Labour Wetland Designation Policy, which covers the filling, draining, flooding or excavating of wetlands.

Harvesting of wood on the better drained portions of this patch should be consistent with the frequent natural disturbance regime – a range of development classes with more than 40% mature composed of early, mid and late seral representation. Harvesting near wetlands should be adequately buffered. Connectivity between wetlands, both riparian and upland, should be maintained

Tolerant Hardwood Hills

(Patch) (WMDS, WMKK ecosections) (3,270 ha)

Historically, this was a patch element of late seral mature tolerant hardwood species found on well drained, medium-textured soils located on hills and steep slopes. These species are still

represented on the inland patches of this element. Coastal patches have been much altered by human actively and exposure to the sea, little or no current evidence of tolerant hardwood is present.

Present forest composition is primarily mature, mostly hardwood and mixedwood, with near equal amounts of mid and late seral communities.

Pure tolerant hardwood type occupies approximately 20% of this element. Tolerant hardwood species are present in a further approximately 19% of the patch as a component of mixedwood and intolerant hardwood types. Red spruce is the dominant softwood.

Flows

Recreation (hunting); Forest Products; Deer (feeding areas in cutovers and partial cuts); Water (percolation, nutrient source); Southern Flying Squirrel (primary habitat); Birds of Prey (goshawk); American marten (denning).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	12%	7%	81% (58 Mat + 23 OF)	23%
Seral Stage	Early	Mid	Late	Unclassified
	15%	41%	35%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	18%	42%	39%	1%

Desired Condition

Continuous mature uneven-aged, hardwood forest of tolerant late seral species (sugar maple, yellow birch, beech).

Issues

Consider promoting late seral, tolerant hardwood regeneration in mature community types where sufficient tolerant hardwood species are present by using canopy retention techniques (selective harvesting). Thinning in all development classes should favour tolerant hardwoods. The rotation age could be lengthened.

Pine Oak Hills and Hummocks

(Patch) (WCHO ecosection) (2,367 ha)

This patch occurs on hummocks of well-drained, coarse-textured soils. Most of the patches are along the coast of St. Marys Bay.

The Ecological Land Classification for Nova Scotia indicates that historically the white pine - red oak community was climax. Currently, this community type does not appear to be present. Scattered white pine and the odd red oak are reported in DNR databases.

Through settlement, this is one of the ecodistrict's most altered elements and the present forest is a reflection of this. About half of this element is converted. Typical land ownership pattern, based on the Acadian tradition of passing on land so that access is always provided to the ocean, has resulted in a landscape of narrow properties. Land on the coast has often been converted to farmland.

The primary covertype is softwood (57%), followed by mixedwood (27%) and hardwood (11%). Most of the species are early or mid seral. Coastal beaches are a prominent feature along the shoreline. Gravel pits are common.

Flows

Recreation (hunting, ATV, trapping); Forest Products; Water (catchment, filter, nutrients, ground water recharge); Deer (habitat); Birds (songbirds); and Fur Bearers (upland species habitat).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Pine Oak Hills and Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	18%	21%	61% (37 Mat + 24 OF)	24%
Seral Stage	Early	Mid	Late	Unclassified
	43%	34%	17%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	57%	11%	27%	5%

Desired Condition

Altered land use features along the coast. Inland, a mix of altered features and natural forest conditions.

Issues

Consideration could be given, on a trial basis and where conditions warrant, to restoring late seral white pine and red oak. Under-planting might be an option. If restoration is not practical, the forest could be managed to promote late seral softwoods and hardwoods which are most prevalent in the ecodistrict.

Investigations could determine if there are feasible opportunities to restore some of the connective function between inland and coastal areas. There are areas of forest and abandoned land reverting to forest and riparian corridors which could serve as a starting point.

Spruce Pine Hummocks
(Patch) (ICHO ecosection) (1,248 ha)

The coastal portion of this hummock terrain has been much altered by human settlement. Communities and abandoned farm land are strung out along the coast. White spruce is perhaps the most common species on the former agriculture land. Black spruce may be present on wetter areas.

The historical presence of the climax species of this element is more evident on patches farther inland where black spruce is prevalent and white pine occurs more as scattered individuals.

Flows

Recreation (ATV, Hunting, Trapping); Forest Products; Water (catchment, filter, ground water recharge, nutrients); Deer (habitat); Birds (songbirds); Fur Bearers (upland species habitat).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Spruce Pine Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	17%	29%	54% (23 Mat + 31 OF)	31%
Seral Stage	Early	Mid	Late	Unclassified
	48%	18%	28%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	75%	3%	18%	4%

Desired Condition

Altered coastal patches with inland softwood patches of mixed development and seral stages.

Issues

Coastal areas are likely to see increased pressure from human settlement. Regulations to prevent or mitigate environmental damage should be strictly adhered to. Landowners wishing to harvest forest stands or reclaim abandoned farmland should be encouraged to re-stock with climax species if favourable conditions can be found (i.e. exposure, drainage).

Inland patches should be managed in accordance with the frequent disturbance regime – a variety of developmental and seral stage classes. Silviculture practices in all types could favour white pine and black spruce. Planting could be considered as an option to increase the white pine component.

Valley Corridors
(Corridor) (Various ecosections) (18,187 ha)

The Clare Ecodistrict contains a large number of streams, rivers, lakes, and wetlands, with 9% of the ecodistrict as inland water. The riparian corridors around this water are extremely important for biodiversity and ecosystem function. Many species utilize both aquatic and terrestrial habitats. Species at risk, such as coastal plain flora, are found on the Tusket and Annis rivers systems.

Historically, forest harvesting often took place in the riparian zone and has influenced current forest communities. Most of the corridors are still forested with the exception of where they pass through more settled areas along the coast. A mature development class is most common. Softwood (37%), mixedwood (40%) and hardwood (22%) covertypes occur. Mid and late seral species are dominant. Connectivity has been compromised in many of the river systems because of dam construction. Camps and cottages are present on some of the waterways.

Flows

Recreation (canoeing, hunting, fishing, trapping); Resource (hydro, forestry, fishery); Water (major and minor drainage systems); Deer (habitat); Fish (habitat-salmon, trout, eels, gaspereau, pickerel, bass); Coastal Plain Flora (habitat for pink coreopsis, Plymouth gentian, water pennywort, sweet pepperbush); Fur Bearers (habitat).

Composition

Clare Ecodistrict 730 (based on statistics up to 2007)
Composition of Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and old forest
	5%	11%	84% (59 Mat + 25 OF)	25%
Seral Stage	Early	Mid	Late	Unclassified
	18%	46%	33%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	37%	22%	40%	1%

Desired Condition

Generally continuous cover of natural forest conditions emphasizing lower impact resource management.

Issues

Beyond its importance to the ecological functioning of waterways, recognize the role of all riparian corridors as habitat. Sustain natural forest conditions in these corridors. Late seral softwood and hardwood could be promoted in forest management activities. Management of adjacent vegetation communities should enhance the integrity of corridors. Encourage restoration of forested corridor where gaps exist. Design road systems that minimize environmental damage to riparian corridors.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Clare 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:

- Managing climax forest communities in relation to the natural disturbance regime, development class and seral stage.
- Investigating the possibility of increasing the amount of late seral species in elements where the predicted climax is tolerant species by:
  - implementing partial cuts in intolerant hardwood or mixedwood stands containing a minor tolerant species component; increased tolerant species regeneration will result
  - considering under-planting of intolerant hardwoods or mixedwoods with tolerant species (red spruce, white pine)
  - planting abandoned agriculture land with tolerant species
  - favouring tolerant species in all thinning treatments (pre-commercial thinning, commercial thinning)
- Benefiting interior wildlife species by increasing patch size, needed because of the land ownership pattern.
- Recognizing the importance of riparian corridors on all water courses both as protectors of aquatic ecosystems and as habitat. Looking into maintaining the integrity of corridors through appropriate management practices (type and rate of harvesting) both within the corridor and in adjacent areas.
- Protection of existing wetlands and wetland complexes. Ensuring wetland integrity is not compromised by resource management activity (harvesting, road construction). Recognizing importance of wetland-adjacent land relationships for biodiversity.
- Development of road plans for Crown blocks. Assessing impact of road construction on ecological concerns, such as fragmentation, aquatic ecosystems, sensitive sites and protected areas. Developing a road maintenance plan to ensure road deterioration does not become a deleterious effect. Encouraging sharing of road networks. Considering decommissioning of roads where secondary use (ATV, snowmobiling) of roads is not an issue.
- Looking for opportunities to inform the public about ecosystem management. Most of the land in Clare is held in private ownership, largely small private woodland owners, so their participation is necessary for ecosystem management to be implemented.
- Investigating avenues for improving connectivity in the ecodistrict, such as attempting to restore natural communities where connectivity gaps exist. Opportunities may exist to do this along some of the many riparian corridors in the ecodistrict. Isolated spots for improvement could be present along the coast.
- Improving representivity in the ecodistrict by considering additional ecosections WMKK, WMDS and IMDM for protection.
- Considering the maintenance of an acceptable balance between the four ecological emphasis classes.

Appendix 1: Flow - Element Interactions

Element	Human	Resource	Water	Deer	Fish	Southern Flying Squirrel	Birds	Coastal Plain Flora	Fur Bearers	Natural Disturbance Regime
Matrix 1. Softwood	- Hunting -ATV -Camps	-Forest Products -Silviculture -Aggregate	-Catchment -Filter -Ground Water Recharge -Nutrients -Feeder streams	Habitat	----------	Habitat (mature)	-Habitat (grouse, woodpecker, Birds of Prey) -Song birds (White throated sparrow)	---------- -	-American Marten -Fisher & squirrel habitat	Infrequent
2. Hardwood	-Hunting -ATV -Camps	-Forest Products -Silviculture	-Catchment -Filter -Ground Water Recharge -Nutrients -Feeder streams	Habitat	----------	Habitat (mature)	Habitat Song birds (warblers)	---------- -	American Marten (denning)	Gap
3. Young Forest	Hunting	Silviculture	-Catchment -Filter -Ground Water Recharge -Nutrients -Feeder streams	Browse	----------	---------- --	-Birds of Prey -Song bird Habitat (White throated sparrow)	---------- -	Food (Bobcat)	----------
Patch 1. Drumlins (Tolerant hardwood, red spruce slopes)	Hunting	-Forest products, Hardwood Logs -Firewood -Spruce Hemlock	-Nutrient source Percolation	-Feeding areas in cut over & partial cuts, cover	----------	Primary habitat	Birds of prey (goshawk nesting)	---------- -	Upland species habitat (fox, coyote, bobcat) American marten habitat	Infrequent / gap
2. Wetlands (mostly black spruce, open fens, some red maple)	-Trapping - Hunting	Peat	-Storage -Filtration -Quality -Flood regulation -Ground water recharge	Cover	----------	---------- --	Birds of Prey (Northern) Harrier Red-tailed Hawk	---------- -	Habitat (beaver, mink, muskrat, otter, raccoons)	Frequent /open seral
3. Tolerant Hardwood Hills	Hunting	Forest Products -hardwood logs -firewood	-Nutrient source Percolation	Feeding areas in cut overs & partial cuts	----------	Primary Habitat	Birds of Prey (Goshawk) Song birds (Warblers)	---------- -	American Marten (Denning)	Gap

Appendix 1: Flow - Element Interactions

Element	Human	Resource	Water	Deer	Fish	Southern Flying Squirrel	Birds	Coastal Plain Flora	Fur Bearers	Natural Disturbance Regime
4. Pine Oak Hills and Hummocks	-Altered Habitat (settlement) -Hunting -ATV -Trapping	Forest Products	-Catchment -Filter -Ground Water Recharge -Nutrients	Habitat	----------	----------	Song Bird (Song Sparrow)	----------	Upland Species Habitat (fox, coyote, bobcat)	Frequent
5. Spruce Pine Hummocks	-Altered Habitat (settlement) -Hunting -ATV -Trapping	Forest Products	-Catchment -Filter -Ground Water Recharge -Nutrients	Habitat	----------	----------	Song Bird (Song Sparrow)	----------	Upland Species Habitat (fox, coyote, bobcat)	Frequent
6. Salt Marsh	-Hunting -Trapping -Bird Watching	----------	Source of nutrients for salt water	Food	Nurseries for fish	----------	-Song Bird (Sharp Tailed Sparrow) -Shore Birds -Waterfowl	----------	Habitat (otter, mink, muskrat)	Open Seral
7. Coastal Beach	Recreation	----------	----------	Food	----------	----------	Shore Birds	----------	Food Source (mink, raccoons)	----------
Valley Corridors	-Canoeing -Fishing -Trapping -Cottages	-Hydro -Forestry	Major Drainage	Habitat (Food, Travel)	Habitat (salmon, trout, eels, gasperau, pickerel, bass)	----------	Food & Nesting (osprey, bald eagle)	-Habitat Pink Coreopsis (Tusket, Annis) Plymouth Gentian (Tusket), Water Pennywort (Tusket), Sweet Pepperbush (Belliveau Lake, Louis Lake, Canoe Lake)	Habitat	Varied (Infrequent, Cap, Frequent, Open seral)

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Mixedwood Hummocks	Matrix	High	IMHO, WMHO, IMDM	Landscape	Infrequent and some gap	-Red Spruce with scattered Eastern Hemlock & White Pine -Tolerant and Intolerant Hardwoods - Red Spruce/White Spruce on abandoned farm land -Black Spruce	- Corridors - Mixedwood drumlins -Hardwood hills	-Roads -Land ownership patterns - Settlement - Possible fragmentation with increase in harvest levels -Species composition within matrix	-Small patch structure -Large amount of intolerant hardwoods -Harvesting practices	-Promote large patch structure & interior conditions -Maintain >60% mature cover -Encourage tolerant hardwood & tolerant softwood regeneration with partial cutting techniques -Restoration to natural communities through appropriate partial harvesting & planting
Tolerant Mixedwood Drumlins	Patch	High	WMDM - well drained medium textured soils on Drumlins	Landscape	Gap	Tolerant hardwood -Intolerant hardwood - Red Spruce with scattered Pine and Hemlock	- Corridors - Spruce matrix	- Roads -Land ownership patterns -Settlement -Species composition within the island	-Harvesting practices -Loss of natural structure (i.e. southern flying squirrel habitat/ movement) - Low percentage of late seral species - Large amount of intolerant hardwoods	- Restoration to natural communities through appropriate partial harvesting & planting - Manage mid seral stands to promote late seral species - Encourage tolerant hardwood & tolerant softwood with appropriate partial harvesting

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Patch	Moderate	WMKK, WMDS	Local - a few isolated small to large patches	Gap	- Tolerant hardwood - Intolerant hardwood -Mixed wood	- Spruce matrix -Corridors	- Species composition within the patch	- Increase in intolerant hardwood - Low amount of seral species	- Restoration to natural communities (tolerant hardwood) through appropriate partial harvesting - Manage mid seral stands to promote late seral species
Pine Oak Hills and Hummocks	Patch	Low	WCHO	Local - primarily linear patch along coastline	Frequent	- Red/White Spruce - Intolerant hardwood - Abandoned farmland	- Spruce matrix - Corridors	- Roads - Landownership patterns - Settlement	- Converted land use (abandoned farmland)	Restoration of natural communities through planting
Spruce Pine Hummocks	Patch	Low	ICHO	Local	Frequent	Black Spruce, White Spruce, intolerant mixedwood	Spruce Matrix	- Roads - Landownership patterns - Settlement	Converted land use	Restoration of natural communities through planting
Valley Corridors	Corridor	High	Tusket, Annis, Salmon, Meteghan, Sissiboo	Landscape	Varied - dependent on community type within corridor	Swamps, fens, flood plains, meadows, coastal plain flora, black spruce, red maple	Many forest types on better-drained sites	- Existing dams - Conversion of riparian zone along major waterways & headwater streams	- Coastal plain flora - Farm field zones (abandoned farm land) - Housing & cottage development - Harvesting adjacent to headwater streams	- Follow coastal plain flora recovery plans - restoration of abandoned farm land - develop guidelines for harvesting near headwater streams - participate in development of watershed management plans - maintain integrity of riparian zone with appropriate harvesting practices

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
Wetlands - Open bogs - Black Spruce swamps - Red Maple swamps	 Patch Patch Patch	 Moderate-high High Low (uncommon)	 Caribou Bog Individual watershed complexes Annis River Tusket River	 Landscape Landscape Local watersheds	 Open seral Frequent Gap	 Bog species Black Spruce, sphagnum on mineral base Red Maple/Poison ivy	 Black Spruce Swamps Open bogs upland softwoods Streams and uplands	 Roads, ATV Potential for excessive harvesting and road construction Not under management pressure	 ATV use Potential effects of harvesting on water systems	 Education Enforcement ***
Salt Marsh	Patch	High	Mavillette Majors Point	local	storms	salt tolerant plant species	Black Spruce White Spruce Abandoned farm land Gravel pits	Waterflow obstructions (freshwater saltwater) - Alteration of marsh and adjoining habitat - Sedimentation - water quality	development pollution	Protection of salt marsh, restoration/enhancement
Coastal Beach	Patch	High	Mavilette Port Maitland	local	Storm and wave action	Salt tolerant coastal plants, dune systems	- Wetlands - Marine flats - abandoned farmland - settlement	- Disturbance	Development ATV use	Stewardship
Cedar	Patch	Low High for biodiversity	Cedar Lake Hectanooya Cedarwood Lake	Local	Gap	- Cedar - Cedar with Eastern Hemlock & Red Spruce		- Isolated patches - Harvesting losses	- poor regeneration - harvesting within & adjacent to patches	Protect existing patches

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
Coastal Plain Flora	Patch	High for biodiversity	Tusket & Annis Rivers Belliveau Lake Canoe Lake	Local	Factors that lower competition such as: -ice scouring - wave action	- Gravelly lake shores & aquatic environment	- Shallow water zone -Riparian zone around lakes	- Isolated patches (Seed dispersed pollination) - Drastic changes in water level - Changes in water quality	- Shoreline development (alteration of shoreline notably structures) - dams - pollution -eutrophication (excessive nutrient load)	Follow coastal plain Flora Recovery plan Stewardship programs

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 Natural Disturbance Regime 5. Follow habitat regulations for buffer management. Establish wider buffers with natural boundaries along major waterways

Appendix 3: Special Occurrences (Ecodistrict 730)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS				
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	Endangered	Endangered
Chimney Swift	*Chaetura pelagica*	Endangered	Threatened	Threatened
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	Special Concern	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	Threatened	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	Threatened	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS				
Sweet Pepper-Bush	*Clethra alnifolia*	Vulnerable	Special Concern	Special Concern
Pink Coreopsis	*Coreopsis rosea*	Endangered	Endangered	Endangered
Water-pennywort	*Hydrocotyle umbellata*	Endangered	Threatened	Threatened
Plymouth Gentian	*Sabatia kennedyana*	Endangered	Endangered	Endangered
FERNS AND THEIR ALLIES				
Prototype Quillwort	*Isoetes prototypus*	Vulnerable	Special Concern	Special Concern
FISH				
Atlantic Whitefish	*Coregonus huntsmani*	Endangered	Endangered	Endangered
GYMNOSPERMS				
Eastern White Cedar	*Thuja occidentalis*	Vulnerable	N/A	N/A
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
LICHENS				
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Graceful Felt Lichen	*Erioderma mollissimum*	Endangered	Endangered	Endangered
MAMMALS				
Moose	*Alces americanus*	Endangered	N/A	N/A
American Marten	*Martes americana*	Endangered	N/A	N/A

Appendix 3: Special Occurrences (Ecodistrict 730)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
REPTILES				
Loggerhead Sea Turtle	*Caretta caretta*	N/A	Endangered	Endangered
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Eastern Ribbonsnake - Atlantic pop.	*Thamnophis sauritus pop. 3*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 730)

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
Blue-winged Teal	*Anas discors*	May Be At Risk (Orange)	S3B
American Bittern	*Botaurus lentiginosus*	Sensitive (Yellow)	S3S4B
Least Sandpiper	*Calidris minutilla*	Secure (Green)	S1B,S5M
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3M
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B
Black-billed Cuckoo	*Coccyzus erythropthalmus*	May Be At Risk (Orange)	S3?B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Cape May Warbler	*Dendroica tigrina*	Sensitive (Yellow)	S3?B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Willow Flycatcher	*Empidonax traillii*	Sensitive (Yellow)	S2B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Sensitive (Yellow)	S3M
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3B
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
Pine Grosbeak	*Pinicola enucleator*	May Be At Risk (Orange)	S3?B,S5N
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S3S4B
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S3B,S5M
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	S2S3B
Warbling Vireo	*Vireo gilvus*	Undetermined (Undetermined)	S1?B
BRYOPHYTES			
a Moss	*Zygodon conoideus*	Sensitive (Yellow)	S2?
DICOTS			
Nova Scotia Agalinis	*Agalinis neoscotica*	Secure (Green)	S3
Smooth Alder	*Alnus serrulata*	Sensitive (Yellow)	S3
Running Serviceberry	*Amelanchier stolonifera*	Undetermined (Undetermined)	S3?
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3
Swamp Milkweed	*Asclepias incarnata ssp. incarnata*	Secure (Green)	S3
Swamp Milkweed	*Asclepias incarnata ssp. pulchra*	Undetermined (Undetermined)	S2S3
Yellow Bartonia	*Bartonia virginica*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 730)

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***
Prickly Hornwort	*Ceratophyllum echinatum*	May Be At Risk (Orange)	S2?
Swamp Loosestrife	*Decodon verticillatus*	Sensitive (Yellow)	S3
Purple-veined Willowherb	*Epilobium coloratum*	Sensitive (Yellow)	S2?
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
Coastal Plain Joe-pye-weed	*Eupatorium dubium*	May Be At Risk (Orange)	S2
Common Bedstraw	*Galium aparine*	Exotic ()	S1
Blunt-leaved Bedstraw	*Galium obtusum*	May Be At Risk (Orange)	S1S2
Panicled Hawkweed	*Hieracium paniculatum*	Secure (Green)	S3
Hairy Lettuce	*Lactuca hirsuta var. sanguinea*	Sensitive (Yellow)	S2
Maleberry	*Lyonia ligustrina*	May Be At Risk (Orange)	S1
Water Beggarticks	*Megalodonta beckii*	Sensitive (Yellow)	S3
Farwell's Water Milfoil	*Myriophyllum farwellii*	Sensitive (Yellow)	S2
Narrow-leaved Evening Primrose	*Oenothera fruticosa ssp. glauca*	Undetermined (Undetermined)	S2
Stout Smartweed	*Polygonum robustius*	Secure (Green)	S3S4
Canada Cinquefoil	*Potentilla canadensis*	Undetermined (Undetermined)	S3?
Intermediate Mermaidweed	*Proserpinaca intermedia*	May Be At Risk (Orange)	S1
Marsh Mermaidweed	*Proserpinaca palustris*	Secure (Green)	S3
Marsh Mermaidweed	*Proserpinaca palustris var. crebra*	Secure (Green)	S3
Marsh Mermaidweed	*Proserpinaca palustris var. palustris*	May Be At Risk (Orange)	S1?
Comb-leaved Mermaidweed	*Proserpinaca pectinata*	Sensitive (Yellow)	S3
Eastern Cudweed	*Pseudognaphalium obtusifolium*	Secure (Green)	S3S4
Pink Pyrola	*Pyrola asarifolia*	Secure (Green)	S3
Virginia Meadow Beauty	*Rhexia virginica*	Secure (Green)	S3
Swamp Rose	*Rosa palustris*	Secure (Green)	S3
Silky Willow	*Salix sericea*	May Be At Risk (Orange)	S2
Elliott's Goldenrod	*Solidago latissimifolia*	Secure (Green)	S3
Horned Sea-blite	*Suaeda calceoliformis*	Secure (Green)	S2S3
Boreal Aster	*Symphyotrichum boreale*	Sensitive (Yellow)	S2?
Canada Germander	*Teucrium canadense*	Sensitive (Yellow)	S3
Humped Bladderwort	*Utricularia gibba*	Secure (Green)	S3S4
Little Floating Bladderwort	*Utricularia radiata*	Secure (Green)	S3
Inverted Bladderwort	*Utricularia resupinata*	May Be At Risk (Orange)	S1S2
Zigzag Bladderwort	*Utricularia subulata*	Secure (Green)	S3
Highbush Blueberry	*Vaccinium corymbosum*	Secure (Green)	S3
Arrow-Leaved Violet	*Viola sagittata var. ovata*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 730)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
FERNS AND THEIR ALLIES			
Northern Maidenhair Fern	*Adiantum pedatum*	May Be At Risk (Orange)	S1
Cut-leaved Moonwort	*Botrychium dissectum*	Secure (Green)	S3
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive (Yellow)	S2S3
Least Moonwort	*Botrychium simplex*	Sensitive (Yellow)	S2S3
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Acadian Quillwort	*Isoetes acadiensis*	Sensitive (Yellow)	S3
Southern Bog Clubmoss	*Lycopodiella appressa*	Secure (Green)	S3S4
Northern Adder's-tongue	*Ophioglossum pusillum*	Sensitive (Yellow)	S2S3
Little Curlygrass Fern	*Schizaea pusilla*	Secure (Green)	S3
Netted Chain Fern	*Woodwardia areolata*	Sensitive (Yellow)	S2S3
FISH			
Striped Bass	*Morone saxatilis*	May Be At Risk (Orange)	S1
Atlantic Salmon	*Salmo salar*	May Be At Risk (Orange)	S2
INSECTS			
Mottled Darner	*Aeshna clepsydra*	Secure (Green)	S3
Lance-Tipped Darner	*Aeshna constricta*	Secure (Green)	S3
Orange Bluet	*Enallagma signatum*	May Be At Risk (Orange)	S1
Vesper Bluet	*Enallagma vesperum*	Sensitive (Yellow)	S2S3
Seaside Dragonlet	*Erythrodiplax berenice*	Sensitive (Yellow)	S3
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Compton Tortoiseshell	*Nymphalis l-album*	Secure (Green)	S1S2
Brook Snaketail	*Ophiogomphus aspersus*	May Be At Risk (Orange)	S1
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Clamp-Tipped Emerald	*Somatochlora tenebrosa*	Secure (Green)	S3
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
LICHENS			
Rimmed Shingles Lichen	*Fuscopannaria leucosticta*	May Be At Risk (Orange)	S1S2
MAMMALS			
Cougar - Eastern pop.	*Puma concolor pop. 1*	Undetermined (5)	Unranked

Appendix 3: Special Occurrences (Ecodistrict 730)

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***
MOLLUSKS			
Tidewater Mucket	*Leptodea ochracea*	Sensitive (Yellow)	S1
MONOCOTS			
Slim-stemmed Reed Grass	*Calamagrostis stricta ssp. stricta*	Sensitive (Yellow)	S1S2
Silvery-flowered Sedge	*Carex argyrantha*	Secure (Green)	S3S4
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined (Undetermined)	S2
Hidden-scaled Sedge	*Carex cryptolepis*	Secure (Green)	S3?
Porcupine Sedge	*Carex hystericina*	Sensitive (Yellow)	S2
Long's Sedge	*Carex longii*	May Be At Risk (Orange)	S1?
Hop Sedge	*Carex lupulina*	Secure (Green)	S3
Toothed Flatsedge	*Cyperus dentatus*	Secure (Green)	S3S4
Low Flatsedge	*Cyperus diandrus*	Undetermined (Undetermined)	S1
Deer-tongue Panic Grass	*Dichanthelium clandestinum*	Secure (Green)	S3
Eaton's Witchgrass	*Dichanthelium spretum*	Secure (Green)	S3S4
Yellow Spikerush	*Eleocharis olivacea*	Sensitive (Yellow)	S2S3
Beaked Spikerush	*Eleocharis rostellata*	Sensitive (Yellow)	S3
Canada Waterweed	*Elodea canadensis*	Secure (Green)	S3?
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Sharp-Fruit Rush	*Juncus acuminatus*	Sensitive (Yellow)	S3S4
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Grassleaf Rush	*Juncus marginatus*	Sensitive (Yellow)	S3
Woods-Rush	*Juncus subcaudatus var. planisepalus*	Sensitive (Yellow)	S3
Loesel's Twayblade	*Liparis loeselii*	Secure (Green)	S3S4
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Fall Panic Grass	*Panicum dichotomiflorum var. puritanorum*	May Be At Risk (Orange)	S1?
Redtop Panic Grass	*Panicum rigidulum var. pubescens*	Sensitive (Yellow)	S3
Tuckerman's Panic Grass	*Panicum tuckermanii*	Sensitive (Yellow)	S2S3
Switch Grass	*Panicum virgatum var. spissum*	Sensitive (Yellow)	S3
Canada Rice Grass	*Piptatherum canadense*	Sensitive (Yellow)	S2
Southern Rein-Orchid	*Platanthera flava*	Sensitive (Yellow)	S2
Southern Rein Orchid	*Platanthera flava var. flava*	Sensitive (Yellow)	S2
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Large Round-Leaved Orchid	*Platanthera macrophylla*	Sensitive (Yellow)	S2

Appendix 3: Special Occurrences (Ecodistrict 730)

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***
Small Round-leaved Orchid	*Platanthera orbiculata*	Secure (Green)	S3
Spotted Pondweed	*Potamogeton pulcher*	May Be At Risk (Orange)	S1S2
Olney's Bulrush	*Schoenoplectus americanus*	Sensitive (Yellow)	S3
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Eastern Blue-Eyed-Grass	*Sisyrinchium atlanticum*	Secure (Green)	S3S4
Coastal Plain Blue-eyed-grass	*Sisyrinchium fuscatum*	May Be At Risk (Orange)	S1
Round-leaved Greenbrier	*Smilax rotundifolia (Atlantic pop.)*	Secure (Green)	S3
Case's Ladies'-Tresses	*Spiranthes casei var. novaescotiae*	Sensitive (Yellow)	S2
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	Sensitive (Yellow)	S2S3
Eastern Skunk Cabbage	*Symplocarpus foetidus*	Secure (Green)	S3S4

*Atlantic Canada Conservation Data Centre S-Ranks, where S1: extremely rare; S2: rare; S3: uncommon; S4: usually widespread, fairly common; S5: widespread, abundant; S#S#: A range between two consecutive ranks for a species/community. Denotes uncertainty about the exact rarity (e.g. S1S2); Consult http://www.accdc.com/Data/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 730)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Applicable Legislation
Lakes - Belliveau Lake, Gilfillan Lake, Spectacle, others	Ecosystems	Service Nova Scotia	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regs)
Loon Nesting Lakes	Bird Habitat	Significant Habitats of Nova Scotia Database (SHNSD)	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regs)
Eagle Nests	Bird Habitat	SHNSD	Nova Scotia Wildlife Act (NSWA)
Tusket River Ecological Site	Plant Species	SHNSD ACCDC	NSESA SARA
Wilderness Areas – Tobeatic	Ecosystems	SOURCE	ACT
Provincial Parks – Ellenwood Lake, Port Maitland Beach, Mavillette Beach, Smugglers Cove, Savary and Glenwood Park reserves - Bluff Head, Pembroke Beach, Ogden Lake and Corberrie	Ecosystems/ Recreation	SOURCE	NS Parks Act
Tusket River Nature Reserve	Ecosystems	SOURCE	ACT
Rivers - Tusket, Carleton, Annis, Sissiboo, Meteghan and Salmon, Silver, Chebogue, others	Ecosystems	Service Nova Scotia	Nova Scotia Environment Act Nova Scotia Forest Act (Wildlife Habitat and Watercourse Protection Regs)
Designated Beaches -Majors Point, Church Point and Bartletts	Ecosystems	SOURCE	Beaches Act
Lake George Watershed	Water Supply Ecosystems	SOURCE Significant Habitats of Nova Scotia Database (SHNSD)	Nova Scotia Environment Act

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type* (1, 2, 3)*		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3)*		EEC Index Ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS wP	1399.4	0.7	1399.4	0.7	36 to 38	43.2	228153.4	14.9	386684.3	25.2	76 to 80	1.1
ICSM	wetlands	624.2	0.3	0	0	52	25.5	37495.4	2.4	0	0	76 to 79	2.5
IMDM	rS eH wP	803.7	0.4	46351.9	24.2	46 to 51	12	25961.2	1.7	524453.7	34.2	64 to 69	9.9
IMHO	rS eH wP	66760.6	34.8	46351.9	24.2	62 to 67	5.7	220504.5	14.4	524453.7	34.2	70 to 73	3
IMSM	bS	13127.6	6.9	33931.7	17.7	69 to 73	2.9	91751.3	6	74241.2	4.8	71 to 74	3.7
WCHO	rO wP	2434	1.3	2434	1.3	33 to 34	49.2	173227.7	11.3	47256.4	3.1	73 to 78	3.6
WMDM	rS eH wP sM yB Be	49533	25.9	49533	25.9	58 to 63	10.2	132981.9	8.7	182056.9	11.9	58 to 63	13.5
WMDS	sM yB Be	796.3	0.4	31899.1	16.6	49 to 53	24.9	3504.7	0.2	57009.3	3.7	52 to 57	16.3
WMHO	rS eH wP	27608.9	14.4	46351.9	24.2	59 to 65	8.8	154580	10.1	524453.7	34.2	64 to 69	7.5
WMKK	sM yB Be	2550.9	1.3	31899.1	16.6	58 to 63	13.5	14963.9	1	57009.3	3.7	58 to 64	11.1
WTLD	wetlands	7276.5	3.8	0	0	67 to 69	6.1	85723	5.6	0	0	77 to 78	3

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserve		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
IMHO	rS eH wP	66760.6	13	730.1	0	126.9	0	857	1.3	0	0	857	1.3
WMDM	rS eH wP sM yB Be	49533	5.1	140.4	0	146.6	0	287	0.6	0	0	287	0.6
WMHO	rS eH wP	27608.9	7	221.7	2.6	135	0	356.7	1.3	2.6	0	359.3	1.3
XXWA		18433.7	1	0	0	0	0	0	0	0	0	0	0
IMSM	bS	13127.6	24	1335.5	0	29.3	0	1364.8	10.4	0	0	1364.8	10.4
WTLD	wetlands	7276.5	12.4	107.6	0	0	0	107.6	1.5	0	0	107.6	1.5
WMKK	sM yB Be	2550.9	2	0	0	0	0	0	0	0	0	0	0
WCHO	rO wP rP	2434	9.8	10.3	10.3	38.5	0	48.8	2	10.3	0.4	59.1	2.4
ICHO	bS wP	1399.4	8.7	95.6	10.4	0	0	95.6	6.8	10.4	0.7	106	7.6
IMDM	rS eH wP	803.7	0.3	2	0	0	0	2	0.3	0	0	2	0.3
WMDS	sM yB Be	796.3	1.5	0	0	0	0	0	0	0	0	0	0
ICSM	wetlands	624.2	0.2	0	7.6	0.1	0	0.1	0	7.6	1.2	7.8	1.2
XXMS	salt marsh	233.4	28.7	66.6	10.4	0.3	0	66.9	28.6	10.4	4.5	77.3	33.1
XXCB	coastal beach	24.9	0	0	21.9	0	0	0	0	21.9	88	21.9	88
Total		**191,607.1**		**2,709.8**	**63.2**	**476.7**	**0**	**3,186.5**		**63.2**		**3,249.9**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act -Designation	Area by Ownership		Policy - Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	2,563	0	Operational Non Designated Parks and Reserves	23	0
Sites of Ecological Significance Under Moratorium	124	0	Old Forest	2,066	0
Protected Beaches	0	63	Designated Provincial Parks and Park Reserves	184	0
Areas under the Special Places Act	22	0			

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

Appendix 6: Description of Road Density Index

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

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

Efficient access systems can be strategically designed to minimize environmental impacts by incorporating factors such as harvest scheduling, life expectancy, location, road class requirements, decommissioning, and mitigation measures (Lindenmayer & Franklin 2002, Forman, 2004). Selection of transportation routes should incorporate knowledge of landscape functions to improve compatibility with natural ecosystem flows and connectivity (Forman & Hersperger, 1996). Furthermore, unroaded and lightly roaded areas 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 3 main factors: 1) the type of transportation feature (e.g. highway, powerline, 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 3 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 1 kilometre radius. The Index algorithm is applied to a grid of 1 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.

Department of Natural Resources 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)
Utility corridors	3	1,516
Trails, tracks, abandoned roads and railways	1	167
Gravel roads and active railways	6	1,304
Paved streets and roads collectors	10	508
Highways	15	84

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 - 6	74,607	38.9
Forest Resource	7 - 15	69,932	36.5
Mixed Rural	16 -24	36,563	19.1
Agriculture Suburban	25 - 39	9,899	5.2
Urban	40 - 100	608	0.3
Total		**191,608**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	18,187	10
Tolerant Mixedwood Hummocks	90,481	6
Spruce Pine Hummocks	1,248	18
Pine Oak Hills and Hummocks	2,367	20
Tolerant Hardwood Hills	3,270	12
Tolerant Mixedwood Drumlins	48,211	6
Wetlands	18,936	7
Total	**182,700***	**7**

*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

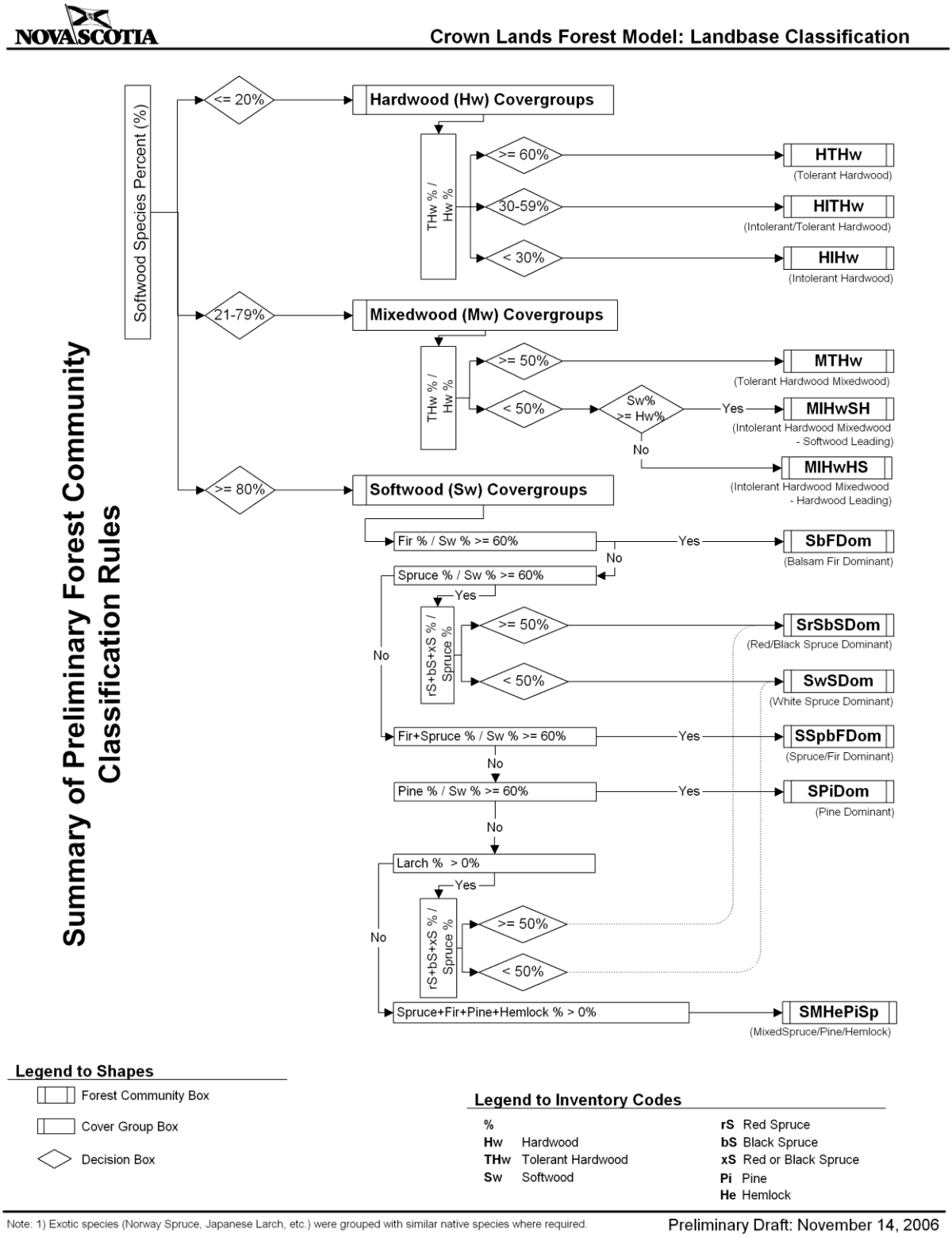
Development Class	Seral Stage
1. Forest Establishment (Height 0 - 6 m) - establishment of new growth following a stand initiating disturbance - high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade intolerant "pioneer" species - peak seed production by forbs and shrubs - approximate age 0 - 25 years	Early Seral Species (Score 10 – 23) - new growth dominated by pioneer tree species or unclassified regeneration Mid Seral Species (Score 24 - 37) - regeneration composed of a mixture of pioneer, mid-climax, and climax species Late Seral Species (Score 38 - 50) - regeneration dominated by climax species
2. Young Forest (Height 7 - 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 – 40	Early Seral Species (Score 10 - 23) - canopy dominated by pioneer tree species Mid Seral Species (Score 24 - 37) - canopy composed of a mixture of pioneer, mid-climax, and climax species Late Seral Species (Score 38 - 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 - 125 years	Early Seral Species (Score 10 - 23) - canopy dominated by pioneer species - over maturity initiates canopy breakup and understory development Mid Seral Species (Score 24 - 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 - 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 - 23) - canopy likely to break up and be replaced by developing understory Mid Seral Species (Score 24 - 37) -pioneer dominated overstory with canopy recruitment from a climax species dominated understory. Late Seral Species (Score 38 - 50) - climax species dominated overstory maintained through gap dynamic processes.

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

Species		Ecodistrict																																						
Code	Name	100	210	220	310	320	330	340	350	360	370	380	410	420	430	440	450	510	520	530	540	550	560	610	620	630	710	720	730	740	750	760	770	780	810	820	830	840	910	920
AS	ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BA	black ash	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BC	black cherry	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BE	beech	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
BF	balsam fir	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	1	1
BP	balsam poplar	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	3	1
BS	black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EC	eastern cedar	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EH	eastern hemlock	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	exotic species	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GB	grey birch	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
IH	intolerant hardwood	3	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
JP	jack pine	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LA	largetooth aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OH	other hardwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
OS	other softwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PC	pin cherry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RM	red maple	3	2	4	2	2	2	2	2	4	2	5	2	2	2	2	2	2	2	2	2	5	3	2	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2	2
RO	oak	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
RP	red pine	3	3	3	3	3	3	3	3	3	4	3	3	3	4	3	3	3	3	4	4	4	4	4	4	4	3	4	3	3	3	4	4	3	4	4	3	3	3	3
RS	red spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SM	sugar maple	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
ST	striped maple	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TA	aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TH	tolerant hardwood	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TL	eastern larch	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
UC	unclassified	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WA	white ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
WB	white birch	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WE	white elm	2	2	4	2	4	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WP	white pine	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
WS	white spruce	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red&black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Clare 730)

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 Hummocks	IMHO (69.8) WMHO (29.3) IMDM (0.9)	Softwood	rS eH wP bS	Infrequent	63336.5 (70%)	Early	701.2	910.3	1769.2	1226	4606.6	32500 (41.8%)	EARLY	14196.9 (18.3%)
						Mid	1136.8	2044.2	2773.1	2844.5	8798.6			
						Late	1102.7	2489.3	9278.1	3692.3	16562.4			
						Uncl	2532.4	0	0	0	2532.4			
		Mixedwood				Early	412.3	731.7	2079	1750.3	4973.3	30042.1 (38.6%)	MID	32614.7 (42%)
						Mid	894.4	2032.5	8750.2	6178.4	17855.5			
						Late	124.6	256.4	3137.7	1271.4	4790.1			
						Uncl	2423.2	0	0	0	2423.2			
		Hardwood	sM yB Be	Gap	27144.2 (30%)	Early	412.6	597.9	2729.9	538.2	4278.6	13460.9 (17.3%)	LATE	24319.1 (31.3%)
						Mid	173.4	418	4664.3	704.8	5960.6			
						Late	43.2	113.7	2578.9	230.9	2966.7			
						Uncl	255	0	0	0	255			
		Unclassified				Early	338.3	0	0	0	338.3	1740.4 (2.2%)	UNCL	6612.7 (8.5%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1402.1	0	0	0	1402.1			
Total					**90,480.7***	**# ha**	**11952.3**	**9593.9**	**37760.4**	**18437**	**77743.4**			
						%	**15.4**	**12.3**	**48.6**	**23.7**	**100**			

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 (Clare 730)

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 Drumlins	WMDM (100%)	Softwood				Early	402.2	420.3	946	651.8	2420.2	11779.9 (28.5%)	EARLY	7336.5 (17.8%)
						Mid	787.4	588	867.4	675.2	2917.9			
						Late	600.1	381.7	3586.2	949.6	5517.5			
						Uncl	924.2	0	0	0	924.2			
		Mixedwood	rS eH wP sM yB Be	Gap	48211.2 (100%)	Early	256.7	334.9	1037.6	675	2304.3	14740.9 (35.7%)	MID	15951.4 (38.7)
						Mid	759.3	751.8	3797.9	2107.4	7416.3			
						Late	100.5	120.5	2659.7	962.7	3843.4			
						Uncl	1177	0	0	0	1177			
		Hardwood				Early	199.3	321.2	1551.3	179.3	2251.2	13,877.5 (33.6%)	LATE	15022.8 (36.4%)
						Mid	209.8	331.8	4641	434.5	5617.2			
						Late	41.1	151.8	5107.3	361.7	5661.9			
						Uncl	347.2	0	0	0	347.2			
		Unclassified				Early	360.8	0	0	0	360.8	865.4 (2.1%)	Unclas	2953 (7.2%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	504.6	0	0	0	504.6			
Total					**48,211.2***	**# ha**	**6670.2**	**3401.9**	**24194.4**	**6997.1**	**41263.7**			
						%	**16.2**	**8.2**	**58.6**	**17**	**100**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Clare 730)

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	IMSM (63.6%) WTLD (31.9%) ICSM (3.3%)	Softwood	bS	Frequent Open Seral	12297.9 (64.9%)	Early	72	188.2	294.4	186.2	740.8	8245 (59 %)	EARLY	2023.6 (14.5%)
						Mid	156	718.4	570.1	798.9	2243.3			
						Late	287	1276.9	2025.6	1196	4785.5			
						Uncl	475.4	0	0	0	475.4			
		Mixedwood				Early	53	117.5	264.4	256.9	691.8	4055.1 (29%)	MID	5392.3 (38.6%)
						Mid	94.5	314.8	1255.7	857.7	2522.7			
						Late	8.4	56.8	382.4	195.7	643.3			
						Uncl	197.3	0	0	0	197.3			
		Hardwood	rM	Gap	604.2 (3.2%)	Early	26.9	94.6	285.5	100.7	507.8	1449.9 (10.4)	LATE	5735.4 (41%)
						Mid	5.3	30.7	500.4	89.9	626.3			
						Late	1.3	18	256.3	30.9	306.6			
						Uncl	9.2	0	0	0	9.2			
		Unclassified				Early	83.2	0	0	0	83.2	228.3 (1.6%)	Unclas	826.9 (5.9%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	145.1	0	0	0	145.1			
Total					**18,936***	**# ha**	**1614.6**	**2815.9**	**5834.8**	**3712.9**	**13978.3**			
						%	**11.6**	**20.1**	**41.7**	**26.6**	**100%**			

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 (Clare 730)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills	WMKK (76.8%) WMDS (23.2%)	Softwood				Early	3.7	15.6	40.2	20.5	80	448.8 (17.9%)	EARLY	387.8 (15.5%)
						Mid	1.3	24.5	35.3	53.8	114.9			
						Late	0	15.6	126.1	57.3	198.9			
						Uncl	55	0	0	0	55			
		Mixedwood				Early	18.5	14.3	33.6	43.3	109.7	973.5 (38.9%)	MID	1028.3 (41.1%)
						Mid	29.4	45.6	263.3	186.4	524.8			
						Late	0.9	14.8	175.7	85.5	276.8			
						Uncl	62.2	0	0	0	62.2			
		Hardwood	sM yB Be	Gap	3269.5 (100%)	Early	12.2	4.5	144.5	36.3	197.5	1042.8 (41.6%)	LATE	873 (34.9%)
						Mid	14.4	27.9	281.1	65.3	388.6			
						Late	13.7	18.3	345	20.3	397.2			
						Uncl	59.4	0	0	0	59.4			
		Unclassified				Early	0.6	0	0	0	0.6	39.7 (1.6%)	Unclas	215.8 (8.6%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	39.2	0	0	0	39.2			
Total					**3,269.5***	**# ha**	**310.4**	**181**	**1444.8**	**568.7**	**2504.9**			
						%	**12.4**	**7.2**	**57.7**	**22.7**	**100**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Clare 730)

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)				
Pine Oak Hills and Hummocks	WCHO (1.2%)	Softwood				Early	44.8	35.4	42.7	15.7	138.4	317.1 (56.8%)	EARLY	238.7 (42.8%)
						Mid	2.4	27.7	19.2	28.7	78			
						Late	2.9	16.2	45.5	19.4	84.1			
						Uncl	16.6	0	0	0	16.6			
		Mixedwood	rO wP	Frequent	2367.3 (100%)	Early	0.6	10.4	8.5	37.3	56.7	151.3 (27.1%)	MID	188.5 (33.8%)
						Mid	2.3	16.4	46	21.5	86.1			
						Late	0	0	5.4	1.2	6.6			
						Uncl	1.9	0	0	0	1.9			
		Hardwood				Early	4.7	10.6	14.5	5.9	35.7	63.5 (11.3%)	LATE	94.1 (16.8%)
						Mid	0.1	2.3	20	2	24.4			
						Late	0	0	3.4	0	3.4			
						Uncl	0	0	0	0	0			
		Unclassified				Early	7.9	0	0	0	7.9	26.1 (4.6%)	Unclas	36.7 (6.6%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	18.2	0	0	0	18.2			
Total					**2,367.3***	**# ha**	**102.4**	**119**	**205.2**	**131.7**	**558**			
						%	**18.3**	**21.3**	**36.7**	**23.6**	**100**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Clare 730)

Element	Eco-section (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Hummocks	ICHO (0.7%)	Softwood	bS wP	Frequent	1248.2 (100%)	Early	20.5	27.6	33.9	26.2	108.3	253.3 (75.3%)	EARLY	160.8 (47.8%)
						Mid	6.6	19.1	2.2	23.2	51.1			
						Late	7.4	32.6	14.2	33.5	87.8			
						Uncl	6.1	0	0	0	6.1			
		Mixedwood				Early	0	10.2	17.2	18.6	46	58.9 (17.5%)	MID	61.9 (18.4%)
						Mid	3.1	3.4	0.5	0.9	7.9			
						Late	0	0	4.6	0.4	5			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0.5	5.3	0	0.7	6.5	9.4 (2.8%)	LATE	92.8 (27.6%)
						Mid	0	0	2.9	0	2.9			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	14.7 (4.4%)	Unclas	20.8 (6.2%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	14.7	0	0	0	14.7			
Total					**1,248.2***	**# ha**	**58.9**	**98.2**	**75.5**	**103.5**	**336.3**			
						%	**17.5**	**29.3**	**22.4**	**30.7**	**100**			

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							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	IMHO (19.5%) WMDM (7.2%) WTLD (6.9%) WMHO (6.1%) IMSM (6%) ICHO (0.8%) WCHO (0.4%) WMKK (0.2%) WMDS (0.2%)	Softwood	bS rS eH wP bS wP	Frequent Infrequent Seral	4796.3 (26.4%)	Early	24.3	41.2	117.3	81.6	264.4	2374.2 (37.3%)	EARLY	1181.3 (18.6%)
						Mid	29	155.4	233.5	241.7	659.7			
						Late	43.2	252.2	752.6	338.7	1386.8			
						Uncl	63.4	0	0	0	63.4			
		Mixedwood	rS eH wP sM yB Be	Gap	1380.7 (7.6%)	Early	10.9	43.3	217.7	155.7	427.6	2562.4 (40.3%)	MID	2914.9 (45.8%)
						Mid	25.4	109.9	986.5	472.9	1594.8			
						Late	4.7	9.2	330.6	128.1	472.5			
						Uncl	67.5	0	0	0	67.5			
		Hardwood	sM yB Be rM	Gap	1606.3 (8.8%)	Early	8.7	37.2	374.8	55.6	476.3	1361.8 (21.4%)	LATE	2078 (32.7%)
						Mid	1.9	25.5	569.6	63.5	660.5			
						Late	3.6	11.7	182.6	20.8	218.7			
						Uncl	6.3	0	0	0	6.3			
		Unclassified				Early	13	0	0	0	13	59.9 (0.9%)	Unclas	184.1 (2.9%)
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	46.9	0	0	0	46.9			
Total					**18,187***	**# ha**	**348.8**	**685.6**	**3765.3**	**1,558.6**	**6358.2**			
						%	**5.5**	**10.8**	**59.2**	**24.5**	**100**			

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Appendix 10: Table 2: Composition of Forest Communities (in Clare Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixed Hummocks	IMHO	Infrequent	rS eH wP	S	SrSbS Dom	25075	32.9%	Mid (M)	**Well Drained** early - Red Maple, White Birch mid - Maple-Yellow Birch - Red Maple late - Sugar Maple- Ash, - Sugar Maple, Yellow Birch, Beech **Moist** early - Balsam Fir, Red Maple mid - Red Spruce-Hemlock - Red Spruce-Balsam Fir late - Hemlock - Red Spruce -Yellow Birch - Red Spruce **Wet** - Black Spruce - Red Maple, Balsam Fir - Black Spruce, Tamarack - Red Maple
	WMHO	Infrequent	rS eH wP	S	SwS Dom	3586.6	4.7 %	Early (E)	
	IMDM	Infrequent	rS eH wP	S	SSpbF Dom	2013.5	2.6 %	M	
				S	SbF Dom	897.9	1.2 %	M	
				S	sPi1 Dom	480.3	0.6 %	Late (L)	
				S	$SMHeP_iSp$	446.7	0.6 %	L	
				M	MiHwSH	16041.2	21.1 %	E	
				M	MiHwHS	10780.4	14.2 %	E	
				M	MTHW	3220.5	4.2%	L	
				H	HiHW	8231.4	10.8 %	E	
				H	HTHW	2876.5	3.8 %	L	
				H	Hi1THw	2353	3.1 %	E	

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

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Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Drumlins	WMDM	Gap	rS eH wP sM yB Be	S	SrSbS Dom	7618.8	21.9 %	M	**Well drained abandoned farmland** early - Red Spruce - White Spruce mid - Maple, Yellow Birch, Red Spruce - Red Maple late - Hemlock-Red Spruce - Yellow Birch-Red Spruce - Sugar Maple, White Ash - Sugar Maple, Yellow Birch
				S	SwS Dom	1888.7	5.4%	E	
				S	SSpbF Dom	972.2	2.8 %	M	
				S	SMHePiSp	659.5	1.9 %	L	
				S	SbF Dom	512.8	1.4 %	E	
				S	SPi Dom	127.8	0.4 %	M	**Well Drained** early – Red Maple, Balsam Fir mid - Beech, Yellow Birch - Sugar Maple, Red Spruce late - Beech, Yellow Birch, Sugar Maple, Red Spruce **Moist** early - Balsam Fir, Red Maple mid - Red Spruce-Hemlock - Red Spruce-Balsam Fir late - Hemlock - Red Spruce - Yellow Birch - Red Spruce
				M	MIHwSH	6904.8	19.9 %	E	
				M	MIHwHS	4901.4	14.1 %	E	
				H	HTHw	5880	16.9 %	L	
				H	HIHw	5211.6	15.0 %	E	
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SSpbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H				MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood	

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Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	IMSM WTLD ICSM	Frequent Open Seral Open Seral	bS	H	HITHw	2785.9	20.9 %	E	**IMSM - Moist** early - Balsam Fir, Red Maple mid - Red Spruce, Hemlock - Red Spruce, Balsam Fir late - Hemlock, Red Spruce - Yellow Birch, Red Spruce **IMSM - Wet** - Black Spruce - Red Maple, Balsam Fir - Tamarack, Black Spruce - Red Maple **Wetland, ICSM-Moist** - Black Spruce - Red Maple - Tamarack, Black Spruce - Red Maple **Wetland, ICSM-Wet** - Wetlands
				S	SrSbSDom	6984.2	52.4 %	L	
				S	SwSDom	576.5	4.3%	E	
				S	SspbFDom	486.1	3.6 %	M	
				S	SbFDom	85.9	0.6 %	E	
				S	SPiDom	63.4	0.6 %	L	
				S	SMHePiSp	48.8	0.3 %	L	
				M	MIHwSH	2280.2	17.1 %	E	

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

Appendix 10: Table 2: Composition of Forest Communities (in Clare Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Valley Corridors	IMHO WMHO IMSM ICHO WCHO	Infrequent Frequent	rS eH wP rS eH wP bS bS wP rO wP	S	SrSbsDom	1843.6	29.2%	L	Corridors pass through many elements. See descriptions of successional types under corresponding element in this table.
				S	SwSDom	187.3	2.9%	E	
				S	SspbFDom	153.1	2.4%	M	
				S	SMHePiSp	84.3	1.3%	L	
				S	SPiDom	53.2	0.8%	L	
	WMDM WMKK WMDS WTLD	Gap Open Seral	rS eH wP sM yB Be sM yB Be sM yB Be	S	SbFDom	52.7	0.8%	E	
				M	MIHwSH	1204.7	19.1%	E	
				M	MIHwHS	1026.2	16.2%	E	
				M	MTHw	331.5	5.2%	L	
				H	HIHw	915.5	14.3%	E	
				H	HTHw	226.3	3.6%	L	
				H	HITHw	220	3.4%	M/L	
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SSpbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H				MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood	

Appendix 10: Table 2: Composition of Forest Communities (in Clare Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WMKK WMDS	Gap	sM yB Be	S	SrSbSDom	322.2	13.0%	M	**Well drained abandoned farmland** early - Red Spruce - White Spruce mid - Maple, Yellow Birch, Red Spruce - Red Maple late - Hemlock-Red Spruce - Yellow Birch-Red Spruce - Sugar Maple, White Ash - Sugar Maple, Yellow Birch
				S	SwSDom	72.6	2.9%	E	
				S	SSpbFDom	33.1	1.3%	M	
				S	SbFDom	12.1	0.4%	E	
				S	SMHePiSp	6.6	0.2%	M	
				S	SPiDom	2.2	0.0%	M	**Well Drained** early - Beech, Yellow Birch, Red Spruce mid - Beech, Yellow Birch - Sugar Maple, Red Spruce late - Beech, Yellow Birch, Sugar Maple, Red Spruce
				M	MIHwSH	395.7	16.0%	E	
				M	MIHwHS	312.4	12.6%	E	
				M	MTHw	265.5	10.7%	L	
				H	HTHw	467.9	18.9%	L	
				H	HIHw	382.5	15.5%	E	**Moist** early - Balsam Fir, Red Maple mid - Red Spruce-Hemlock - Red Spruce-Balsam Fir late - Hemlock - Red Spruce - Yellow Birch - Red Spruce
				H	HITHw	192.4	7.8%	M/L	

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

Appendix 10: Table 2: Composition of Forest Communities (in Clare Grouped by Landscape Element)									
Element	**Ecosections**	**Dominant NDR**	**Dominant Climax Type**	**Cover Type**	**Forest* Community (Crown Model)**	**Area (ha)**	**Percent of Forest Commmunity**	**Successional Stage**	**Successional Types**
Pine Oak Hills and Hummocks	WCHO	Frequent	rO wP	S	SrSbSDom	176.3	33.1%	M	**Dry** -Black Spruce -White Pine -Red Oak **Well drained/Moist** early-Balsam Fir, Red Maple mid-Red Spruce, Balsam Fir late-Red Spruce, Hemlock -Red Spruce, White Pine
				S	SwSDom	127.4	23.9 %	E	
				S	SSpbFDom	9.4	1.7 %	M	
				S	SpiDom	4	0.7 %	L	
				M	MIHwSH	93.8	17.6 %	E	
				M	MIHwHS	50.8	9.5 %	E	
				M	MTHw	6.6	1.2 %	L	
				H	HIHw	46	8.6 %	E	
				H	HITHw	13	2.4 %	M	
				H	HTHw	4.4	0.8 %	L	
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SSpbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H				MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood	

Appendix 10: Table 2: Composition of Forest Communities (in Clare Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Cover Type	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Hummocks	ICHO	Frequent	bS wP	S	SrSbSDom	142.7	44.4 %	L	**Moist**
				S	SwSDom	94.2	29.3%	E	early-Balsam Fir, Red Maple
				S	SSpbFDom	13.6	4.2%		
				S	SbFDom	1.9	0.5 %	E	mid-Red Spruce, Hemlock -Red Spruce, Balsam Fir
				M	MIHwSH	38.5	12.0 %	E	
				M	MIHwHS	15.4	4.8 %	E	late-Hemlock, Red Spruce -Yellow Birch, Red Spruce
				M	MTHw	5	1.5 %	L	
				H	HIHw	7.3	2.2 %	E	**Wet**
				H	HITHw	2.2	0.6 %	M/L	-Black Spruce -Red Maple, Balsam Fir -Tamarack, Black Spruce -Red Maple
*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 eH wP sM yB Be	49533	25.9	182056.9	11.9
rS eH wP	46351.9	24.2	524453.7	34.2 %
bS	33931.7	17.7	74241.2	4.8
sM yB Be	31899.1	16.6	57009.3	3.7
rO wP	2434	1.3	47256.4	3.1
bS wP	1399.4	0.7	386684.3	25.2
rM	727.7	0.4	12819.5	0.8
Total	**166,276.8**	**86.8***	**1,214,521.3**	**83.7****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Mixedwood Hummocks (Matrix)	86,531	959.3	68756.6	1092	6098	9625.2	55,206 to 60,019	64 to 69
Tolerant Mixedwood Drumlins	45,930	264.2	35308.5	453.9	4939.8	4963.7	28,100 to 30,582	61 to 67
Wetlands	18,288	1321.9	14819.1	65.7	974.8	1106.1	12,729 to 13,282	70 to 73
Valley Corridors	8,361	538.6	6990.7	41.2	505.1	285.4	5863 to 6006	70 to 72
Tolerant Hardwood Hills	3,172	0	2318.2	2.3	535.3	316.2	1818 to 1976	57 to 62
Pine Oak Hills and Hummocks	2,245	59.1	934.6	32.9	1167	51.1	781 to 807	35 to 36
Spruce Pine Hummocks	1,152	102.5	453.1	5.2	543.4	48.2	456 to 480	40 to 42
Total	**165,679**	**3,245.6**	**129,580.8**	**1,693.2**	**14,763.4**	**16,396**	**104,954 to 113,152**	**63 to 68**

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	1280.3	106	515.6	5.2	604.6	48.9	506 to 531	40 to 41
ICSM	593.3	7.8	418.8	0	159.4	7.3	324 to 327	55
IMDM	6306.3	2	464	0	96.1	74.2	369 to 406	58 to 64
IMHO	64060.7	857	51854.2	877.1	3800.1	6672.3	41,635 to 44,971	65 to 70
IMSM	12671.0	1364.8	9973.8	57.2	384.5	890.7	9082 to 9527	72 to 75
WCHO	2306.6	59	966	34.8	1196.3	50.5	805 to 830	35 to 36
WMDM	47201.4	287	36337.7	459.2	5077	5040.5	28,915 to 31,435	61 to 67
WMDS	764.7	0	496.2	0.3	198.2	70	390 to 425	51 to 56
WMHO	26392.2	359.3	20292.7	245.3	2434.3	3060.6	16,405 to 17,936	62 to 68
WMKK	2485.1	0	1887.6	1.9	344.3	251.3	1479 to 1605	60 to 65
WTLD	7071.5	107.6	6273.1	12.5	446.3	232	4874 to 4990	69 to 71
Total	**165463.1**	**3150.5**	**129479.7**	**1694.0**	**14741.1**	**16398.3**	**104783 to 112982**	**63 to 68**

For an explanation of calculations and other information to help you 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 centimeters 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 11m, 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.)
Precommercial 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. www.speciesatrisk.gc.ca/glossary_e.cfm
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 land base designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

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