Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS NORTH MOUNTAIN ECODISTRICT 920

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2015-920

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 920: North Mountain

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the North Mountain Ecodistrict.

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (2002) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

Conventions

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

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

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

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Understanding the Landscape as an Ecological System

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

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

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

Elements Within Landscapes (Map 2)

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

Tolerant Hardwood Hills is the matrix element, representing nearly 73% of the ecodistrict. This element naturally supports a hardwood forest of shade-tolerant species, such as sugar maple, yellow birch, and beech.

Red and Black Spruce Flats, representing nearly 8% of the ecodistrict, is the largest patch element. Shade loving mixedwoods of red spruce, hemlock, yellow birch, and sugar maple are the climax forest. The remaining three patch elements, in order of size, are **Tolerant Mixedwood Hummocks**, **Red Spruce Hummocks**, and **Wetlands**.

Tolerant Mixedwood Slopes is a combination patch and corridor element found on steep slopes and on the escarpment overlooking the Annapolis Valley.

Flow – Element Interactions (Appendix 1; Map 2)

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

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

River corridors promote connectivity.

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

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

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

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

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

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

Although the North Mountain Ecodistrict has experienced a past history of agriculture, agricultural abandonment, and forest harvesting, most of the matrix element is still considered forested in largely mature or multi-aged development classes.

Yet the majority of species are in the early seral stage. Because of its extent, the matrix plays an important role in species movement in the ecodistrict. Some portions of the matrix have experienced heavier land use pressure, so measures could be implemented to improve connectivity in those areas (e.g. Baxters Harbour to Halls Harbour and Black Rock to Morden).

Some large patches with interior forest conditions appear to exist (e.g. Morden to East Margaretsville and St. Croix to Victoria Beach).

In most elements, forest harvesting has resulted in more early seral species.

The many streams through the elements support riparian zones which, aside from being important habitat in themselves, can be critical connections of ecosystem elements, particularly in fragmented sections of the landscape.

An additional concern in ecological planning is the maintenance of connectivity between conservation areas such as wilderness, old growth, and ecological reserves.

Appendix 2 identifies management strategies and practices for various features in the ecodistrict.

These strategies attempt to enhance connectivity by restoring or sustaining natural patterns within the ecodistrict. Strategies that might be considered include:

- Adopting forest management practices that encourage the development of the appropriate climax species.
- Mitigating potentially negative barren effects of concentrated land use by restoring natural communities where feasible.
- Taking measures to maintain or restore connectivity among conservation areas.

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

The hydrological system provides significant linkages. Numerous small streams originate in the ecodistrict, with many flowing northward to the Bay of Fundy or southward to the Annapolis Valley. Some anadromous fish swim from the Atlantic Ocean up rivers in the ecodistrict to spawn.

Transportation routes connect the ecodistrict to the Annapolis Valley Ecodistrict 610. Human activities, such as fishing, hunting, tourism, whale watching, and commerce, serve a connective function.

The forest provides a connection to the ocean and to the Annapolis Valley, much of which has been converted to agricultural and other uses. Species such as deer use the forest to travel into the agricultural land of the valley for forage.

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

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

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

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

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

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

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

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

- forest establishment (0 to 6 m height)

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

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

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

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

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

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

Target Ranges for Composition Indicators

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

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

Table 7 - Landscape Composition Target Ranges (by Development Class / Disturbance Regime)				
Natural Disturbance Regime	**Development Class**			
	Forest Establishment	**Young Competing Forest**	**Mature Forest (including multi-aged and old forest)**	**Multi-aged and Old Forest**
Frequent Stand Initiating	5 - 30%	5 - 30%	>40% early, mid, and late seral representation	>8%
Infrequent Stand Initiating	5 - 20%	5 - 20%	>60% most in mid and late seral stages	>16%
Gap Replacement	0 - 15%	0 - 15%	>70% most in late seral stage	>24%

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in North Mountain						
Element	**Seral Stage**					
	Early	**% ***	**Middle**	**%**	**Late**	**%**
Red and Black Spruce Flats	IH4, IH6, MW 4, MW 5	46.0	MW 2, SH8, SH9	22.0	**SH6, SP7**	19.0
Red Spruce Hummocks	IH4, IH6, MW 4, MW 5	79.0	MW 2, SH7, SH8	12.0	**SH5**, SH6	3.0
Tolerant Mixedwood Hummocks	OF1, IH4, IH6	76.0	MW 2, MW 4, MW 5, SH5, SH6, SH8	11.0	TH1, TH2, TH5, **MW1,** MW 3	3.0
Tolerant Hardwood Hills	IH4, IH6, OF1	48.0	IH7, TH7, TH8	25.0	**TH1, TH2,** TH3, TH4, TH5, (**CO3**)	18.0
Tolerant Mixedwood Slopes	IH4, IH6	31.0	MW 2, MW 4, MW 5, SH5, SH8	29.0	**MW1,** MW 3, SH3	35.0
Wetlands	WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8, SP7					

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

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

Bolded vegetation types indicate typical late successional community

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

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

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

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

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

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

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

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

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

The overall ecological emphasis index for North Mountain is 50 to 57. This is one of the lower ecological emphasis indexes in the Western Ecoregion and suggests that the intensity of land use may be of concern as far as its impact on biodiversity.

Approximately 55% of the land in North Mountain falls in the extensive EEC.

About 13% of the ecodistrict has been converted to other uses. This is land which has been changed to an unnatural state for human use or areas where practices have significantly degraded site productivity. Converted land, often agricultural or urban, usually follows existing roadways. Most of the converted land occurs east of Hampton and on Digby Neck. There appears to be a large parcel of land between Hampton and Victoria Beach, which, except for along the coastlines, contains very little converted land.

The reserve class accounts for nearly 2% of the land. This class is divided into legal reserves and policy reserves. Legal reserves have legal status under IUCN (International Union for the

Conservation of Nature) codes of I, II, III, such as wilderness areas, protected beaches and designated provincial parks. Policy reserves are areas set aside under provincial policies, such as the Old Forest Policy. The largest areas of reserve are located at extreme ends of the ecodistrict in Cape Blomidon and Brier Island.

The intensive EEC accounts for about 18% of the land. Practices may produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels.

Twelve percent of the land is unclassified.

DNR will continue to develop and evaluate other measures of conservation risk.

Road Index (Appendices 6, 7; Map 5)

The GIS-based "Road Index" provides a standard assessment and mapping of road distributions across ecodistricts to assist planners to objectively explore options for managing road networks and assess the intersection of road affects with other features of the landscape. Density, distance, and type of linear feature (e.g. road types, power lines) are used to calculate index values that indicate relative road pressure. The index value is mapped over all areas of the landscape using a one hectare grid. The overall index may be calculated for any area of interest, such as element, ecosection, ecodistrict, or ecoregion, by averaging the index values within the area to provide a relative indication of land use pressure. The index provides a numerical indicator of road influence that can be used to monitor temporal changes and compare different landscapes.

In discussing road ecology, Forman (2004) describes five distinctive landscape types in North America: city-suburb, agricultural, forestry, arid-grassland, and natural landscape. Each landscape type has a characteristic pattern of road networks with distinctive ecological effects and planning considerations (Forman & Hersperger 1996). These were adapted in Nova Scotia to classify five Road Index Benchmark Ranges associated with particular land use settings:

- Remote Landscape (RI 0 to 6): Unpopulated with few roads, trails, or other linear features
- Forest Resource (RI 7 to 15): Forest access roads are the primary linear feature
- Mixed Rural (RI 16 to 24): Mixed land use of rural settlement, forestry, and agriculture
- Agriculture/Suburban (RI 25 to 39): Suburban settlement and/or open agricultural fields
- Urban (RI 40 to 100): Urban environment with high building densities, roads, and few tracts of undeveloped land outside municipal parks

Road, trail, and utility corridors are vital components of human land use. However, transportation systems are expensive and produce many undesirable environmental effects, such as chronic siltation, invasion routes for exotic species, fragmentation, loss of productive land, and increased human presence.

Low road density areas are important features for biodiversity conservation. Planning should consider block scheduling options, life expectancy, class requirements, decommissioning

strategies, and overall landscape function, in order to develop efficient access systems designed to minimize environmental impacts.

North Mountain has an overall average Road Index value of 12, which falls in the Forest Resource Index range (Appendix 7, Tables 2 and 3). This value denotes areas without much settlement where forest access roads are the primary type of road.

Much of the ecodistrict is in the Mixed Rural and Agriculture Suburban categories, which usually include existing transportation routes. These categories are generally separated by areas in the Forest Resource category (Map 5).

The portion of the ecodistrict from Hampton to Victoria Beach has the largest area without many roads on the North Mountain.

Opportunities to lessen the impact of road construction, because of the land ownership, fall largely on private woodland owners. Causes of action that might be considered include:

- Ensure best management practices are adhered to in construction and maintenance of roads.
- Encourage landowners to share, in as far as is possible, common access.
- Encourage the maintenance the remote character of sections of the ecodistrict through landowner education and land purchases.
- Encourage the decommissioning of roads.

The impact of roads on an ecodistrict such as North Mountain is measured by Road Index values.

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

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

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

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

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

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

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

Species at Risk

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

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

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

As of 2013 in the North Mountain Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: nine endangered, one threatened, and six vulnerable. In addition to the listed species, the national General Status process also identifies nine orange-status species, 52 yellow-status species, 43 green-status species, and seven other-status (extirpated, exotic, or undetermined) species for a total of 131 other species of conservation concern in this district.

Designated species at risk found within the North Mountain Ecodistrict include Atlantic sturgeon, American eel (fish); monarch butterfly (insect); eastern mountain avens and goldencrest (plants); little brown myotic bat and harbor porpoise (mammals); and several bird species (red knot, peregrine falcon, rusty blackbird, bobolink, harlequin duck, and Canada warbler).

Other species of conservation concern known for the North Mountain Ecodistrict include spikemoss and maidenhair spleenwort (fern and their allies); early hairstreak and mustard white (insects); northern goshawk, gadwall, brant, common goldeneye, and least sandpiper (birds); wild leek, rosy sedge, yellow ladies'-tresses, Michaux's dwarf birch, and blue vervain (plants).

Old Forest

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

Birds

In the North Mountain Ecodistrict, there are several provincially endangered species. The roseate tern is endangered provincially and nationally. Roseate tern records are from the southwestern end of the ecodistrict in the vicinity of Brier Island. No observations of breeding have been since 1997.

Bicknell's thrush is classed as endangered. Nationally, this thrush is designated threatened by COSEWIC and of special concern by SARA. A single pair of Bicknell's thrush was observed in 1986 near Victoria Beach, Annapolis County, but there are no further records since that time.

Other endangered bird species found in this ecodistrict are red knot, rusty blackbird, barn swallow, harlequin duck, and Canada warbler.

The American peregrine falcon, which nests on ledges along the steep cliffs bordering the Bay of Fundyshore, is vulnerable in Nova Scotia and is a species of special concern in Canada.

To date, 17 yellow-status bird species have been documented in the ecodistrict.

With the exception of purple sandpipers, which breed on the northern tundra, all of these yellow-status species likely nest in the ecodistrict.

The eastern bluebird, a yellow-status species in Nova Scotia, is not listed under the NSESA and also does not have any national designations. Bluebird declines go much farther in history, and are related to land use changes and competition with introduced species, so it remains a species that is monitored.

Insects

The only formally listed species of insect in the North Mountain Ecodistrict is the monarch butterfly (federal species of concern). Three species of butterfly considered to be of concern in Nova Scotia have been noted as occurring in this ecodistrict: early hairstreak (orange status), satyr comma (yellow status), and mustard white butterfly (yellow status).

Plants

A total of 62 plant species known to occur in the North Mountain Ecodistrict are considered to be species at risk (five with red status), may be at risk (23 with orange status), or sensitive (344 with yellow status).

Of the 5 species listed under the NSESA, three also have federal designations: golden crest (threatened

in Canada), mountain avens (endangered in Canada), and prototype quillwort (special concern in Canada). Eastern white cedar is designated vulnerable in Nova Scotia and black ash is a provincially threatened species.

Acadian quillwort, dwarf rattlesnake-plantain, and Drummond's rockcress are only a few of the many yellow-status plant species found here.

Several North Mountain species are considered by botanists to belong to a group of geographically isolated plants known as the Atlantic Coastal Plain Flora (ACPF), which occur primarily in southwestern Nova Scotia. This is a low number of ACPF species compared to other ecodistricts in the southwestern part of the province where a number of ACPF plant species are rare and at risk, some with provincial and national endangered status. Coastal plain plants present on the North Mountain include: golden crest (red), coastal plain blue-eyed grass (orange), eastern skunk cabbage (green), grassleaf rush (yellow), and inverted bladderwort (orange).

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

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

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

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

North Mountain Ecodistrict has eight ecosections that each make up 2% or less of the ecodistrict (IFSM, IMSM, WCDS, WCHO, WCKK, WCSM, WFDS, and WTLD). Of these, IFSM, IMSM, WCDS, WCSM, WFDS, and WTLD also occupy less than 2% of the ecoregion. WCSM has a high ecoregion conversion rate of 64%.

Many of these ecosections have a tolerant hardwood climax so the total area in the ecodistrict that could support this climax is substantial. However, in reality, primarily the result of harvesting practices, many of the sites are occupied by intolerant hardwoods.

Wetlands are recognized as an important component of landscapes. Their scarcity in the ecodistrict and region makes them unique. An additional concern is that 27%, on an ecoregional basis, has been converted to other uses.

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

920 North Mountain Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Hills (Matrix)	WCKK WMHO WMKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be), red Spruce (rS)[1] ironwood (Ir), white Ash (w A)[2]
Tolerant Mixedwood Hummocks (Patch)	WFHO	Infrequent	sM, yB, Be, rS, eastern Hemlock (eH)
Red and Black Spruce Flats (Patch)	IFSM IMHO IMSM	Frequent	black Spruce (bS), rS, balsam Fir (bF)
Red Spruce Hummocks (Patch)	WCHO WCSM	Infrequent	rS, white Pine (w P)
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, bF, tamarack (tL), red Maple (rM)
Tolerant Mixedwood Slopes (Patch/Corridor)	WCDS WFDS WMDS	Gap	sM, yB, Be, rS, eH, w P

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

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

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

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

[1] On the coastal exposed slopes of Cape Chignecto red spruce occurs on WCKK and WCRD.
[2] North Mountain soils are richer and support a greater diversity of trees and plants.

WCKK comprises two ecosection locations, at Douglasville and Sandy Cove. This ecosection is underlain by coarse sandy soils of glacial-fluvial origin. White pine may be scattered.

WMKK is the dominant ecosection on Digby Neck. The cool moist climate associated with this area results in coastal white and black spruce and fir forests, most notably along the Fundy- facing slopes. Where sheltered from the winds and with a southerly exposure, tolerant hardwood forests will be found.

Red oak occurs on the escarpment ecosection WMDS but is scattered.

WCHO and WCSM have soils similar to those of WMHO and WMKK except they are very gravelly. These ecosections are wave-washed gravelly soils derived from basalt and they occur along the Bay of Fundy, except for a small pocket at Victoria Vale.

Ecological Representivity (Appendices 4, 5)

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

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

Reserves within the ecodistrict include designated provincial parks and park reserves at Blomidon, Valleyview, Annapolis Basin Lookoff, Lake Midway, and Central Grove. Operational non-designated parks and park reserves are located at Cape Split, Blomidon, Scots Bay (North and South), Baxter Harbour, Blomidon Lookoff, and Cottage Cove.

There is an international biological program (IBP) site in Central Grove. Protected beaches can be found at Scots Bay, Hampton and Israels Cove Beach. Old growth forest selections are also found within Blomidon Provincial Park.

Nature Conservancy lands are present at St. Croix Cove, Long Island, Peajack Road on Brier Island, and Gull Rock Road on Brier Island.

The amount of area in reserve within the ecodistrict is quite small. Only ecosections WMHO, IMHO, and WTLD exceed 1% of their area in reserve.

Opportunities to improve representivity, because of the scarcity of Crown land, will need to be directed toward private lands.

A priority might be those ecosections that form less than 2% of the ecodistrict with little or no representivity. These include IFSM, IMSM, WCDS, WCHO, WCKK, WCSM, WFDS, and WTLD.

ELA Summary

Element Interpretation (All appendices and maps)

The North Mountain Ecodistrict is a narrow ridge parallel to the south shoreline of the Bay of Fundy. It stretches for about 200 kilometres from Cape Split to Brier Island. At the southwestern end, it is broken to form Digby Neck, Long Island and Brier Island. A maximum elevation of about 240 metres is attained. North Mountain is the northern boundary of the Annapolis Valley Ecodistrict 610 and serves to shelter the valley from the cooler climate along the Bay of Fundy.

The south-facing slope of the North Mountain can be steep in places, with escarpment-like features at several locations. Small steep valleys dissect the slope. On the Bay of Fundy side, the slopes are longer and more gradual, but usually end with vertical cliffs at the coastline, such as at Cape Split, Margaretsville, and Keatings Sand Beach.

The North Mountain is a ridge of basalt. The majority of the soils have developed from dark brown or dark yellowish brown sandy loam till derived almost entirely from the underlying basaltic rock. Most soils are moderately coarse and well- drained. Although the soil is stony, extensive areas on the north slopes are suitable for agriculture and can be used for growing vegetables and forage. A large area of soils between Arlington West and Moshers Corner are derived from sandy clay loams and are moderately well-drained.

The total freshwater area is 373 hectares, or 0.4% of the ecodistrict.

On well-drained sites along the Fundy Shore, white spruce is the dominant tree species with black spruce on the wetter sites. A short distance inland, usually less than half a kilometre, red spruce will begin to occur on the lower and middle slopes of the North Mountain while sugar maple and yellow birch are found on the upper slopes and crests.

Beech was probably abundant at one time, but has been reduced to an understory species in most of the tolerant hardwood stands. However, there are still extensive areas on the steep slopes overlooking the valley where beech, mostly of low quality, is a dominant species. An example can be seen at the provincial park outside of Bridgetown.

Most of the forest has been heavily harvested over the centuries and the current forest is a mixture of intolerant hardwood species, along with white spruce and balsam fir, with scattered occurrences of red spruce and white pine.

Some of the less accessible sites near Blomidon and Cape Split and in steep slopes suggest that the climax forest consisted of a mixed shade-tolerant hardwood and softwood association. The slopes on the Fundy side support a varied forest with tolerant hardwoods, red spruce, and a few white pine on the upper slopes. Shaded and lower slopes of the vaults are red and black spruce and hemlock.

Depressional areas have a dominant growth of black spruce, alder, and sphagnum mosses. One of Nova Scotia's rarest native trees, eastern white cedar, grows in a few locations, usually in streamside alluvial deposits near the southwestern end of the mountain.

The coastal effect on Digby Neck starts to become more noticeable with fewer hardwoods in the forest composition starting at Trout Cove and Centreville. Eventually the entire forest, except in sheltered areas, is influenced by the cooler, moist climate and is predominantly spruce, mountain ash and stunted white birch. Elsewhere, the coastal influence extends inland only slightly from the Bay of Fundy shore.

Natural disturbance agents in the ecodistrict are primarily associated with hurricanes and are of an infrequent nature so that old growth forests may develop with an uneven-aged structure. Stands of fire origin are uncommon. Insect defoliation has not been a significant factor in forest disturbance. Yellow birch dieback of the 1940s has been a significant agent in the North Mountain forest.

Tolerant Hardwood Hills

(Matrix) (WCKK, WMHO and WMKK ecosections) (71,579 ha)

This matrix element makes up nearly 73% of the ecodistrict. Found largely on well-drained hummocks or hills, most of the element naturally supports forest of tolerant hardwoods. A large portion of Digby Neck is somewhat different; its exposure to the ocean becomes more prominent and in those cases, white spruce, black spruce, and balsam fir are climax species with the tolerant hardwoods likely to be climax on the more sheltered south-facing slopes.

The current forest is mainly mature (43%) or multi-aged (26%). Softwood, mixedwood, and hardwood covertypes make up 28%, 36%, and 34% of the element, respectively. The softwood covertype is dominated by early seral species, primarily white spruce on abandoned farmland. Red spruce is also quite common. The hardwood covertype has nearly equal amounts of early, mid, and late seral species. Early seral species being red maple and white birch; the late being tolerant hardwoods. Ash and ironwood may be a minor component of these stands. The mixedwoods are mostly intolerant softwoods and hardwoods.

Reports in the early 1900s suggest that at that time much of the matrix was a severely culled mixedwood with a few scattered farms. That farmland and much of the subsequent farmland has been abandoned and reverted to white spruce. Much of the white spruce is mature or overmature and a significant amount of harvesting has taken place in the past 15 or so years as the spruce has been damaged by the bark beetle.

Many small brooks have their headwaters in this element, highlighting the need for exercising best management practices in the riparian zone along the waterways. Small wetlands are sometimes associated with these headwater streams.

One of the ecosections comprising this element, WCKK, is considered uncommon in the ecodistrict (Appendix 3, Table 2).

Only about 2.6% of this element contains Crown land. Representivity is an issue. Of the three ecosections in the element – WMHO, WMKK, and WCKK – only 1.5%, 0.4%, and 0% respectively are in the reserve category (Appendix 4). These ecosections all have the tolerant hardwood community as climax species.

Approximately 11% of the element is converted (Appendix 12a), primarily rural settlement along ecodistrict roadways. Much of the remainder is considered forest land although it is a patchy quilt work of the various development classes among farmland.

There is a relatively small area in larger size stands (more than 100 ha) so interior forest habitat is lacking.

Portions of the eastern end of the ecodistrict are the most fragmented in North Mountain.

Flows

People (agriculture, forestry, trapping, hunting, sugar bush, quarries, cottages, settlements, fishing villages, wharves); water (headwaters, nutrient source, temperature regulation, travel corridor, source of pool material); deer (food, thermal refuge in summer); red -tailed hawk (nesting, food, perch trees); trout (temperature, nutrient, regulate water input); squirrel (mature softwood or mixedwood is habitat).

Composition

North Mountain Ecodistrict 920 (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
	18%	13%	69% (43 Mat + 26 OF)	26%
Seral Stage	Early	Mid	Late	Unclassified
	48%	25%	18%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	28%	34%	36%	2%

Desired Condition

A predominately mature late seral hardwood community of sugar maple, yellow birch, and beech. Good representation of old forest. Some inclusions of agriculture land.

Issues

- small amount of tolerant hardwoods
- amount of over-mature spruce
- unique ecosection
- lack of representation
- lack of interior forest habitat
- patches of fragmentation

Tolerant Mixedwood Hummocks
(Patch) (WFHO ecosection) (7,517 ha)

This well-drained element occurs in patches and can be found on hummocky ground with clay soils. The most western extent of the element is the Hampton area. The largest patch extends between Hampton and the Port George area.

The area is reported to support a pre-European settlement forest of tolerant mixedwoods (usually red spruce, hemlock, yellow birch, and a minor component of sugar maple).

About 30% of the area has been converted to farmland. The current forest has a significant representation of all development classes and comprises of 38% softwood, 36% mixedwood, and 22% hardwood.

The softwood component is largely white spruce on abandoned farmland and the occasional red spruce or balsam fir. Mixedwoods are generally red maple or white birch, with spruces or balsam fir, while the hardwoods are generally intolerant white birch or red maple.

Representivity is an issue since only 21.7 hectares (0.3% of ecosection area) is in the reserve category. A relatively high area (30%) of this element has been converted to non-forest uses.

The largest area between Hampton and Port George is heavily fragmented and lacks interior forest habitat. A few of the other small scattered areas of this element provide opportunities for increasing patch size.

Flows

People (some agriculture, harvesting, trapping, settlement, bird watching); water (first order streams); deer (habitat); red-tailed hawk (nesting and feeding); squirrel (habitat).

Composition

North Mountain Ecodistrict 920 (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
	19%	23%	58% (33 Mat + 25 OF)	25%
Seral Stage	Early	Mid	Late	Unclassified
	76%	11%	3%	10%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	22%	36%	4%

Desired Condition

A predominately mature, late seral tolerant mixedwood (red spruce, hemlock, and yellow birch) forest. Good representation of old forest.

Issues

- large amount of early seral species and lack of late seral species
- fragmentation of large area
- relatively high converted area
- lack of representation

Red and Black Spruce Flats
(Patch) (IFSM, IMHO and IMSM ecosections) (6,773 ha)

Scattered in areas along the length of the ecodistrict, this element is imperfectly drained (moist soils) and is found on generally hummocky but occasionally flat terrain. The element is quite variable in nature, supporting on moister sites a climax forest of red spruce and yellow birch. The wet areas may contain black spruce, alders, red maple, larch, or ash. This area, because of drainage issues, has had less past agricultural activity than most of the elements.

The current forest contains a significant amount of all development classes and supports 35% softwood, 40% mixedwood, and 24% hardwood. Much of the softwood is white spruce with red spruce or balsam fir. The mixedwoods are often softwoods with intolerant hardwoods (red maple, white birch, and aspen) but there is a fairly good component of tolerant hardwood mixedwoods. The hardwood is equally split between tolerant and intolerant types.

Most of the patches are well- forested and often associated with headwaters of streams and wetlands. Ecosections IFSM and IMSM occupy less than 2% of the ecodistrict and ecoregion. Both of these ecosections contain only minuscule amounts in the reserve category.

Flows

People (Long Island settlement, fishing, trapping); deer (shelter); trout (habitat); squirrel (food).

Composition

North Mountain Ecodistrict 920 (based on statistics up to 2007)

Composition of Red and Black Spruce Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	21%	17%	62% (35 Mat + 27 OF)	27%
Seral Stage	Early	Mid	Late	Unclassified
	46%	22%	19%	13%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	35%	24%	40%	1%

Desired Condition

A variety of community types, including tolerant softwood and tolerant hardwoods but dominated by red spruce-yellow birch climax. Representation in all seral stages and development classes with most in the late seral and mature stages.

Issues

- large amounts of early seral species
- uncommon ecosections, IFSM and IMSM
- representivity

Red Spruce Hummocks

(Patch) (WCHO and WCSM ecosections) (1,560 ha)

This element is, for the most part, scattered in small areas along the coast. The element is characterized by wave-washed gravelly soils derived from basalt.

The climax forest is tolerant mixedwoods (red spruce, red maple, and yellow birch) or red spruce. A history of agriculture has dominated this element.

The current forest is mostly mature with covertypes of softwood (26%), mixedwood (52%), and hardwood (21%). White spruce on abandoned farmland is the prevalent softwood. Mixedwoods are often white spruce with intolerant hardwoods (red maple, white birch, aspen). The hardwood component is mostly intolerant species.

Ecosections WCHO and WCSM are uncommon at the ecodistrict level, making up 1.5% and 0.1% of the ecodistrict, respectively. These ecosections are the most converted in the ecodistrict: WCHO (29.5%) and WCSM (46.2%).

Both ecosections have little or no area in the reserve category.

WCSM makes up 1.7% of the ecoregion.

Individual areas are quite fragmented because of the amount of converted land as well as forest harvesting. Efforts could be made to increase the amount of interior forest habitat.

Flows

People (settlement, agriculture); water (nutrients, water temperature, regulation, filtering); deer (habitat); trout (habitat); squirrel (mature softwood habitat).

Composition

North Mountain Ecodistrict 920 (based on statistics up to 2007)

Composition of Red Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	10%	22%	68% (44 Mat + 24 OF)	24%
Seral Stage	Early	Mid	Late	Unclassified
	79%	12%	3%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	26%	21%	52%	1%

Desired Condition

Mostly mature tolerant softwood (red spruce) or tolerant mixedwood (red spruce, yellow birch, red maple) with good representation of older forest.

Issues

- amount of early seral species
- uncommon ecosections
- representivity
- fragmentation and interior forest habitat

Wetlands

(Patch) (WTLD ecosection) (533 ha)

The Wetlands element refers to the larger wetlands in the ecodistrict. These larger wetlands are located on Digby Neck. Brier Island contains a large amount of bogs. Long Island has fens around Long Island Lakes, along with smaller bogs in adjacent areas, fens and bogs around Little River, and fens and meadows around Gidneys Brook. A number of smaller wetlands are scattered throughout the ecodistrict.

Wetlands play an important role in filtering, water storage, and groundwater recharge. Management and use of wetlands and the adjacent areas is an important aspect of maintaining biodiversity across the landscape. Species at risk, such as mountain avens and golden crest, are present in the Wetlands element.

This element is about 4.6% converted to other uses. The wetland ecosection is uncommon, representing only 0.5% of the area. The ecosection has 23.3% of its area in the reserve category.

Flows

People (trapping, research, fishing); water (collection, storage, filtration); deer (potential cover where forested); red-tailed hawk (hunting); trout (general habitat, water release, water storage); squirrel (habitat where forested with softwoods).

Composition

North Mountain Ecodistrict 920 (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
	29%	51%	20% (2 Mat + 18 OF)	18%
Seral Stage	Early	Mid	Late	Unclassified
	86%	9%	2%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	83%	1%	16%	0%

Desired Condition

Naturally functioning wetlands with minimal human disturbance.

Issues

- unique ecosection
- species at risk

Tolerant Mixedwood Slopes

(Patch/Corridor) (WCDS, WFDS and WMDS ecosections) (10,539 ha)

This element is characterized by sharply sloped terrain found along numerous streams flowing to the Bay of Fundy and also the corridor-like steep escarpment overlooking the Annapolis Valley on the ecodistrict's southern edge. Both of these features occur east of Digby. The soils of this element, although comprising various soil textures, are well- drained. The climax species is the tolerant mixedwood community. The current forest is largely mature, comprising of 48% hardwood, 33% mixedwood, and 18% softwood. Hardwoods and mixedwoods are dominated by tolerant species, although intolerants still make up a sizable portion. White spruce is the most prevalent softwood.

Two of the ecosections comprising this element, WCDS and WFDS, are uncommon at the ecodistrict and ecoregional scale. These two elements contain no area in the reserve category. These areas, mostly forested and often associated with water, may be important corridors when they traverse altered landscapes.

Flows

People (rock climbing, viewscapes, sugar bush); water (nutrient input, protector of riparian zones, source of woody debris, some control over water flow, springs at foot of dissections); deer (travel corridors); red-tailed hawk (nesting, food); Trout (food source, regulate water input, escarpment limits fish movement); squirrel (mixedwoods provide habitat).

Composition

North Mountain Ecodistrict 920 (based on statistics up to 2007)

Composition of Tolerant Mixedwood Slopes

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	9%	7%	84% (56 Mat + 28 OF)	28%
Seral Stage	Early	Mid	Late	Unclassified
	31%	29%	35%	5%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	18%	48%	33%	1%

Desired Condition

A predominately late seral mixedwood community of red spruce, hemlock, white pine, yellow birch, sugar maple, and beech. Good representation of Old forest.

Issues

- unique ecosections
- representivity
- importance as travel corridors

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the North Mountain 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 through silviculture activities such as partial cuts or thinnings in the appropriate mid seral stands or planting of abandoned agriculture land.
- Benefiting wildlife by increasing the number of large patch areas.
- Maintaining connectivity and attempting to enhance where broken by settlement.
- Ensuring adequate connectivity exists among riparian corridors.
- Recognizing the importance of riparian corridors on all watercourses, both as protectors of aquatic ecosystems and as habitat.
- Ensuring wetland integrity is not compromised by resource management activity (harvesting, road construction) and recognizing the importance of wetland-adjacent land relationships for biodiversity.
- Encouraging shared use of roads and use of best management practices in road construction and maintenance and attempting to maintain or increase lands without roads.
- Attempting to improve representivity in under-represented ecosections.
- Attempting to increase the amount of formally protected Old Forest.
- Consider maintaining acceptable balance among four ecological emphasis classes.
- Recognizing that private landowners are the largest group of landowners and that efforts to manage at the landscape level require their participation.

Appendix 1: Flow - Element Interactions

Element	People	Water	Deer	Red-Tailed Hawk	Trout	Squirrel
Matrix Tolerant Hardwood Hills (WMHO, WMKK, WCKK)	- agriculture, forestry, trapping, hunting, sugar bush, quarries, cottages, settlements of fishing villages, and wharves	- first and second order streams - headwaters of many streams originating at height of land in element and emptying into Bay of Fundy and southerly ecodistricts - source of nutrients - water temperature regulator - filtering of rainwater - alleviates potential erosion problems at time of maximum discharge - travel corridor - source of pool material	Climax - some food - thermal refuge in summer Current - food source - mature softwood winter cover - agriculture offers seasonal food	Climax - nesting and food Current - perch trees, nesting, food (mix of habitat beneficial)	- temperature regulation - nutrient source - somewhat regulates water flow through shading (many of streams dry up during hot summer months)	- mature softwood or mixedwood provide habitat
Tolerant Mixedwood Slopes (WMDS, WFDS, WLDS)	- rock climbing - viewscapes - sugar bush	- nutrient input to streams (important because of hardwood organic matter) - protection of the riparian zone - source of woody debris - some control over water flow into dissections - springs at foot of dissections	- in some cases travel corridors - steep escarpment may limit travel	Climax - nesting and food	- food source - to some degree help regulate water levels to enable fish movement to lakes - escarpment limits movement by fish	- mixedwoods provide habitat
Tolerant Mixedwood Hummocks (WFHO)	- agriculture land (some good land) - harvesting - trapping - hunting - settlement	- numerous first order streams - similar to matrix - contains small wetlands - protector of wetlands	Climax - shelter - winter cover Current - food in cutovers - agricultural food source - habitat	- same as matrix	- same as matrix	- habitat in both climax and current forest
Red and Black Spruce Flats (IMSM, IFSM, IM HO)	- settlement in western end - fishing - trapping	- numerous wetlands - water storage, filtration - protectors of wetlands - headwaters of some streams	- shelter in forested areas	----------	- food and water input to streams - protector of stream environment	----------
Red Spruce Hummocks (WCSM, WCHO)	- settlement - agriculture	- many streams flowing through - source of nutrient - water temperature regulation - filtering of rainwater	- some habitat	----------	- habitat	- mature softwood habitat
Wetlands (WTLD)	- trapping - research - fishing	- water collection, storage, filtration	- potential cover where forested - food	- hunting	- general habitat - water release - water quality	- habitat where forested with mature softwood

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Matrix	High	WM HO WM KK WCKK	Landscape	Gap	Climax sugar maple, yellow birch, beech Current - white spruce - intolerant hardwood - some tolerant hardwood - agriculture land	- tolerant mixedwood hummocks - tolerant mixedwood dissections	- species composition - lack of large patch size - lack of old forest - lack of areas without roads - connectivity	- harvesting practices - harvesting, ownership pattern - harvesting ownership - harvesting ownership, settlement - fragmentation (in area east of Hampton)	- manage climax species according to natural disturbance regime; use of thinnings and partial cuts in stands with a tolerant component to increase their percentage in stands; planting of agricultural land - encourage patch aggregation, land purchase - encourage more old forest on private land or land purchase - encourage more areas without roads on private land or land purchase - attempt to maintain cover by encouraging partial harvesting where applicable - encourage planting of white spruce cutovers - patch aggregation - attempt to maintain >60% mature cover
Tolerant Mixedwood Slopes	Patch/ Corridor	High (unique)	WMDS, WFDS, WCDS	Local	Gap	Climax - tolerant mixedwood Current - tolerant hardwood, tolerant mixedwood, white spruce	- tolerant hardwoods hills and hummocks	- species composition - maintaining integrity - isolation	- harvesting practices - land use practices in adjacent elements - fragmentation in patches of matrix	- if harvesting occurs encourage tolerant species - appropriate land use practices in nearby elements - ensure percolation character of matrix is maintained/enhanced

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	Patch	Moderate	WFHO	Landscape	Gap	Climax - tolerant mixedwood Current - white spruce - intolerant mixedwoods and hardwoods - agriculture land	- tolerant hardwood hills And hummocks	- species composition - fragmentation within patch - isolation	- harvesting practices - harvesting practices, agriculture settlement - connectivity through matrix	- manage climax species according to natural disturbance regime; use of thinnings and partial cuts in stands with a tolerant component to increase percentage of tolerants in stands; planting of abandoned agriculture land to tolerant species - encourage aggregation within patches - to maintain cover encourage partial harvesting where possible - plant white spruce cutovers -patch aggregation
Red and Black Spruce Flats	Patch	Moderate	IMHO, IMSM, IFSM	Local	Infrequent/ Gap	Climax - red spruce tolerant softwood, tolerant hardwood, wetlands Current - intolerant mixedwoods, white spruce, red/black spruce, intolerant hardwood, tolerant hardwood	- tolerant hardwood hills and hummocks, tolerant mixedwood hummocks	- species composition	- harvesting practices	- similar to Matrix

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Red Spruce Hummocks	Patch	Moderate	WCHO, WCSM	Local	Gap	Climax - red spruce - tolerant hardwood Current - intolerant mixedwoods, white spruce, intolerant hardwood, converted land	- tolerant hardwood hills and hummocks, tolerant mixedwood dissections, tolerant mixedwood hummocks	- fragmentation, loss of habitat - lack of interior forest habitat	- conversion - movement - harvesting, conversion	- patch aggregation where possible, land purchase
Wetlands	Patch	High	WTLD	Local	----------	- black spruce, red map le, bog species, sedges	- tolerant mixedwood hummocks, tolerant hardwood hills and hummocks, moist tolerant mixedwoods	- settlement - recreational use	- possible negative impacts from road salt, infilling - ATV use	- applicable enforcement

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 920)

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
Bicknell's Thrush	*Catharus bicknelli*		Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Peregrine Falcon - anatum/tundrius	*Falco peregrinus pop. 1*	Vulnerable	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Harlequin Duck - Eastern population	*Histrionicus histrionicus pop. 1*	Endangered	Special Concern	Special Concern
Roseate Tern	*Sterna dougallii*	Endangered	Endangered	Endangered
Buff-breasted Sandpiper	*Tryngites subruficollis*	N/A	N/A	Special Concern
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
Eastern Mountain Avens	*Geum peckii*	Endangered	Endangered	Endangered
FERNS AND THEIR ALLIES				
Prototype Quillwort	*Isoetes prototypus*	Vulnerable	Special Concern	Special Concern
FISH	-			
American Eel	*Anguilla rostrate*	N/A	N/A	Threatened
Atlantic Sturgeon	*Acipenser oxyrinchus*	N/A	N/A	Threatened
GYMNOSPERMS				
Eastern White Cedar	*Thuja occidentalis*	Vulnerable	N/A	N/A
INSECTS	-			
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS	-			
Fin Whale	*Balaenoptera physalus*	N/A	Special Concern	Special Concern
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Harbour Porpoise - Northwest Atlantic population	*Phocoena phocoena (NW Atlantic pop.)*	N/A	Threatened	Special Concern
MONOCOTS	-			
Goldencrest	*Lophiola aurea*	Vulnerable	Threatened	Special Concern

Appendix 3: Special Occurrences (Ecodistrict 920)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS			
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS			
Northern Goshawk	*Accipiter gentilis*	Secure (Green)	S3S4
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Gadwall	*Anas strepera*	May Be At Risk (Orange)	S2B
Brant	*Branta bernicla*	Sensitive (Yellow)	S3M
Common Goldeneye	*Bucephala clangula*	Secure (Green)	S2B,S5N
Purple Sandpiper	*Calidris maritima*	Sensitive (Yellow)	S3N
Least Sandpiper	*Calidris minutilla*	Secure (Green)	S1B,S5M
Semipalmated Sandpiper	*Calidris pusilla*	Sensitive (Yellow)	S3M
Northern Cardinal	*Cardinalis cardinalis*	Secure (Green)	S3S4
Black Guillemot	*Cepphus grylle*	Secure (Green)	S3S4
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B S3B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3S4B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3B,S4N
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S5N
Red-breasted Merganser	*Mergus serrator*	Secure (Green)	S3M S3
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Sensitive (Yellow)	S2S3M
Great Cormorant	*Phalacrocorax carbo*	Sensitive (Yellow)	S2S3M
Red Phalarope	*Phalaropus fulicarius*	Sensitive (Yellow)	S3M
Red-necked Phalarope	*Phalaropus lobatus*	Sensitive (Yellow)	S3B
American Golden-Plover	*Pluvialis dominica*	Sensitive (Yellow)	S3
Pied-billed Grebe	*Podilymbus podiceps*	Sensitive (Yellow)	S3B
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3B
Eastern Bluebird	*Sialis sialis*	Sensitive (Yellow)	S3B
Common Tern	*Sterna hirundo*	Sensitive (Yellow)	S3B,S5M
Arctic Tern	*Sterna paradisaea*	May Be At Risk (Orange)	S2S3B
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S1?B,S4S5M
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	
Solitary Sandpiper	*Tringa solitaria*	Secure (Green)	
BRYOPHYTES			
Rugel's Anomodon Moss	*Anomodon rugelii*	Sensitive (Yellow)	S2S3
Wulf's Peat Moss	*Sphagnum wulfianum*	Sensitive (Yellow)	S2S3

Appendix 3: Special Occurrences (Ecodistrict 920)

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***
DICOTS			
Nova Scotia Agalinis	*Agalinis neoscotica*	Secure (Green)	S3
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Wood Anemone	*Anemone quinquefolia*	Sensitive (Yellow)	S2
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Michaux's Dwarf Birch	*Betula michauxii*	Sensitive (Yellow)	S2
Marsh Bellflower	*Campanula aparinoides*	Sensitive (Yellow)	S3
Large Toothwort	*Cardamine maxima*	May Be At Risk (Orange)	S1
Small-flowered Bittercress	*Cardamine parviflora var. arenicola*	Sensitive (Yellow)	S2
Seaside Spurge	*Chamaesyce polygonifolia*	Secure (Green)	S3
Chinese Hemlock-parsley	*Conioselinum chinense*	Sensitive (Yellow)	S2
American Cancer-root	*Conopholis americana*	May Be At Risk (Orange)	S1S2
Rock Whitlow-Grass	*Draba arabisans*	Sensitive (Yellow)	S2
Rock Whitlow-Grass	*Draba glabella*	May Be At Risk (Orange)	S1
Purple-veined Willowherb	*Epilobium coloratum*	Sensitive (Yellow)	S2?
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
Common Bedstraw	*Galium aparine*	Exotic ()	S1
Northern Bedstraw	*Galium boreale*	May Be At Risk (Orange)	S2
American False Pennyroyal	*Hedeoma pulegioides*	Sensitive (Yellow)	S2S3
Round-lobed Hepatica	*Hepatica nobilis var. obtusa*	May Be At Risk (Orange)	S1S2
Kalm's Hawkweed	*Hieracium kalmii*	(Undetermined)	S2?
Panicled Hawkweed	*Hieracium paniculatum*	Secure (Green)	S3
Pinebarren Golden Heather	*Hudsonia ericoides*	Sensitive (Yellow)	S2
Pale Jewelweed	*Impatiens pallida*	Sensitive (Yellow)	S2
Pale-Spiked Lobelia	*Lobelia spicata*	May Be At Risk (Orange)	S1
Greenland Stitchwort	*Minuartia groenlandica*	Sensitive (Yellow)	S2
Water Blinks	*Montia fontana*	May Be At Risk (Orange)	S1
Farwell's Water Milfoil	*Myriophyllum farwellii*	Sensitive (Yellow)	S2
Narrow-leaved Evening Primrose	*Oenothera fruticosa ssp. glauca*	Undetermined	S2
Smooth Sweet Cicely	*Osmorhiza longistylis*	(Undetermined)	S2
Glaucous Rattlesnakeroot	*Prenanthes racemosa*	May Be At Risk (Orange)	S1
Laurentian Primrose	*Primula laurentiana*	May Be At Risk (Orange)	S3
Eastern Cudweed	*Pseudognaphalium obtusifolium*	Secure (Green)	S3S4
Lesser Pyrola	*Pyrola minor*	Secure (Green)	S2
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow)	S3
Swamp Rose	*Rosa palustris*	Sensitive (Yellow)	S3
Peach-leaved Dock	*Rumex persicarioides*	Secure (Green)	S2?
		May Be At Risk (Orange)	

Appendix 3: Special Occurrences (Ecodistrict 920)

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***
Knotted Pearlwort	*Sagina nodosa*	Secure (Green)	S2S3
Meadow Willow	*Salix petiolaris*	Secure (Green)	S3
White Mountain Saxifrage	*Saxifraga paniculata ssp. neogaea*	Sensitive (Yellow)	S2
Hairy Goldenrod	*Solidago hispida*	May Be At Risk (Orange)	S1?
Sticky Goldenrod	*Solidago simplex var. randii*	.1 Extirpated ()	SH
Fringed Blue Aster	*Symphyotrichum ciliolatum*	Sensitive (Yellow)	S2S3
Canada Germander	*Teucrium canadense*	Sensitive (Yellow)	S3
Heart-leaved Foamflower	*Tiarella cordifolia*	Sensitive (Yellow)	S2
Inverted Bladderwort	*Utricularia resupinata*	May Be At Risk (Orange)	S1S2
Alpine Bilberry	*Vaccinium uliginosum*	Sensitive (Yellow)	S2
Blue Vervain	*Verbena hastata*	Secure (Green)	S3
Arrow-Leaved Violet	*Viola sagittata var. ovata*	Secure (Green)	S3S4
FERNS AND THEIR ALLIES			
Maidenhair Spleenwort	*Asplenium trichomanes*	Sensitive (Yellow)	S2
Cut-leaved Moonwort	*Botrychium dissectum*	Secure (Green)	S3
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive (Yellow)	S2S3
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Dwarf Scouring-Rush	*Equisetum scirpoides*	Secure (Green)	S3S4
Appalachian Fir-Clubmoss	*Huperzia appalachiana*	Undetermined (Undetermined)	S1S3
Northern Firmoss	*Huperzia selago*	Undetermined (Undetermined)	S1S3
Acadian Quillwort	*Isoetes acadiensis*	Sensitive (Yellow)	S3
Little Curlygrass Fern	*Schizaea pusilla*	Secure (Green)	S3
Rock Spikemoss	*Selaginella rupestris*	May Be At Risk (Orange)	S1
INSECTS			
Henry's Elfin	*Callophrys henrici*	Secure (Green)	S2
Early Hairstreak	*Erora laeta*	May Be At Risk (Orange)	S1
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Compton Tortoiseshell	*Nymphalis l-album*	Secure (Green)	S1S2
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Green Comma	*Polygonia faunus*	Secure (Green)	S3
Grey Comma Satyr	*Polygonia progne*	Secure (Green)	S3S4
Comma Aphrodite	*Polygonia satyrus*	Sensitive (Yellow)	S1
Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined (5)	Unranked

Appendix 3: Special Occurrences (Ecodistrict 920)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
MONOCOTS			
Wild Chives	*Allium schoenoprasum*	May Be At Risk (Orange)	S2
Wild Chives	*Allium schoenoprasum var. sibiricum*	May Be At Risk (Orange)	S2
Wild Leek	*Allium tricoccum*	May Be At Risk (Orange)	S1
Silvery-flowered Sedge	*Carex argyrantha*	Secure (Green)	S3S4
Porcupine Sedge	*Carex hystericina*	May Be At Risk (Orange)	S2
Loose-Flowered Sedge	*Carex laxiflora*	May Be At Risk (Orange)	S1
Rosy Sedge	*Carex rosea*	Secure (Green)	S3
Swan's Sedge	*Carex swanii*	Sensitive (Yellow)	S2S3
Blunt Broom Sedge	*Carex tribuloides*	Secure (Green)	S3?
Greenish Sedge	*Carex viridula ssp. brachyrrhyncha*	May Be At Risk (Orange)	S1
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Deer-tongue Panic Grass	*Dichanthelium clandestinum*	Secure (Green)	S3
Quill Spikerush	*Eleocharis nitida*	Secure (Green)	S3
Yellow Spikerush	*Eleocharis olivacea*	Sensitive (Yellow)	S2S3
Ovate Spikerush	*Eleocharis ovata*	Sensitive (Yellow)	S2?
Few-flowered Spikerush	*Eleocharis quinqueflora*	May Be At Risk (Orange)	S2
Nodding Fescue	*Festuca subverticillata*	May Be At Risk (Orange)	S1
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
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
White Adder's -Mouth	*Malaxis brachypoda*	May Be At Risk (Orange)	S1
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Glaucous Blue Grass	*Poa glauca*	Sensitive (Yellow)	S2S3
Narrow-leaved Blue-eyed-grass	*Sisyrinchium angustifolium*	Secure (Green)	S3S4
Coastal Plain Blue-eyed-grass	*Sisyrinchium fuscatum*	May Be At Risk (Orange)	S1
Small Burreed	*Sparganium natans*	Secure (Green)	S3
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	Sensitive (Yellow)	S2S3
Eastern Skunk Cabbage	*Symplocarpus foetidus*	Secure (Green)	S3S4
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

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

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

Appendix 3: Special Occurrences (Ecodistrict 920)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Loon Nesting Lakes	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Environment Act Nova Scotia Forests Act (subsection: *Wildlife Habitat and Watercourses Protection Regulations*)
Eagle Nests	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act (NSWA)
Osprey Nests	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act
Bat Hibernaculum	Species	DNR Restricted Landuse Database	Nova Scotia Wildlife Act
Peregrine Fa l con Nesting Areas	Species	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act
Protected Areas – Tiddville Nature Reserve; Aylesford Mountain	Ecosystems/ Recreation	DNR Restricted Landuse Database	Nova Scotia Special Places Protection Act
Provincial Park - Blomidon, Cape Split	Ecosystems/ Recreation	DNR Restricted Landuse Database	Nova Scotia Parks Act
Protected Beaches – Scots Bay; Hampton;	Ecosystems/ Recreation	DNR Restricted Landuse Database	Nova Scotia Beaches Act
Private Conservation Lands – Briar Island; Long Island	Ecosystems/ Recreation		Nova Scotia Conservation Easements Act

Appendix 3: Special Occurrences (Ecodistrict 920)
Table 1d – Heritage Features

Feature	Type	Information Source
Abandoned Mines	Geological and Cultural Heritage	NS Abandoned Mines Database
Historic Fishing and Shipbuilding Villages	Cultural/Community Heritage	Local Knowledge

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
IFSM	sM, yB, Be	331	0.3	79,460	80.3	53 to 57	18.0	1,332	1.0	84,863	60.7	63 to 67	8.0
IMHO	rS	5,106	5.2	6,604	6.7	56 to 65	7.3	5,310	3.8	13,192	9.4	53 to 62	7.4
IMSM	rS, eH, wP	1,340	1.4	938	0.9	54 to 59	9.9	1,372	1.0	6,453	4.6	51 to 55	10.0
WCDS	rS, sM, yB, Be	132	0.1	132	0.1	38 to 42	12.4	1,953	1.4	14,425	10.3	74 to 79	3.4
WCHO	rS	1,497	1.5	6,604	6.7	37 to 40	29.5	4,288	3.1	13,192	9.4	37 to 41	33.1
WCKK	sM, yB, Be	542	0.5	79,460	80.3	47 to 52	13.1	6,545	4.7	84,863	60.7	72 to 79	4.2
WCSM	sM, yB, Be	62	0.1	79,460	80.3	34	46.2	2,430	1.7	84,863	60.7	23 to 24	63.9
WFDS	rS, eH, wP, sM, yB, Be	583	0.6	10,401	10.5	57 to 59	4.1	583	0.4	10,401	7.4	50 to 53	4.1
WFHO	sM, yB, Be	7,517	7.6	79,460	80.3	34 to 38	30.3	7,517	5.4	84,863	60.7	27 to 32	30.3
WMDS	rS, eH, wP, sM, yB, Be	9,818	9.9	10,401	10.5	57 to 60	12.2	13,512	9.7	10,401	7.4	58 to 61	10.6
WMHO	sM, yB, Be	55,683	56.3	79,460	80.3	51 to 58	13.3	55,929	40.0	84,863	60.7	47 to 54	13.3
WMKK	sM, yB, Be	15,444	15.6	79,460	80.3	51 to 57	3.8	25,142	18.0	84,863	60.7	50 to 57	4.9
WTLD	wetlands	532	0.5	0	0.0	73 to 74	4.6	1,023	0.7	0	0.0	54 to 55	27.0

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
WMHO	sM, yB, Be	55,683	2.0	627	25	162	27.3	790	1.4	52	0.1	842	1.5
WMKK	sM, yB, Be	15,444	0.6	13	7	43	0.0	56	0.4	7	0.0	62	0.4
WMDS	rS, eH, wP, sM, yB, Be	9,818	2.5	154	45	45	0.0	199	2.0	45	0.5	244	2.5
WFHO	sM, yB, Be	7,517	0.0	0	0	0	21.7	0	0.0	22	0.3	22	0.3
IMHO	rS	5,106	1.0	52	256	2	0.0	53	1.0	256	5.0	310	6.1
WCHO	rS	1,497	0.0	0	3	0	0.0	0	0.0	3	0.2	3	0.2
IMSM	rS, eH, wP	1,340	2.1	3	0	0	0.0	3	0.2	0	0.0	3	0.2
WFDS	rS eH wP, sM yB, Be	583	0.0	0	0	0	0.0	0	0.0	0	0.0	0	0.0
WCKK	sM, yB, Be	542	0.0	0	0	0	0.0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	532	2.0	8	113	3	0.0	11	2.0	113	21.3	124	23.3
XXWA	NONE	373	0.0	0	0	0	0.0	0	0.0	0	0.0	0	0.0
IFSM	sM, yB, Be	331	0.2	0	0	1	0.0	1	0.2	0	0.0	1	0.2
WCDS	rS, sM, yB, Be	55,683	2.0	627	25	162	27.3	790	1.4	52	0.1	842	1.5
WCSM	sM, yB, Be	15,444	0.6	13	7	43	0.0	56	0.4	7	0.0	62	0.4
Total		**98,766**		**857**	**448**	**255**	**49.0**	**1,112**		**497**		**1,609**	
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)
Designated Provincial Parks and Park Reserves	833	0	Old Forest	561	0
Nature Conservancy of Canada	0	403	Designated Provincial Parks and Park Reserves	73	0
Sites of Ecological Significance Under Moratorium	24	0	Nature Conservancy of Canada	0	49
Nova Scotia Nature Trust	0	21	Operational Non Designated Parks and Reserves	11	0
Protected Beaches	0	20			

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

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

The resulting index values are scaled to provide a potential range of 0 to 100. For the purpose of map interpretation, these values have been grouped into benchmark ranges that reflect characteristic patterns of land use in Nova Scotia.

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

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

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

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	1,255
Utility corridors	3	0.4
Gravel Roads and active railways	6	550
Paved streets and roads collectors	10	348
Highways	15	0

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	7,556	7.6
Forest Resource	7 to 15	35,377	35.7
Mixed Rural	16 to 24	32,979	33.3
Agriculture Suburban	25 to 39	22,940	23.2
Urban	40 to 100	20	<1.0
Total		**98,872**	**99.8**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Hills	71,579	10
Tolerant Mixedwood Slopes	10,539	15
Tolerant Mixedwood Hummocks	7,517	14
Red and Black Spruce Flats	6,773	15
Red Spruce Hummocks	1,560	23
Wetlands	533	26
Total	**98,501**	**12**

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

Appendix 8: Development Classes and Seral Stages

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

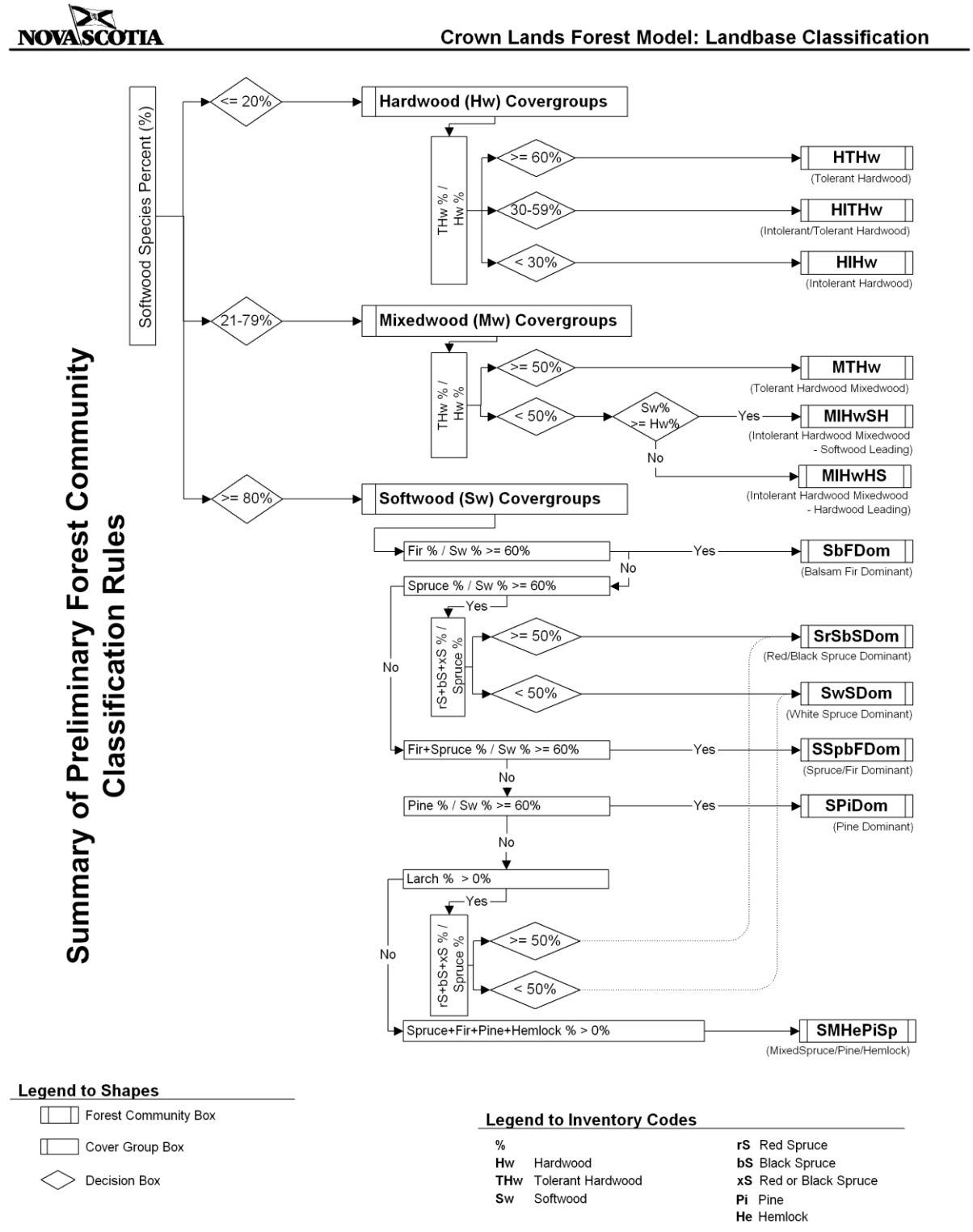
Summary of species-level seral score values by ecodistrict (Source: NSDNR - January 2014 revision)

Species		Ecodistrict																			
Code	**Name**	**100**	**210**	**220**	**310**	**320**	**330**	**340**	**350**	**360**	**370**	**380**	**410**	**420**	**430**	**440**	**450**	**510**	**520**	**530**	**540**
AS	ash	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
BC	black cherry	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
BF	balsam fir	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	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
BS	black spruce	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
EH	eastern hemlock	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
GB	grey birch	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
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
JP	jack pine	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3
LA	largetooth aspen	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
OS	other softwood	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
RM	red maple	3	2	4	2	2	2	2	2	4	2	5	2	2	2	2	2	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
RP	red pine	3	3	3	3	3	3	3	3	3	4	3	3	3	4	3	3	3	3	4	4
RS	red spruce	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
ST	striped maple	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
TH	tolerant hardwood	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
UC	unclassified	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
WB	white birch	3	4	2	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
WP	white pine	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
XS	red and black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

Code	Name	550	560	610	620	630	710	720	730	740	750	760	770	780	810	820	830	840	910	[illegible]
AS	ash	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
BC	black cherry	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
BF	balsam fir	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	1	1
BP	balsam poplar	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
EC	eastern cedar	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
	exotic species	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
IH	intolerant hardwood	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
JP	jack pine	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LA	largetooth aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OH	other hardwood	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
PC	pin cherry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RM	red maple	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
RP	red pine	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
SM	sugar maple	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
TA	aspen	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
TL	eastern larch	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
WA	white ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
WB	white birch	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	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
WS	white spruce	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red and black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

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

Appendix 9: Vegetation Community Classification – Forest Model



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

Preliminary Draft: November 14, 2006

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

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	WMHO (77.8%) WMKK (21.5%) WCKK (0.8%)	Softwood				Early	1,190	2,815	2,591	3,494	10,090	16,565; 27.6	EARLY	28,868; 48.1
						Mid	102	251	470	401	1,224			
						Late	110	92	1,251	331	1,784			
						Unclass	3,467	0	0	0	3,467			
		Mixedwood				Early	937	2,278	3,642	4,717	11,572	21,755; 36.2	MID	14,803; 24.7
						Mid	180	551	3,291	1,859	5,881			
						Late	85	8	1,938	788	2,818			
						Unclass	1,483	0	0	0	1,483			
		Hardwood	sM yB Be	Gap	71,579; 100.0	Early	795	1,134	2,546	1,727	6,203	20,379; 33.9	LATE	10,651; 17.7
						Mid	291	690	5,151	1,566	7,697			
						Late	133	167	5,228	520	6,048			
						Unclass	430	0	0	0	430			
		Unclassified				Early	1,003	0	0	0	1,003	1,352; 2.3	UNCL	5,730; 9.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	350	0	0	0	350			
Total					**71,579***	**# ha**	**10,555**	**7,986**	**26,107**	**15,403**	**60,051**			
						%	**17.6%**	**13.3%**	**43.5%**	**25.6%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Slopes	WMDS (93.2%) WFDS (5.5%) WCDS (1.3%)	Softwood				Early	54	153	442	362	1,011	1,636; 18.4	EARLY	2,745; 30.8
						Mid	4	12	66	32	114			
						Late	0	1	181	52	235			
						Unclass	276	0	0	0	276			
		Mixedwood	rS, eH, wP, sM, yB, Be rS, sM, yB, Be	Gap	10,539; 100.0	Early	53	126	456	525	1,160	2,907; 32.7	MID	2,550; 28.6
						Mid	8	49	486	451	994			
						Late	0	0	427	193	621			
						Unclass	133	0	0	0	133			
		Hardwood				Early	74	39	278	131	521	4,281; 48.1	LATE	3,149; 35.4
						Mid	84	107	845	406	1,441			
						Late	8	106	1,854	325	2,293			
						Unclass	25	0	0	0	25			
		Unclassified				Early	53	0	0	0	53	77; 0.9	UNCL	458; 5.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	24	0	0	0	24			
Total					**10,539***	**# ha**	**794**	**594**	**5,035**	**2,478**	**8,901**			
						%	**8.9%**	**6.7%**	**56.6%**	**27.8%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

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	WFHO (59.6%)	Softwood				Early	150	316	554	474	1,494	1,895; 38.3	EARLY	3,756; 75.9
						Mid	3	7	24	6	40			
						Late	0	0	27	5	32			
						Unclass	329	0	0	0	329			
		Mixedwood				Early	71	459	390	518	1,439	1,799; 36.3	MID	551; 11.1
						Mid	0	31	107	57	194			
						Late	0	0	9	10	19			
						Unclass	147	0	0	0	147			
		Hardwood	sM, yB, Be	Infrequent	7,517; 100.0	Early	98	281	191	109	679	1,095; 22.1	LATE	149; 3.0
						Mid	2	36	237	43	317			
						Late	0	0	85	13	98			
						Unclass	1	0	0	0	1			
		Unclassified				Early	144	0	0	0	144	161; 3.3	UNCL	494; 10.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	18	0	0	0	18			
Total					**7,517***	**# ha**	**962**	**1,129**	**1,625**	**1,234**	**4,950**			
						%	**19.4%**	**22.8%**	**32.8%**	**24.9%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Red and Black Spruce Flats	IMHO (75.3%) IMSM (19.8%) IFSM (4.9%)	Softwood	rS rS, eH, wP	Infrequent	6,039; 89.2	Early	119	356	104	419	998	1,783; 34.9	EARLY	2,364; 46.3
						Mid	4	49	33	80	166			
						Late	21	30	194	39	283			
						Unclass	335	0	0	0	335			
		Mixedwood				Early	63	232	269	421	985	2,036; 39.9	MID	1,111; 21.8
						Mid	52	41	268	206	566			
						Late	31	1	87	92	211			
						Unclass	275	0	0	0	275			
		Hardwood	sM, yB, Be		232; 3.4	Early	40	105	131	70	346	1,217; 23.8	LATE	948; 18.6
						Mid	9	36	289	45	379			
						Late	3	1	417	34	455			
						Unclass	37	0	0	0	37			
		Unclassified				Early	35	0	0	0	35	69; 1.3	UNCL	680; 13.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	34	0	0	0	34			
Total					**6,773***	**# ha**	**1,057**	**849**	**1,793**	**1,405**	**5,104**			
						%	**20.7%**	**16.6%**	**35.1%**	**27.5%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Red and Black Spruce Hummocks	WCHO (96.1%) WCSM (3.9%)	Softwood	rS	Infrequent	1,499; 96.1	Early	10	35	76	61	181	238; 25.6	EARLY	731; 78.6
						Mid	0	1	2	2	5			
						Late	0	1	2	0	3			
						Unclass	49	0	0	0	49			
		Mixedwood				Early	15	104	179	119	417	488; 52.5	MID	112; 12.1
						Mid	0	0	38	14	52			
						Late	0	0	11	0	11			
						Unclass	8	0	0	0	8			
		Hardwood	sM, yB, Be	Gap	43; 2.7	Early	5	50	62	15	131	198; 21.3	LATE	25; 2.7
						Mid	1	9	32	14	56			
						Late	0	0	11	0	11			
						Unclass	0	0	0	0	0			
		Unclassified				Early	2	0	0	0	2	6; 0.6	UNCL	61; 6.6
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	4	0	0	0	4			
Total					**1,560***	**# ha**	**93**	**200**	**413**	**225**	**930**			
						%	**10.0%**	**21.5%**	**44.4%**	**24.2%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (North Mountain 920)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Wetlands	WTLD (100.0%)	Softwood	bS		160; 3.0	Early	27	42	1	20	91	106; 83.1	EARLY	109; 86.0
						Mid	5	4	0	0	8			
						Late	1	2	0	0	3			
						Unclass	4	0	0	0	4			
		Mixedwood				Early	0	14	1	3	18	21; 16.1	MID	11; 8.5
						Mid	0	3	0	0	3			
						Late	0	0	0	0	0			
						Unclass	0	0	0	0	0			
		Hardwood				Early	0	0	1	0	1	1; 0.5	LATE	3; 2.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0.2; 0.2	UNCL	4; 3.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Unclass	0	0	0	0	0			
Total					**533***	**# ha**	**37**	**65**	**2**	**23**	**127**			
						%	**29.2%**	**50.8%**	**1.7%**	**18.3%**	**100.0%**			

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

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

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WMHO WMKK WCKK	Gap	sM, yB, Be	S	SwSDom	11,537	19.7%	E	**Well-Drained** early - pasture, wS, aspen, rM, wB mid - rM, wB late - sM, yB, Be (WA, Ir) **Moist** early - pasture, wS, aspen, rM mid - bF, rS, rM, yB late - rS, eH, yB, sM, Be (WA, Ir)
				S	SrSbSDom	3,847	6.6%	L	
				S	SbFDom	570	1.05	M	
				S	SSpbFDom	552	0.95	M	
				S	SPiDom	35	0.1%	L	
				S	SMHePiSp	22	0.0%	L	
				M	MIHwSH	8,544	14.6%	E	
				M	MIHwHS	8,236	14.0%	E	
				M	MTHw	4,975	8.5%	L	
				H	HIHw	9,474	16.1%	E	
				H	HTHw	6,909	11.8%	L	
				H	HITHw	3,996	6.8%	M	
Total						**58,699**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Bals am 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 North Mountain Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Slopes	WMDS WFDS WCDS	Gap	rS, wP, eH, yB, sM, Be	S	SwSDom	1,099	12.5%	E	**Well-Drained** early - rM, wB, rO mid - rS, bF late - rS, eH, wP, yB, sM, Be (lr)
				S	SrSbSDom	321	3.6%	L	
				S	SSpbFDom	95	1.1%	M	
				S	SbFDom	92	1.0%	M	
				S	SMHePiSp	25	0.3%	L	
				S	SPiDom	4	0.0%	L	
				M	MTHw	1,212	13.7%	L	
				M	MIHwHS	869	9.8%	E	
				M	MIHwSH	826	9.4%	E	
				H	HTHw	2,518	28.5%	L	
				H	HITHw	911	10.3%	M	
				H	HIHw	853	9.7%	E	
Total						**8,824**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Bals am 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 North Mountain Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Hummocks	WFHO	Infrequent	sM, yB, Be	S	SwSDom	1,690	35.3%	E	**WFHO** **Well Moist** early - pastures, wS, aspen, rM, yB mid - bF, rS, rM, yB late - rS, eh, yB (sM)
				S	SbFDom	77	1.6%	M	
				S	SrSbSDom	65	1.4%	M	
				S	SSpbFDom	61	1.3%	M	
				S	SMHePiSp	3	0.1%	L	
				M	MIHwSH	910	19.0%	E	
				M	MIHwHS	765	16.0%	E	
				M	MTHw	124	2.6%	L	
				H	HIHw	822	17.2%	E	
				H	HITHw	157	3.3%	M	
				H	HTHw	116	2.4%	L	
Total						**4,789**	**100.0%**		

*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Bals am 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 North Mountain Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Red and Black Spruce Flats	IMHO IFSM IMSM	Infrequent	sM, yB, Be rS, eH, wP	S	SwSDom	943	18.7%	E	**IMHO** **Moist** early - wS, aspen, rM mid - bF, rS, bS, rM, yB late - rS, yB **Wet** edaphic, bS, tL, rM, wetland **IMSM, IFSM** **Wet** edaphic, bS, tL, rM, wetlands **Moist** early - wS, aspen, rM mid - bF, bS, rS, rM, yB late - rS, yB
				S	SrSbSDom	764	15.2%	L	
				S	SSpbFDom	38	0.8%	M	
				S	SbFDom	38	0.7%	M	
				M	MIHwSH	951	18.9%	E	
				M	MIHwHS	668	13.3%	E	
				M	MTHw	417	8.3%	L	
				H	HIHw	547	10.9%	E	
				H	HTHw	442	8.8%	L	
				H	HITHw	228	4.5%	M	
Total						943	**100.0%**		

*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Bals am 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 North Mountain Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Red Spruce Hummocks	WCHO WCSM	Infrequent Gap	rS sM yB Be	S	SwSDom	225	24.4%	E	**Well Rapid** early - wS, aspen, wB, rM mid - bF, rM, yB late - rS, rM, yB
				S	SMHePiSp	5	0.5%	L	
				S	SrSbSDom	4	0.4%	L	
				S	SSpbFDom	3	0.4%	M	
				M	MIHwHS	268	29.0%	E	
				M	MIHwSH	186	20.1%	E	
				M	MTHw	34	3.7%	L	
				H	HIHw	167	18.1%	E	
				H	HITHw	20	2.2%	M	
				H	HTHw	11	1.2%	L	
Total						**924**	**100.0%**		

*Forest Community Codes:			
	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Bals am 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 North Mountain Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	WTLD	Open Seral		S	SwSDom	63	50.0%	E	edaphic, bS, tl, rM and wetlands
				S	SrSbSDom	43	33.8%	L	
				M	MIHwSH	14	10.9%	E	
				M	MIHwHS	7	5.3%	E	
Total						**126**	**100.0%**		

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

Appendix 10:
Table 3: Summary of "Potential Climax" Forest Abundance
(Based on ELC Interpretations)

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
sM, yB, Be	79,460	80.3%	84,863	60.7%
rS, eH, wP, sM, yB, Be	10,401	10.5%	10,401	7.4%
rS	6,604	6.7%	13,192	9.4%
rS, eH, wP	938	0.9%	6,453	4.6%
bS	160	0.2%	2,118	1.5%
rS, sM, yB, Be	132	0.1%	14,425	10.3%
Total	**97,694**	**98.7%***	**131,452**	**93.9%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Hills	71,577	905	39,737	13,270	8,080	9,585	36,421 to 41,214	51 to 58
Tolerant Mixedwood Slopes	10,516	242	6,840	1,474.4	1,237	722	5,922 to 6,283	56 to 60
Tolerant Mixedwood Hummocks	7,517	22	2,395	2,086	2,273	740	2,525 to 2,895	34 to 39
Red and Black Spruce Flats	6,773	313	3,994	916	570	981	3,782 to 4,273	56 to 63
Red Spruce Hummocks	1,560	3	590	392	468	107	570 to 623	37 to 40
Wetlands	533	125	336	43	25	4	389 to 391	73
Total	**98,476**	**1,609**	**53,893**	**18,181**	**12,654**	**12,140**	**49,608 to 55,678**	**50 to 57**

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
IFSM	331	1	212	28	60	31	174 to 190	53 to 57
IMHO	5,106	310	2,936	659	374	828	2,883 to 3,297	56 to 65
IMSM	1,340	3	852	228	133	124	730 to 792	54 to 59
WCDS	132	0	42	62	16	12	50 to 56	38 to 42
WCHO	1,497	3	564	384	441	107	548 to 601	37 to 40
WCKK	542	0	274	142	71	55	255 to 282	47 to 52
WCSM	62	0	25	8	29	0	21	34
WFDS	583	0	380	150	24	29	330 to 344	57 to 59
WFHO	7,517	22	2,394	2,086	2,276	739	2,524 to 2,893	34 to 38
WMDS	9,818	244	6,434	1,266	1,195	679	5,555 to 5,895	57 to 59
WMHO	55,683	842	31,215	8,662	7,431	7,533	28,302 to 32,068	51 to 58
WMKK	15,444	62	8,240	4,470	582	2,001	7,860 to 8,861	51 to 57
WTLD	532	124	338	42	25	4	389 to 391	73 to 74
Total	98,586	1,609	53,906	18,186	12,656	12,142	**49,621 to 55,691**	**50 to 57**

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

Appendix 13:

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

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

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

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

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

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

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

Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand-initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand-initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand-initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.
Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.
Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the “matrix, patch, corridor” concept of landscape structure.)
Pre-commercial thinning	A silviculture treatment to reduce the number of trees in young stands before the stems are large enough to be removed as a forest product. Provides increased growing space and species selection opportunities to improve future crop tree growth.

Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain, or standing water body.
Road deactivation	Measures taken to stabilize roads and logging trails during periods of inactivity, including the control of drainage, the removal of sidecast where necessary, and the re-establishment of vegetation for permanent deactivation.
Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms which are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened, and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.
Threatened species	A species that is likely to become endangered if the factors affecting its vulnerability are not reversed. A species declared as threatened under the federal or Nova Scotia species at risk legislation (NS Endangered Species Act or federal SARA).
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vernal pool	A seasonal body of standing water that typically forms in the spring from melting snow and other runoff, dries out in the hotter months of summer, and often refills in the autumn.

Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

Literature Referenced

Bruce, J. and B. Stewart. 2005. Development of a "road index" for landscape level assessment of linear transportation features using density, distance, and class measures. Unpublished report.

Diaz, N. and D. Apostol. 1992. Forest landscape analysis and design: a process for developing and implementing land management objectives for landscape patterns. R6 ECO-TP-043-92. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Region.

Duke, T. and L. Benjamin. 2005. Forest / wildlife habitat and management guide, 560 – Chignecto Ridges. Department of Natural Resources, Kentville. Internal report. 15pp.

Dunster, J. and K., Dunster. 1996. Dictionary of natural resource management. UBC Press. 363 pp.

Fenow, B.E. 1912. Forest Conditions of Nova Scotia. 93 pp.

Forman, R.T.T. 2004. Road ecology's promise: what's around the bend? Environment 46(4):8-21.

Forman, R.T.T. and R.D. Deblinger. 2000. The ecological road-effect zone of a Massachusetts (USA) suburban highway. Conservation Biology 14: 36-46.

Forman, R.T.T. 1999. Spatial models as an emerging foundation of road system ecology, and a handle for transportation planning and policy. In Proceeding of the Third International Conference on Wildlife Ecology and Transportation, edited by G.L.Evink, P.Garrett, and D.Zeigler, 118-123. Tallahassee, Florida: Florida DOT.

Lindenmayer, D. B. and J. F. Franklin. 2002. Conserving forest biodiversity: a comprehensive multi-scaled approach. Island Press. ISBN 1-55963-935-0. 351 pp.

Methven, I. and M. Kendrick. 1995. A Disturbance History Analysis of the Fundy Model Forest Area. 16pp.

Mailman, G. E. 1975. Tobeatic Resource Management Area Land Inventory. Nova Scotia Department of Natural Resources.

Neily, P. and E. Quigley. 2005. Natural disturbance ecology in the forests of Nova Scotia. Ecosystem Management Group, Department of Natural Resources, Truro. Unpublished report.

Neily, P., E. Quigley, L. Benjamin, B. Stewart, and T. Duke. 2003. Ecological land classification for Nova Scotia. Vol. 1 - mapping Nova Scotia's terrestrial ecosystems. Nova Scotia Dept. of Natural Resources, Forestry Division, Truro. 83 pp.

Nova Scotia Department of Natural Resources. 2006. Guidelines for the development of long range management frameworks. Nova Scotia Department of Natural Resources, Regional Services, Halifax. 33 pp.

Nova Scotia Department of Natural Resources. 2002. Wildlife Habitat and Watercourses Protection Regulations. Section 40 of the Forests Act R.S.N.S. 1989, c. 179 O.I.C. 2001-528 (November 15, 2001, effective January 14, 2002), N.S. Reg. 138/2001 as amended by O.I.C. 2002-609 (December 20, 2002), N.S. Reg. 166/2002
http://www.gov.ns.ca/natr/wildlife/habitats/protection/

Reed, R.A., J.Johnson-Barnard, and W.L. Baker. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. Conservation Biology 10:1098-1106.

Seymour, R. S. and M. L. Hunter, Jr. 1999. Principles of Forest Ecology. Chapter 2. In: M.L. Hunter Jr. Ed. Maintaining Biodiversity in Forest Ecosystems. 698 pp.

Spellerberg, I.F. 1998. Ecological effects of roads and traffic: a literature review. Global Ecology & Biogeography Letters 7, 317-333.

Stewart, B. and P. Neily. 2008. A procedural guide for ecological landscape analysis. Department of Natural Resources, Truro. Report for 2008-2.

Strang, R. M. 1972. Ecology and land use of barrens of Western Nova Scotia. Canadian Journal of Forest Resources. 2(3): 276-290.

USDA Forest Service.1999. Roads analysis: informing decisions about managing the national forest transportation system. Misc. Rep FS-643. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 222 p.