Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS GOVERNOR LAKE ECODISTRICT 450

PART 3: Landscape Analysis for Forest Ecosystem Planners

ELA 2014-450

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 450: Governor Lake

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ISBN 978-1-55457-586-2

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

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

Information sources and statistics (benchmark dates) include:

- Forest Inventory (1995) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006), and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

Conventions

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

REPORT FOR ELA 2015-450

Table of Contents – Part 3

Tables

Appendices

Theme Maps Available on Website

Part 3: Landscape Analysis of Governor Lake – *For Forest Ecosystem Planners*

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:

Understanding the Landscape as an Ecological System

- Elements Within Landscapes
- Flow-Element Interactions
- Landscape Connectivity

Landscape Indicators

- Forest Composition Indicators
- Land Use Indicators

Fine Scale Features

- Priority Species and Other Special Occurrences
- Rare Ecosections
- Ecological Representivity

ELA Summary

- Element Interpretation
- Ecosystem Issues and Opportunities

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 Governor Lake Ecodistrict – one matrix, four patches, and a corridor. A matrix is the dominant element. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts (see connectivity section for full discussion of matrix, patch and corridor concepts).

Red and Black Spruce Hummocks is the matrix element, representing 72% of the ecodistrict area. On well-drained slopes, forests are dominated by red spruce and white pine. Other species common in the element include black spruce, balsam fir, red maple, and white birch.

Tolerant Hardwood Hills is the largest patch element, representing 18% of the ecodistrict. Yellow birch is a dominant species followed by sugar maple and red maple. Mixedwood forests of balsam fir, red spruce, and yellow birch are also found in the element on lower slopes.

The other patch elements, in order of size, are **Tolerant Hardwood Drumlins and Hummocks**, **Wetlands**, and **Spruce Pine Flats**.

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

Flow – Element Interactions (Appendix 1; Map 2)

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

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.

Connective management strategies could include:

- Mitigating potentially negative barrier effects of concentrated land use in the Valley Corridors element by sustaining and restoring natural communities in keyareas.
- Enhancing connectivity among conservation areas by applying appropriate medium and high biodiversity emphasis standards when managing areas with natural linkage potential.
- Improving ecoregional connectivity by sustaining and restoring natural conditions at important linkage points among ecodistricts.

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

Most of the landscape flows identified are also linkages to adjacent areas or ecodistricts (Map 2).

The current landscape patterns in the Governor Lake Ecodistrict are influenced by past land use, fire, windstorms, disease/insect infestations, and forestry activities.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

Each element contains a number of forest stands that can be classified by vegetation, soil, and ecosites. The DNR publication ***Forest Ecosystem Classification for Nova Scotia, Part I: Vegetation Types (2010)*** (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 Governor Lake

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Pine Flats	OW2, SH9, SP6	18.0	SP4, SP7	30.0	**SP5**	40.0
Red and Black Spruce Hummocks	IH6, MW4, MW5, SH8, SH9	19.0	SH5, SH6, SP4	24.0	MW1, MW2, MW3, SH1, SH2, **SH3,** SH4, SP5	37.0
Tolerant Hardwood Drumlins and Hummocks	IH6	16.0	IH7, TH7	21.0	TH1, TH2, **TH8**	29.0
Tolerant Hardwood Hills	IH6	23.0	IH7, TH7	30.0	TH1, TH2, **TH8**	28.0
Wetlands	WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8					

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

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

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

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

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

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

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

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

In Governor Lake, the EEI range is 63 to 74 (Appendices 12a and 12b). This EEI would suggest a relatively moderate to high state of "naturalness" in the ecodistrict and habitat is generally favourable for biodiversity.

About 73% of the land falls in the extensive ecological emphasis class. This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

A little over 1% of the ecodistrict has been converted. This is land that has been changed to an unnatural state for human use, mostly settlements, farms, urban development, and transportation and utility corridors.

The reserve class accounts for less than 2% of the area and is divided into two categories: legal reserves and policy reserves. The legal reserves are those areas that have legal status under the IUCN (The International Union for the Conservation of Nature and Natural Resources) codes of I, II, or III such as wilderness areas, protected beaches, and designated provincial parks. The second type of reserves is those set aside under various provincial policies, such as the Old Forest Policy.

Less than 2% of the ecodistrict falls in the intensive class, representing lands managed intensively to optimize resource production from sites maintained in a native forested state. Management may eliminate or reduce the duration of some development processes, particularly old forest stages, and may include exotic species, old field spruce, and monoculture plantations. Despite intensive practices, these lands are an important component of landscape structure and composition.

About 22% of the land area 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.

Governor Lake has an overall RI value of approximately 2 (Appendix 7, Table 3), which falls within the Remote RI range of 0 to 6 and represents 52% of the ecodistrict (Appendix 7, Table 2). The Forest Resource category, with an RI range of 7 to 15, represents 44% of the ecodistrict.

The highest road densities occur around settlements and the major transportation systems. In the Governor Lake Ecodistrict, the Valley Corridors element has the highest RI of 10.

Roads can contribute to habitat fragmentation and environmental degradation. Since nearly 74% of land ownership in the ecodistrict is in private hands, efforts could be made to:

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

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

Data on the status and location of priority species, ecological land classification, representivity analysis, and other landscape characterization themes were used to identify special occurrences,

rare ecosections, and ecological representivity. These fine scale features, which occur at a sub-landscape level, may require special management practices to conserve their uncommon characteristics.

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

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

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

The primary species data used in this report are from the Atlantic Canada Conservation Data Centre and DNR's Significant Habitat Database. Efforts are made to ensure data are as accurate and up-to-date as possible. Lists and maps indicate what is currently known. Due diligence tied to planning, management, and stewardship may require that surveys be carried out to update information or to fill gaps in our knowledge. Priority species may require special actions in terms of forest management and other activities that alter habitat and the landscape. If more information is required or if management specific to a priority species 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 Governor Lake Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: five endangered, two threatened, and two vulnerable. In addition to the listed species, the national General Status process also identifies two orange-status species, 16 yellow-status species, three green-status species, and two species with an undetermined rank for a total of 23 other species of conservation concern in this ecodistrict.

Designated species at risk found within the ecodistrict include moose, wood turtle, and snapping turtle, four bird species (Canada warbler, rusty blackbird, common nighthawk, and chimney swift) and blue and boreal felt lichen.

Other species of conservation concern known for the Governor Lake Ecodistrict include northern goshawk and yellow-bellied flycatcher (birds); northern bog violet and showy lady’s slipper (plants); blistered tarpaper and blistered jellyskin lichens; and triangle floater and eastern lampmussel (mollusks).

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 IRM decision-making procedures (see http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf).

Birds

As of 2013, four at risk bird species have been found in the ecodistrict. All four are listed under the NSESA: chimney swift, rusty blackbird, and Canada warbler as endangered and common nighthawk as threatened. All four species are also listed under SARA: chimney swift, common nighthawk, and Canada warbler as threatened and the rusty blackbird as special concern.

There has been a nationwide decline in aerial insectivores such as chimney swift and common nighthawk due to declines in insect food species. Availability of nesting and roosting habitat for chimney swifts is also thought to be a threat to these species as its namesake habitat, chimneys, get sealed up, torn down, or collapse without replacement.

Habitat loss and land use practices, particularly on wintering grounds, are thought to have contributed to the widespread decline of rusty blackbird and Canada warbler.

Lichens

Two lichen species at risk are found in the ecodistrict. The Atlantic population of boreal felt lichen is designated by COSEWIC as endangered and listed under the federal SARA and NSESA as the same. Blue felt lichen is designated by COSEWIC as special concern and is listed federally as special concern and provincially as vulnerable.

The distribution of boreal felt lichen in Nova Scotia is largely limited to within tens of kilometres from the Atlantic coast, in high humidity forested areas adjacent to or within wetlands that have a major balsam fir contingency.

Blue felt lichen is known from 88 locations in Nova Scotia that represent a considerable portion of the entire range known in North America. In Nova Scotia, blue felt lichen are generally found in mixed forests containing red maple that are in wet depressions or adjacent to streams, rivers, or lakes in coastal areas up to 300 metres in elevation. For both lichen species at risk known to the ecodistrict, surveys in other potential habitat areas may reveal additional occurrences.

Both of these lichen species are considered cyanolichens, a group that is threatened by atmospheric pollutants and acid precipitation, which changes the chemistry of the bark on the trees on which the lichens grow, which can cause direct mortality or interfere with reproduction. Also, their habitats often overlap with areas otherwise suitable for forest harvesting activities, which can serve as a threat to the species either by direct mortality or habitat loss.

Forestry activities on Crown land in areas where boreal felt lichen may occur are subject to special management practices for the species, which requires that surveys for the species are conducted, and, if found, an area buffering the occurrence will not be harvested.

Mammals

Moose on the mainland of Nova Scotia have been designated as endangered under the Nova Scotia Endangered Species Act. Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy.

Moose are often observed throughout the Governor Lake Ecodistrict and the majority of the southern and eastern portions of the ecodistrict are considered by the Department as part of a "Moose Concentration Area," which is subject to special management practices for forestry activities above and beyond the standard Wildlife Habitat and Watercourse Protection Regulations required for all forestry.

Moose are commonly associated with forested landscape habitats that have been altered or disturbed by events such as fire, wind (i.e. blowdown), disease, or timber harvesting. The habitat requirements of moose are largely dependent on successional forest stages. Early successional hardwood trees and shrubs provide necessary browse vegetation while mature conifer cover is valuable for shelter, thermal cover, and protection in winter and summer.

White-tailed deer numbers increase from east to west and are typically more abundant in and near the Musquodoboit Valley where soil productivity is higher and lower elevations result in reduced snow depths. This area and northward into Colchester County are considered important wintering areas for deer.

The high concentration of white-tailed deer in the northern and western portions of the ecodistrict do not favour moose using those areas extensively during the winter or year-round. However, the northeastern portion of the ecodistrict is still likely to provide important migration habitat during periods of high dispersal such as during mating season, or when moving among summer and winter habitats. The forested lake, river, and stream corridors of the ecodistrict mandated by the Wildlife Habitat Watercourse Protection regulations play an especially important role to moose to allow undetected travel, while ensuring temporary food, water, and shelter.

Black bear are widespread through the ecodistrict and their numbers are healthy. Black bears can be a threat to moose while moose calves are young as they are a known prey to adult black bears.

Reptiles

Wood turtle is listed as threatened under both the federal SARA and the NSESA. Wood turtle is uncommon province-wide, with the majority of observations occurring in a few main concentration areas. The St. Marys, Musquodoboit, and Stewiacke rivers are all known to support wood turtle. Portions of the uppermost reaches of each of these rivers occur in the Governor Lake Ecodistrict, where some wood turtle observations have been made.

Threats to wood turtles in Nova Scotia include alteration and destruction of river and stream habitats, nest predation, vehicle strikes, and translocations of turtles by people. Where forestry activities overlap with known wood turtle areas on Crown land, special management practices are required to mitigate detrimental effects of forestry on wood turtles and their habitat.

The snapping turtle population is relatively stable and in most watersheds in the province they remain fairly common. However, populations are under increasing threats that include illegal harvest, road mortality, nest failures, low recruitment, and high juvenile mortality. The snapping turtle is listed as vulnerable under the NSESA and special concern under the federal SARA and COSEWIC.

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.

Within the Governor Lake Ecodistrict, there are seven ecosections – ICSM, IMRD, IMSM, PMHO, WFDM, WFKK, and WMDM – that each comprise less than 2% percent of the ecodistrict area. These seven ecosections combined form 8% of the ecodistrict.

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

450 Governor Lake			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Red and Black Spruce Hummocks (Matrix)	ICHO IMHO IMRD WCHO WCKK WMHO	Frequent	red Spruce (rS), black Spruce (bS), white Pine (wP)
Tolerant Hardwood Hills (Patch)	WFKK WMKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Tolerant Hardwood Drumlins and Hummocks (Patch)	WFDM WMDM	Gap	sM, red Maple (rM), yB, Be
Spruce Pine Flats (Patch)	ICSM IMSM PMHO	Frequent	bS, wP
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, tamarack (tL), rM
Valley Corridors (Corridor)	Various	Various	Various

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

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

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

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

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.

A Nature Conservancy of Canada site on private land is the only site that is a legal reserve, accounting for 190 hectares, or 0.3% of this ecodistrict (Appendix 5). The provincial Old Growth Policy protects another 832 hectares of forest stands on Crown land under policy reserve. In total, there are 1,022 hectares, or 1.6% of the ecodistrict, with legal reserve or policy reserve protection.

ELA Summary

Element Interpretation (All appendices andmaps)

Located near the centre of the eastern mainland, the Governor Lake Ecodistrict is an upland underlain by granitic bedrock. To the north, the ecodistrict drops sharply to the West River St. Marys, but on the other three sides it is less abrupt in its rise above the shales and quartzites of the Eastern Interior Ecodistrict. The Governor Lake Ecodistrict covers an area of approximately 633 square kilometres, or 10% of the ecoregion.

At its highest point, the ecodistrict is 200 metres above sea level. The ecodistrict has the hottest summer temperatures and the coldest winter temperatures in the ecoregion. Along with the Margaree Valley, Governor Lake has the shortest frost free period in the province – less than 90 days. On an annual basis, the ecodistrict receives 1,300 to 1,400 millimetres of precipitation, which is similar for most of the eastern and western ecoregions.

Governor Lake is underlain by intruding Meguma Group granite, similar to that found in the South Mountain 720 and Eastern Granite Uplands 430 ecodistricts, which is very resistant toerosion. The terrain is thinly covered by coarse granitic till with many large granite boulders. Some glacial activity has created drumlins and eskers, which can be found scattered throughout the ecodistrict. The soils are coarse-textured, well-drained, gravelly sandy loams.

The ecodistrict's geology can best be seen after a disturbance, such as fire or clearcut harvesting, which has removed the vegetation and exposed the boulder-strewn landscape. Approximately 2% of the ecodistrict has exposed bedrock, much of which is found in hummocky or hilly topography around the Lower Rocky Lake area in the Liscomb Game Sanctuary.

About 6% of the ecodistrict is covered with lakes and streams.

On the well-drained upper slopes and crests of hills and drumlins, tolerant hardwood forests dominated with yellow birch – some with diameters over one metre – and red maple and lesser amounts of sugar maple and beech are found.

Elsewhere, softwood forests dominate the ecodistrict with stands of red spruce and scattered hemlock. Isolated pockets of white pine will be found on the coarse shallow soils of ridges associated with black spruce and ericaceous vegetation.

The ecodistrict is prone to wildfire due to the dryness of the soils and to windthrow due to the shallowness of the soils.

Red and Black Spruce Hummocks
(Matrix) (ICHO, IMHO, IMRD, WCHO, WCKK and WMHO ecosections) (43,160 ha)

Within the Governor Lake Ecodistrict, 43,526 hectares have been identified as the matrix forest element, being primarily made up of hummocky topography and coarse-textured soils.

This matrix area has approximately 60% imperfectly drained sites and 40% well-drained sites.

On the well-drained areas, late vegetation types range from a mix of spruce, white pine, tolerant hardwoods, and red maple. Black spruce and white pine are found on dry sites.

On the imperfectly drained sites, black spruce, red maple, balsam fir, and larch form the dominant community type. The better-drained portions of the matrix seem to be subject to infrequent disturbances whereas the imperfectly drained areas appear to be subject to more frequent change events.

Currently, the matrix is dominated by softwood covertypes that contain a relatively even seral stage distribution, with development classes dominated by establishment and young stands.

Flows

Fish (stream cover regulating water quantity, quality, temperature**,** source of food); deer (habitat providing food, water, cover, shelter); moose (habitat providing food, water, cover, shelter); people (forestry, mineral exploration/development, fishing/hunting/trapping, recreation); water (headwaters, source of nutrients, temperature regulation, filtration, groundwater regulation).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)
Composition of Red and Black Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	41%	30%	29% (21 Mat + 8 OF)	8%
Seral Stage	Early	Mid	Late	Unclassified
	19%	24%	37%	20%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	68%	8%	13%	11%

Desired Condition

Even distribution of early, mid and late vegetation types appropriate to respective ecosections, with consideration for some large areas of predominantly softwood cover capable of providing interior forest conditions.

Issues

- Currently 70% of the element has forest cover less than 40 years of age resulting in a significant shortage of mature and old growth forest.
- A large proportion of the element is being intensively managed with shorter rotation ages to maximize volume.
- Silviculture has also reduced stand diversity by favouring red spruce.
- Mortality of red spruce due to the spruce bark beetle has been significant in over-mature stands.

Tolerant Hardwood Hills

(Patch) (WFKK and WMKK ecosections) (10,776 ha)

This element consists of knolls primarily made up of medium-textured soils resulting in mainly well-drained ecosites.

Gap disturbance is thought to be the dominant natural disturbance pattern acting on this element, with late vegetation tending toward tolerant hardwoods, red maple, and red spruce.

Approximately 60% of the element contains establishment to young development classes, which would seem to be reflective of frequent disturbances rather than the suggested natural gap disturbance process.

Softwood and mixedwood covertypes dominate, whereas hardwood is the predicted dominant late vegetation type.

Flows

Fish (stream cover regulating water quantity, quality, temperature, source of food); deer (habitat providing food, water, cover, shelter); moose (habitat providing food, water, cover, shelter); people (forestry, mineral exploration/development, fishing/hunting/trapping, recreation); water (movement, temperature/quality/quantity regulation).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)

Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	41%	19%	40% (34 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	23%	30%	28%	19%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	42%	20%	25%	13%

Desired Condition

Tending toward more mature mixedwood and hardwood stands characteristic of gap disturbance.

Issues

- Intensive forest management has converted hardwood forests to softwood plantations to take advantage of the productive soils. This has resulted in an overabundance of young forests with 60% of the element less than 40 years of age.
- Mature and multiage forests are 30% below desired levels and there is a significant shortage of old growth forest.

Tolerant Hardwood Drumlins and Hummocks
(Patch) (WFDM and WMDM ecosections) (2,199 ha)

This element of well-drained drumlins consists of approximately equal areas of fine and medium-textured soils. Gap disturbance is considered to be the natural disturbance regime (NDR), with hardwood being the predicted dominant late vegetation.

Currently, statistics indicate approximately two-thirds of this element is in the establishment and young development classes with softwood being the dominant covertype.

Flows

Fish (stream cover regulating water quantity, quality, temperature, source of food); deer (habitat providing food, water, cover, shelter); moose (habitat providing food, water, cover, shelter); people (forestry, mineral exploration/development, fishing/hunting/trapping, recreation); water (movement, temperature/quality/quantity regulation).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)
Composition of Tolerant Hardwood Drumlins and Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	48%	22%	30% (28 Mat + 2 OF)	2%
Seral Stage	Early	Mid	Late	Unclassified
	16%	21%	29%	34%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	51%	12%	14%	23%

Desired Condition

Over time increase the amount of the mature development class and shift from predominately softwood to mid/late seral mixedwood and hardwood stands characteristic of gap disturbances.

Issues

- Currently 70% of the element has forest cover less than 40 years of age resulting in a significant shortage of older forest.
- A large proportion of the element is being intensively managed with shorter rotation ages to maximize volume.
- The intensive use of this ecodistrict for wood supply increases the potential for fragmentation and isolation of this small patch level element.
- Forest management has converted hardwood forests to softwood plantations to take advantage of the productive soils.

Wetlands
(Patch) (WTLD ecosection) (1,587 ha)

Wetlands account for 1,587 hectares, or approximately 3% of the ecodistrict.

The most common wetlands in the ecodistrict are large wetland complexes associated with rivers and lakes. Other wetlands are narrow linear communities associated with flow accumulations and small streams, as a community of hydrophytic vegetation (sedges, sphagnum moss, false holly, and winterberry) associated with level terrain where drainage is impeded, or as a depression in the landscape where water remains in excess year round.

Smaller disjoint wetlands are often embedded within other elements, especially the Spruce Pine Flats element. Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple. For the most part, sites are underlain by poorly drained mineral soils derived from glacial tills or organic soils derived from peat (sphagnum mosses) or sedges. This element plays a critical role in water collection, filtering, and groundwater recharge.

Flows

Fish (stream cover regulating water quantity, quality, temperature, source of food); deer (food); moose (food, shelter, calving areas); people (mineral exploration/development, fishing/hunting/trapping, recreation); water (filtration, discharge regulation).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)
Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	33%	34%	33% (25 Mat + 8 OF)	8%
Seral Stage	Early	Mid	Late	Unclassified
	11%	15%	62%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	78%	3%	8%	11%

Desired Condition

Adjoining natural forest cover and adequate associated drainage patterns to accommodate functioning wetlands.

Issues

- In this ecodistrict the scattered distribution of wetlands increases their ecological importance. They are often a significant component of natural corridors associated with the larger rivers and streams.
- Smaller wetlands are also embedded in the Red and Black Spruce Hummocks element where they provide critical habitat and landscape connectivity.
- Wetlands need to be isolated from road construction to maintain their ecological integrity and isolation.

Spruce Pine Flats

(Patch) (ICSM, IMSM and PMHO ecosections) (938 ha)

This relatively small element of 998 hectares consists of imperfectly to poorly drained coarse and medium-textured soils. Impeded drainage tends to lead to an edaphic community type of black spruce, larch, balsam fir, and red maple.

Flows

Fish (stream cover regulating water quantity, quality, temperature, source of food); deer (habitat providing food, water, cover, shelter, potential winter cover); moose (food, better areas for winter/summer cover); people (mineral exploration/development, fishing/hunting/trapping, recreation); water (filtration, discharge regulation).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)

Composition of Spruce Pine Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	38%	30% (19 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	18%	30%	40%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	73%	3%	18%	6%

Desired Condition

Maintain a balanced development class distribution in the generally edaphic community type of black spruce, larch, balsam fir, and red maple. Management activities in this element should recognize the poorly drained nature of this area.

Issues

- A large proportion of this element has been harvested in the past 40 years creating an overabundance of establishment and young forests.
- The moist to wet soils are sensitive to machine harvesting.
- Stands are not suitable for partial harvesting due to their susceptibility to windthrow.

Valley Corridors
(Corridor) (Various ecosections) (1,023 ha)

The most evident linear features within this ecodistrict are watercourses, with six of the most prominent being identified. These corridors are made up of numerous different small ecosection types bounding the streams. The current forest cover within these corridors contains a fairly well-balanced distribution of development and seral stages and is dominated by softwood covertypes. All three disturbance regimes – frequent, infrequent, and gap – are thought to influence the natural development of these corridor areas.

Flows

Fish (movement, dams on these watercourses impede movement); deer (movement, basic habitat, some wintering on slopes of the Musquodoboit Valley); moose (habitat providing food, water, cover, shelter); people (forestry, mineral exploration/development, fishing/hunting/trapping, recreation); water (movement, temperature regulation, issues with dams).

Composition

Governor Lake Ecodistrict 450 (based on statistics up to 2006)
Composition of Valley Corridors

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	40%	21%	39% (25 Mat + 14 OF)	14%
Seral Stage	Early	Mid	Late	Unclassified
	16%	19%	47%	18%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	54%	11%	20%	15%

Desired Condition

Continuous natural forest conditions appropriate to the numerous different ecosection types that make up the corridors.

Issues

- Corridors provide an important linkage from the interior to the Atlantic coast.
- Barriers created byloss of mature forest cover along corridors can negatively influence use.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Governor Lake 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:

- The Governor Lake Ecodistrict is rural in nature and though not subject to highsettlement land use the ecodistrict has been heavily influenced by forestry activity which has fragmented the forest structure.
- Maintaining a balance between the four ecological emphasis classes, attempting to keep EEI above 50.
- Managing forest communities toward development class and seral stage distributions appropriate to the natural disturbance regimes for sites.
- Recognizing that the extent to which this ecodistrict has been used as an industrial wood supply area will create practical and economic issues with regard to working toward more balanced development and seral classes.
- Enhancing connectivity of the corridor elements by maintaining and, where required, restoring natural forest conditions.
- Strategically planning for the construction, maintenance, and abandonment of access roads to conserve the distribution of low road density areas.
- Recognizing that the significant portion of unclassified forest should be addressed so that a statistic analysis can be more complete.

Appendix 1: Flow - Element Interactions

Element	Fish	Deer	Moose	People	Water
Matrix Red and Black Spruce Hummocks	Stream cover regulating water quantity, quality, temperature, source of food	Habitat providing food water, cover, shelter	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Headwaters, source of nutrients, temperature regulation, filtration, groundwater regulation
Corridors East River Sheet Harbour	Movement, dam obstacle to movement	Movement, basic habitat	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation issues with dams
Musquodoboit	Movement, dam obstacle to movement	Movement, habitat some wintering on slopes	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation issues with dams
Ten Mile Stream	Movement, dam obstacle to movement	Movement, basic habitat	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation issues with dams
Twelve Mile Stream	Movement, dam obstacle to movement	Movement, basic habitat	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation issues with dams
South Brook	Movement, dam obstacle to movement	Movement, basic habitat	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation issues with dams
Liscomb	Movement	Movement, basic habitat	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature regulation

Appendix 1: Flow - Element Interactions

Element	Fish	Deer	Moose	People	Water
Patches Tolerant Hardwood Hills	Stream cover regulating water quantity, quality, temperature, source of food	Habitat providing food water, cover, shelter	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development fishing/hunting/trapping, recreation	Movement, temperature/quality/quantity regulation
Tolerant Hardwood Drumlins and Hummocks	Stream cover regulating water quantity, quality, temperature, source of food	Habitat providing food water, cover, shelter	Habitat providing food water, cover, shelter	Forestry, mineral exploration/development, limestone quarry fishing/hunting/trapping, recreation	Movement, temperature/quality/quantity regulation
Spruce Pine Flats	Stream cover regulating water quantity, quality, temperature, source of food	Habitat providing food water, cover, shelter, potential winter cover	Food, better areas for winter / summer cover	Mineral exploration / development fishing/hunting/trapping, recreation	Filtration, discharge regulation
Wetlands	Stream cover regulating water quantity, quality, temperature, source of food	Food	Food, shelter, calving areas	Mineral exploration / development fishing/hunting/trapping, recreation	Filtration, discharge regulation

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Red and Black Spruce Hummocks	Matrix	High	ICHO WCKK WMHO Intensively managed red spruce forests	Landscape	Frequent	Even-aged red spruce forests	WMKK	Short rotation forest management reducing proportion of older forests. Loss of interior forest habitat.	Important wood supply area. Intensive forestry.	Longer rotation, larger patch sizes.
Tolerant Hardwood Hills	Patch	High	WMKK	Landscape	Gap	Yellow birch, red maple	WMHO	Stand conversion from tolerant hardwoods to softwood plantations.	Fragmentation.	Maintain mature hardwood forests
Tolerant Hardwood Drumlins and Hummocks	Patch	Moderate	North of Ten Mile Lake. Old growth red spruce at Abraham Lake	Local	Gap	Tolerant hardwood on upper slopes with red spruce on lower slopes	Various	Stand conversion from hardwood to softwood plantations.	Over harvesting. Fragmentation.	
Spruce Pine Flats	Patch	Low	ICSM	Local	Frequent	Wet forests of black spruce	WCHO		Over harvesting.	Careful harvesting on the wet soils to avoid site degradation.

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Wetlands	Patch	High	Large wetland associated with Big Brook Lake	Local	Open Seral Frequent	Shrubby wetlands around lakes	Various	Loss of habitat when adjacent forests are altered through harvesting	Off-site pollutants and alteration due to road construction.	Buffer to maintain wetland integrity and water quality
Valley Corridors	Patch	High	Ten, Twelve and Fifteen Mile Streams	Landscape	Various	Riparian forests of red maple and balsam fir forests on moist to wet soils	Various	Road crossings	Corridors link adjacent ecodistricts to the north and south. Flows provided from interior upland to Atlantic coastal.	Buffer riparian zone to maintain water quality for fish habitat and connectivity.

Appendix 2b: Connective Management Strategies

Structure Type	Attributes	Conditions of Concern	Management Strategies
Matrix	percolation, large patch, interior habitat	fragmentation, excessive edge	1. Promote contiguous forest structure using strategies suchas patch aggregation and overstory-sustaining selection cutting 2. Promote large patch structure and interior conditions 3. Mitigate large-scale, long-term, fragmentation of the matrixthat could impede percolation 4. Manage age and structure appropriate to NDR. For gap and infrequently disturbed ecosections maintain 60% mature cover
Patch Ecosystems	patch size, nearest neighbour, edge / interior, intervening habitat condition	undesirable connections, internal composition, excessive separations, threats to key patch	1. Identify and map key patch representatives (high qualityor critical link/distance) 2. Maintain natural isolations, as well as necessary“nearest neighbour” distances 3. Identify potential metapopulation habitat dynamics (if applicable)
Linear Corridors	continuous connection	barriers, interruptions, excessive edge	1. Mitigate 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 450)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS				
Chimney Swift	*Chaetura pelagica*	Endangered	Threatened	Threatened
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
LICHENS				
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Boreal Felt Lichen - Atlantic population	*Erioderma pedicellatum (Atlantic pop.)*	Endangered	Endangered	Endangered
MAMMALS				
Moose	*Alces americanus*	Endangered	N/A	N/A
REPTILES				
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 450)

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

SPECIES		DESIGNATION	
Common Name	Scientific Name	Provincial General Status Rank	ACCDC S-Rank*
BIRDS	-		
Northern Goshawk	*Accipiter gentilis*	Secure (Green)	S3S4
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Yellow-bellied Flycatcher	*Empidonaxflaviventris*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Fox Sparrow	*Passerella iliaca*	Secure (Green)	S3S4B
DICOTS			
Michaux's Dwarf Birch	*Betula michauxii*	Sensitive (Yellow)	S2
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
Comb-leaved Mermaidweed	*Proserpinacapectinata*	Sensitive (Yellow)	S3
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow)	S3
Bog Willow	*Salix pedicellaris*	Sensitive (Yellow)	S2
Dwarf Bilberry	*Vaccinium caespitosum*	Sensitive (Yellow)	S2
Northern Bog Violet	*Viola nephrophylla*	Sensitive (Yellow)	S2
Golden Alexanders	*Zizia aurea*	May Be At Risk (Orange)	S1
INSECTS			
Broadtailed Shadowdragon	*Neurocorduliamichaeli*	N/A	S1
LICHENS			
Blistered Tarpaper Lichen	*Collema furfuraceum*	Sensitive (Yellow)	S3?
Blistered Jellyskin Lichen	*Leptogium corticola*	Sensitive (Yellow)	S2S3
Peppered Moon Lichen	*Sticta fuliginosa*	Sensitive(Yellow)	S3?
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
MOLLUSKS			
Triangle Floater	*Alasmidonta undulata*	Secure (Green)	S2S3
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
MONOCOTS			
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Woods-Rush	*Juncus subcaudatus var. planisepalus*	Sensitive (Yellow)	S3

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

Appendix 3: Special Occurrences (Ecodistrict 450)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Loon Nesting Sites	Habitat	NS Significant Species and Habitats	Canadian Migratory Bird Convention Act, Wildlife Act
Deer Wintering Areas	Habitat	NS Significant Species and Habitats	Wildlife Act
Goshawk Nests	Habitat	NS Significant Species and Habitats	Wildlife Act
Wood Turtle Rivers (Stewiacke, Musquodoboit, St. Marys)	Habitat	NS Significant Species and Habitats	Wildlife Act, NS Endangered Species Act
Head-waters (Musquodoboit, Liscomb, East/West River Sheet Harbour, Stewiacke, St. Marys rivers)	Ecosystem	NS Significant Species and Habitats	NS Environment Act, Forestry Act, Fisheries Act
Freshwater Lakes, Rivers and Streams (Seventeen Mile, Twelve Mile, Ten Mile streams; Cox Flowage, Rocky Lakes, Governor Lake, many small lakes)	Ecosystem	NS Significant Species and Habitats	NS Environment Act
Liscomb Game Sanctuary	Ecosystem	Provincial Database	NS Wildlife Act
St. Marys Corridor Lands	Ecosystem	Provincial Database	NS Wildlife Act, NS Environment Act
Tait Lake Nature Reserve	Ecosystem	Provincial Database	Special Places Protection Act

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type* (1, 2, 3)		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3)*		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	rS	7,121	11.2	21,436	33.9	70 to 74	0.6	22,923	3.6	56,710	8.8	7 to 80	2.4
ICSM	bS	270	0.4	2,885	4.6	53 to 73	0.0	1,275	0.2	158,898	24.7	64 to 72	3.3
IMHO	bS wP	16,457	26.0	10,738	17.0	62 to 74	0.7	133,831	20.8	80,255	12.5	63 to 73	3.2
IMRD	bS wP	864	1.4	10,738	17.0	62 to 73	0.0	62,882	9.8	802,54.6	12.5	70 to 75	2.7
IMSM	bS	521	0.8	2,885	4.6	70 to 75	0.1	12,402	1.9	158,898	24.7	63 to 69	7.8
PMHO	wetlands	207	0.3	0	0.0	74 to 75	0.0	1,073	0.2	0	0.0	73 to 74	0.6
WCHO	rS	1,757	2.8	21,436	33.9	61 to 75	0.0	8,112	1.3	56,710	8.8	72 to 76	7.2
WCKK	rS	10,757	17.0	21,436	33.9	60 to 74	0.5	33,442	5.2	56,710	8.8	73 to 80	0.8
WFDM	sM yB Be	1,101	1.7	12,870	20.3	50 to 72	1.5	29,704	4.6	83,209	13.0	60 to 69	11.4
WFKK	sM yB Be	981	1.5	12,870	20.3	61 to 72	2.1	11,786	1.8	83,209	13.0	56 to 63	16.4
WMDM	sM yB Be	1,098	1.7	12,870	20.3	62 to 74	0.7	18,583	2.9	83,209	13.0	62 to 72	4.4
WMHO	rS eH	6,844	10.8	10,339	16.3	66 to 72	4.2	48,440	7.5	13,896	2.2	63 to 71	4.7
WMKK	sM yB Be	9,937	15.7	12,870	20.3	60 to 72	2.5	125,414	19.5	83,209	13.0	59 to 69	7.5
WTLD	wetlands	1,770	2.8	0	0.0	71 to 75	0.3	18,744	2.9	0	0.0	76 to 78	1.0

*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)
IMHO	bS wP	16,457	23.6	0	16	311	0	311	1.9	16	0	327	2.0
WCKK	rS	10,757	27.9	0	0	30	0	30	0.3	0	0	30	0.3
WMKK	sM yB Be	9,937	17.5	0	0	244	0	244	2.5	0	0	244	2.5
ICHO	rS	7,121	9.9	0	0	69	0	69	1.0	0	0	69	1.0
WMHO	rS eH	6,844	7.1	0	115	105	0	105	1.5	115	2	220	3.2
WTLD	wetlands	1,770	27.2	0	0	4	0	4	0.2	0	0	4	0.2
WCHO	rS	1,757	68.5	0	0	46	0	46	2.6	0	0	46	2.6
WFDM	sM yB Be	1,101	34.1	0	58	0	0	0	0.0	58	5	58	5.3
WMDM	sM yB Be	1,098	17.0	0	0	20	0	20	1.8	0	0	20	1.8
WFKK	sM yB Be	981	27.1	0	0	0	0	0	0.0	0	0	0	0.0
IMRD	bS wP	864	18.9	0	0	0	0	0	0.0	0	0	0	0.0
IMSM	bS	521	37.1	0	0	4	0	4	0.7	0	0	4	0.7
ICSM	bS	270	55.0	0	0	0	0	0	0.0	0	0	0	0.0
PMHO	wetlands	207	0.0	0	0	0	0	0	0.0	0	0	0	0.0
Total		**59,683**		**0**	**190**	**832**	**0**	**832**		**190**		**1,022**	

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)
Nature Conservancy of Canada	0	190	Old Forest	832	0

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

Appendix 6: Description of Road Density Index

Road, trail, and utility corridors provide the background structure for transporting people and goods and are integral components of human land use. However, transportation systems are expensive and have a wide range of negative environmental impacts including 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	760
Utility corridors	3	48
Gravel Roads and active railways	6	396
Paved streets and roads collectors	10	29
Highways	15	0

Table 2: Distribution of Road Index Classes

Road Index		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	18,100	52.2
Forest Resource	7 to 15	15,066	43.5
Mixed Rural	16 to 24	1,362	3.9
Agriculture Suburban	25 to 39	134	0.4
Urban	40 to 100	0	0
Total		**34,662**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	934	10
Red and Black Spruce Hummocks	23,178	2
Tolerant Hardwood Hills	5,494	3
Tolerant Hardwood Drumlins and Hummocks	1129	3
Spruce Pine Flats	481	4
Wetlands	1,043	3
Total	**34,663**	**2**

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

Appendix 8: Development Classes and Seral Stages

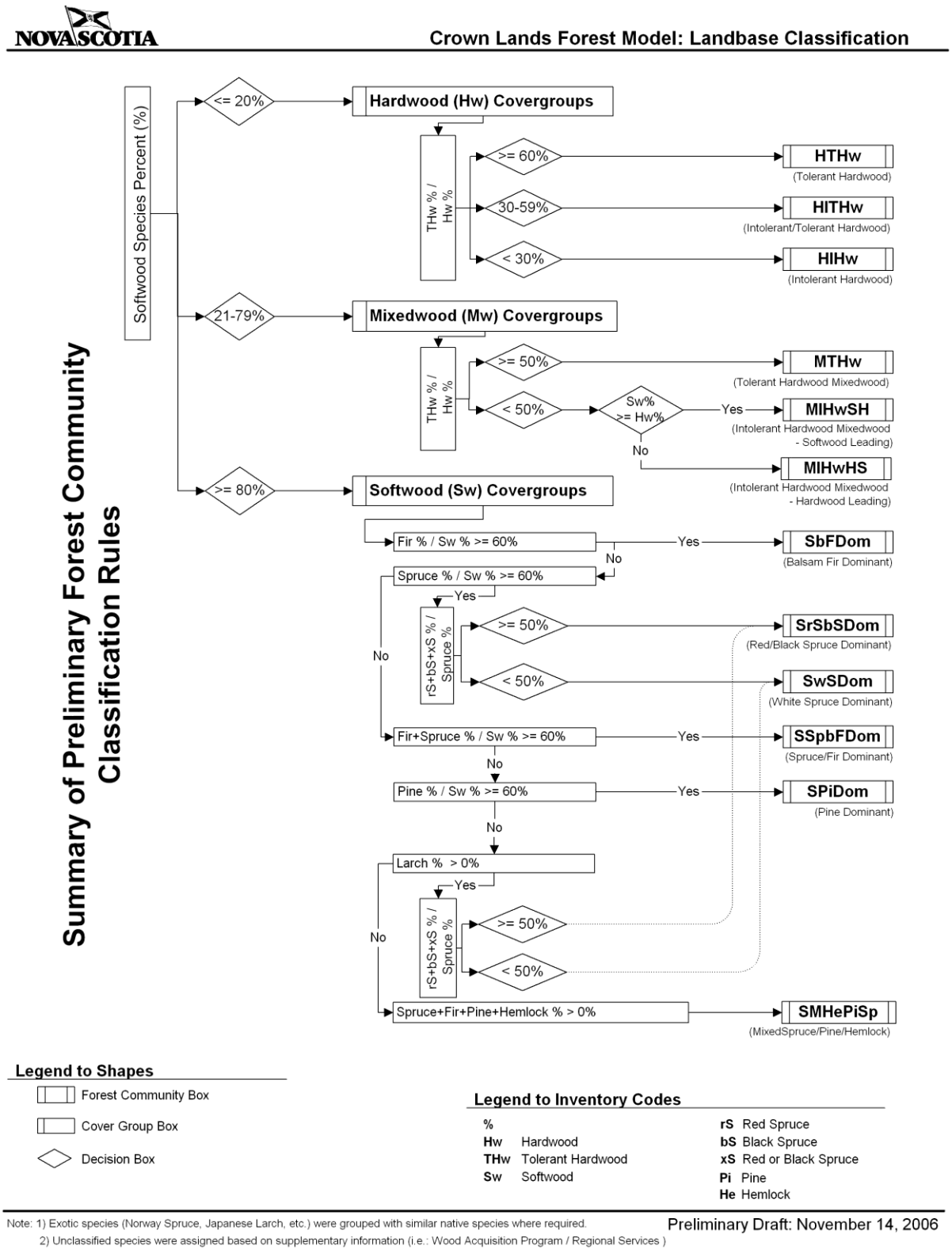
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and shrubs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

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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



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 (Governor Lake 450)

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	IMHO (37.9%) WCKK (23.6%) ICHO (16.5%) WMHO (15.9%) WCHO (4.1%) IMRD (2.0%)	Softwood	rS bS wP rS eH	Frequent Infrequent	39754; 92.1	Early	1,948	2,411	389	240	4,988	26,383; 68.3	EARLY	7,219; 18.7
						Mid	1,752	2,604	871	706	5,933			
						Late	2,346	4,598	3,755	1,453	12,151			
						Uncl	3,311	0	0	0	3,311			
		Mixedwood				Early	326	302	153	125	906	5,105 13.2	MID	9,317; 21.4
						Mid	413	774	746	431	2,364			
						Late	85	198	558	129	970			
						Uncl	865	0	0	0	865			
		Hardwood	sM yB Be	Infrequent	3,407; 7.8	Early	165	206	213	19	602	3,088; 8.0	LATE	14,185; 36.7
						Mid	132	354	496	38	1,020			
						Late	152	33	876	3	1,064			
						Uncl	402	0	0	0	402			
		Unclassified				Early	662	20	42	0	724	4,054; 10.5	UNCL	7,908; 20.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	3,331	0	0	0	3,331			
Total					**43,160***	**# ha**	**15,888**	**11,500**	**8,099**	**3,143**	**38,630**			
						%	**41.1%**	**29.8%**	**21.0%**	**8.1%**	**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 (Governor Lake 450)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	WTLD (17.9%) IMHO (6.3%) WCKK (56.1%) WMKK (13.9%) ICSM (5.8%)	Softwood	rS bS bS wP	Frequent Infrequent	628; 61.4	Early	6	29	12	20	66	493; 53.5	EARLY	147; 16.0
						Mid	13	34	4	31	82			
						Late	101	97	58	30	286			
						Uncl	59	0	0	0	59			
		Mixedwood				Early	0	7	11	2	20	182; 19.7	MID	173; 18.7
						Mid	4	8	28	25	64			
						Late	10	12	50	13	86			
						Uncl	12	0	0	0	12			
		Hardwood	sM yB Be	Gap	271; 26.5	Early	11	3	2	1	18	104; 11.3	LATE	431; 46.8
						Mid	7	1	15	4	26			
						Late	8	1	51	0	60			
						Uncl	0	0	0	0	0			
		Unclassified				Early	44	0	0	0	44	143; 15.5	UNCL	170; 18.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	99	0	0	0	99			
Total					**1,023***	**# ha**	**372**	**191**	**233**	**126**	**921**			
						%	**40.3%**	**20.7%**	**25.3%**	**13.7%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Governor Lake 450)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills	WMKK (91.0%) WFKK (9.0%)	Softwood	rS eH	Gap	3,233; 30.0	Early	423	328	133	33	918	4,369; 42.5	EARLY	2,331; 22.7
						Mid	425	321	202	136	1,083			
						Late	401	562	644	162	1,770			
						Uncl	599	0	0	0	599			
		Mixedwood				Early	180	116	189	42	526	2,552; 24.8	MID	3,114; 30.3
						Mid	264	191	611	111	1,177			
						Late	25	64	308	49	447			
						Uncl	402	0	0	0	402			
		Hardwood	sM yB Be	Gap	7,543.0; 70.0	Early	111	147	190	5	453	2,035; 19.8	LATE	2,885; 28.0
						Mid	120	205	515	14	854			
						Late	19	53	585	11	668			
						Uncl	54	0	6	0	61			
		Unclassified				Early	302	13	120	0	435	1,329; 12.9	UNCL	1,955; 19.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	895	0	0	0	895			
Total					**10,776***	**# ha**	**4,218**	**2,000**	**3,504**	**563**	**10,285**			
						%	**41.0%**	**19.4%**	**34.1%**	**5.5%**	**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 (Governor Lake 450)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Drumlins and Hummocks	WMDM (50.1%) WFDM (49.9%)	Softwood	rS eH rS bS	Gap	550; 25.0	Early	74	116	22	0	212	1,090; 51.4	EARLY	335; 15.8
						Mid	33	165	82	15	296			
						Late	78	136	149	12	375			
						Uncl	207	0	0	0	207			
		Mixedwood				Early	3	15	11	4	32	298; 14.1	MID	450; 21.2
						Mid	4	16	56	7	83			
						Late	24	5	87	6	121			
						Uncl	62	0	0	0	62			
		Hardwood	sM yB Be	Gap	1,649; 75.0	Early	15	6	11	0	31	246; 11.6	LATE	612; 28.9
						Mid	4	9	55	4	71			
						Late	2	7	104	3	116			
						Uncl	28	0	0	0	28			
		Unclassified				Early	47	1	12	0	61	484; 22.9	UNCL	720; 34.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	424	0	0	0	424			
Total					**2,199.0***	**# ha**	**1005**	**474**	**590**	**49**	**2,118**			
						%	**47.5%**	**22.4%**	**27.8%**	**2.3%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Governor Lake 450)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats	IMSM (55.4%) ICSM (22.5%) PMHO (22.1%)	Softwood	bS	Frequent	595; 63.4	Early	5	48	23	17	93	584; 72.5	EARLY	143; 17.8
						Mid	40	83	23	15	161			
						Late	46	136	77	50	308			
						Uncl	22	0	0	0	22			
		Mixedwood				Early	10	11	11	3	35	145; 18.0	MID	242; 30.0
						Mid	44	23	4	2	73			
						Late	0	3	2	0	5			
						Uncl	32	0	0	0	32			
		Hardwood				Early	10	0	2	0	12	26; 3.2	LATE	319; 39.7
						Mid	0	0	7	0	7			
						Late	0	0	6	0	6			
						Uncl	0	0	0	0	0			
		Unclassified				Early	3	0	1	0	3	50; 6.3	UNCL	101; 12.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	47	0	0	0	47			
Total					**393***	**# ha**	**260**	**304**	**156**	**87**	**805**			
						%	**32.3%**	**37.7%**	**19.3%**	**10.8%**	**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 (Governor Lake 450)

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	None	635; 40.0	Early	38	13	2	0	53	486; 77.6	EARLY	71; 11.3
						Mid	12	45	9	4	70			
						Late	49	144	113	38	344			
						Uncl	20	0	0	0	20			
		Mixedwood				Early	3	2	0	0	5	52; 8.3	MID	93; 14.8
						Mid	5	5	9	2	20			
						Late	0	1	18	6	25			
						Uncl	1	0	0	0	1			
		Hardwood				Early	0	0	1	0	1	21; 3.4	LATE	386; 61.7
						Mid	0	0	3	0	4			
						Late	12	0	5	0	17			
						Uncl	0	0	0	0	0			
		Unclassified				Early	12	0	0	0	12	67; 10.7	UNCL	76; 12.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	55	0	0	0	55			
Total					**1,587***	**# ha**	**207**	**210**	**160**	**50**	**626**			
						%	**33.0%**	**33.5%**	**25.5%**	**8.0%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Governor Lake 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 Hummocks	ICHO IMHO IMRD WCHO WCKK WMHO	Frequent	rS bS wP	S	SrSbSDom	16,525	47.8%	L	**Well-drained ecosites** Early – Mid VTs: bF, rS, bS, rM, wB Late VTs: rS, eH, wP, bS, yB, sM, **Moist ecosites** Early – Late VTs: bF, bS, rM, yB **Poorly drained ecosites** Early – Late VTs: bS, bF, rM, tL
				S	SbFDom	6,441	18.6%	E	
				S	SSpbFDom	2,500	7.2%	M	
				S	SPiDom	513	1.5%	L	
				S	SwSDom	306	0.9%	E	
				S	SMHePiSp	97	0.3%	L	
				M	MIHwSH	2,686	7.8%	E/M	
				M	MTHw	1,273	3.7%	L	
				M	MIHwHS	1,146	3.3%	E/M	
				H	HTHw	1,462	4.2%	L	
				H	HIHw	1,141	3.3%	E/M	
				H	HITHw	485	1.4%	M	
Total						**34,576**	**100.0%**		
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H			MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood		

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

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Valley Corridors	ICHO ICSM IMHO WCKK WFDM WFKK WMHO WMKK WTLD XXWA	Infrequent Frequent Gap	rS bS bS wP sM yB Be rS eH sM yB Be	S	SrSbSDom	290	37.3%	L	**Well-drained ecosites** Early – Mid VTs: bF, rM, wB Late VTs: rS, eH, wP, yB, sM, Be **Moist ecosites** Early – Late VTs: bF, bS, rM **Poorly drained ecosites** Early – Late VTs: bS, bF, rM, tL
				S	SbFDom	82	10.5%	E	
				S	SPiDom	57	7.3%	L	
				S	SSpbFDom	32	4.1%	M	
				S	SwSDom	20	2.6%	E	
				S	SMHePiSp	12	1.6%	L	
				M	MTHw	76	9.8%	L	
				M	MIHwSH	63	8.0%	E/M	
				M	MIHwHS	43	5.5%	E/M	
				H	HTHw	57	7.3%	L	
				H	HIHw	36	4.6%	E/M	
				H	HITHw	12	1.5%	M	
Total						**779**	**100.0%**		

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

Appendix 10: Table 2: Composition of Forest Communities (in Governor Lake 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	WFKK WMKK	Gap	sM yB Be	S	SrSbSDom	2,454	27.4%	L	**Well-drained ecosites** Early VTs: rM, wB Mid to Late VTs: rM, yB, sM **Moist ecosites** Early – Mid VTs: bF, rS, rM Late VTs: rS, yB
				S	SbFDom	1,160	13.0%	E	
				S	SSpbFDom	493	5.5%	M	
				S	SwSDom	145	1.6%	E	
				S	SPiDom	72	0.8%	L	
				S	SMHePiSp	46	0.5%	L	
				M	MIHwSH	1,205	13.5%	E/M	
				M	MIHwHS	712	7.9%	E/M	
				M	MTHw	635	7.1%	L	
				H	HIHw	879	9.8%	E/M	
				H	HTHw	734	8.2%	L	
				H	HITHw	422	4.7%	M	
Total						**8,656**	**100.0%**		
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H			MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood		

Appendix 10: Table 2: Composition of Forest Communities (in Governor Lake Grouped by Landscape Element)									
Element	**Ecosections**	**Dominant NDR**	**Dominant Climax Type**	**Covertype**	**Forest* Community (Crown Model)**	**Area (ha)**	**Percent of Forest Community**	**Successional Stage**	**Successional Types**
Tolerant Hardwood Drumlins and Hummocks	WFDM WMDM	Gap	sM yB Be	S	SrSbSDom	586	35.9%	L	**Well-drained ecosites** Early – Mid VTs: rM, wB Mid to Late VTs: rM, sM, yB **Moist ecosites** Early – Mid VTs: bF, rS, yB, rM Late VTs: rS, yB
				S	SbFDom	278	17.0%	E	
				S	SSpbFDom	159	9.7%	M	
				S	SwSDom	58	3.5%	E	
				S	SMHePiSp	9	0.6%	L	
				M	MTHw	125	7.7%	L	
				M	MIHwSH	121	7.4%	E/M	
				M	MIHwHS	53	3.2%	E/M	
				H	HTHw	122	7.5%	L	
				H	HIHw	93	5.7%	E/M	
				H	HITHw	31	1.9%	M	
Total						**1,634**	**100.0%**		
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H			MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood		

Appendix 10: Table 2: Composition of Forest Communities (in Governor Lake Grouped by Landscape Element)									
Element	**Ecosections**	**Dominant NDR**	**Dominant Climax Type**	**Covertype**	**Forest* Community (Crown Model)**	**Area (ha)**	**Percent of Forest Community**	**Successional Stage**	**Successional Types**
Spruce Pine Flats	ICSM IMSM PMHO	Frequent	bS bS wP	S	SrSbSDom	390	51.6%	L	**Moist ecosites** Early – Late VTs: bF, bS, wP, rM **Poorly drained ecosites** Early – Late VTs: bS, rM, tL
				S	SbFDom	128	17.0%	E	
				S	SSpbFDom	66	8.8%	M	
				M	MIHwSH	88	11.7%	E/M	
				M	MIHwHS	51	6.7%	E/M	
				M	MTHw	6	0.8%	L	
				H	HIHw	17	2.3%	E/M	
				H	HTHw	6	0.8%	L	
				H	HITHw	2	0.3%	M	
Total						**755**	**100.0%**		
*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominant SwSDom-White Spruce Dominant SspbFDom-Spruce Fir Dominant SbFDom-Balsam Fir Dominant			SpiDom-Pine Dominant SMHePiSp-Mixed Spruce Pine Hemlock MIHwSH-Intolerant Hardwood Mixedwood S MIHwHS-Intolerant Hardwood Mixedwood H			MTHw-Tolerant Hardwood Mixedwood HIHw-Intolerant Hardwood HTHw-Tolerant Hardwood HITHw-Intolerant Tolerant Hardwood		

Appendix 10: Table 2: Composition of Forest Communities (in Governor Lake 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	bS tL rM	S	SrSbSDom	364	65.0%	L	**Moist ecosites** Early – Late VTs: bF, bS, rM, wA **Poorly drained ecosites** Early – Late VTs: bS, rM, tL, alders, false holly, winterberry
				S	SbFDom	76	13.7%	E	
				S	SSpbFDom	30	5.4%	M	
				S	SPiDom	9	1.6%	L	
				S	SMHePiSp	4	0.7%	L	
				S	SwSDom	3	0.5%	E	
				M	MIHwSH	25	4.5%	E/M	
				M	MTHw	16	2.9%	L	
				M	MIHwHS	11	1.9%	E/M	
				H	HTHw	12	2.2%	L	
				H	HITHw	5	0.9%	M	
				H	HIHw	4	0.7%	E/M	
Total						**559**	**100.0%**		

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

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

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
rS	21,436	33.9%	56,710	8.8%
sM yB Be	12,870	20.3%	83,209	13.0%
bS wP	10,738	17.0%	80,255	12.5%
rS eH	10,339	16.3%	13,896	2.2%
bS	2,885	4.6%	158,898	24.7%
Total	**58,266**	**92.1%***	**392,967**	**61.2%****

*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 ForestPolicy).
Extensive	**0.75**	• Lands managed for multiple values using ecosystem-based techniques that conserve biodiversity, and natural ecosystem conditions and processes. • Forestry practices employ ecosystem-based prescriptions which consider natural disturbance regimes, successional trends, structure, and composition. Natural regeneration is favoured to provide the next forest. Practices may include protection from fire and insects. • Management complies with the Forest Code of Practice, and excludes the use of herbicides, exotic tree species, off-site native species, genetically modified organisms, and stand conversion.
Intensive	**0.25**	• Lands managed intensively to optimize resource production from sites maintained in a native state (e.g. forested). Despite intensive practices these lands are an important component of landscape structure and composition. • Management may eliminate or reduce the duration of some development processes, particularly mature old forest stages, and may result in non-natural succession. Practices may produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels. Forests are protected from fire, insects, and competing vegetation. • Management adheres to environmental regulations and policies such as the Wildlife Habitat and Watercourse Protection Regulations, and Forest Code of Practice.
Converted	**0**	• Land converted to an unnatural state for human use, or areas where practices have significantly degraded site productivity (e.g. agriculture, urban development roads, Christmas trees, seed orchards, forest soil compaction).

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Red and Black Spruce Hummocks	43,032	665	32,234	533	488	9,112	27,252 to 31,808	63 to 74
Tolerant Hardwood Hills	10,702	218	7,470	288	253	2,473	6,511 to 7,747	61 to 72
Tolerant Hardwood Drumlins and Hummocks	2,198	79	1,263	70	24	763	1,234 to 1,615	56 to 73
Wetlands	1,587	4	1,468	5	6	104	1,132 to 1,184	71 to 75
Valley Corridors	1,007	53	661	22	35	236	613 to 731	61 to 73
Spruce Pine Flats	1,007	53	661	22	35	236	613 to 731	61 to 73
Total	**59,533**	**1,072**	**43,757**	**940**	**840**	**12,924**	**37,373 to 43,786**	**63 to 74**

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

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

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

EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
ICHO	7,121	69	6,274	43	45	690	4,957 to 5,302	70 to 74
ICSM	270	0	159	12	0	99	147 to 197	54 to 73
IMHO	16,372	327	11,632	313	120	3,981	10,124 to 12,115	62 to 74
IMRD	863	0	635	28	0	201	533 to 634	62 to 73
IMSM	521	4	464	0	1	53	365 to 391	70 to 75
PMHO	207	0	201	0	0	6	152 to 155	74 to 75
WCHO	1,757	46	1,204	18	0	490	1,075 to 1,321	61 to 75
WCKK	10,742	30	7,474	144	56	3,038	6,431 to 7,950	60 to 74
WFDM	1,100	58	482	58	16	485	556 to 798	51 to 73
WFKK	981	0	721	37	21	202	601 to 702	61 to 72
WMDM	1,098	20	781	11	8	278	678 to 817	62 to 74
WMHO	6,801	220	5,419	7	288	866	4,503 to 4,936	66 to 73
WMKK	9,863	244	6,820	252	246	2,300	5,997 to 7,147	61 to 72
WTLD	1,769	4	1,618	5	6	137	1,253 to 1,321	71 to 75
Total	**36,943**	**1,975**	**21,070**	**3,347**	**4,215**	**6,337**	**37,373 to 43,786**	**63 to 74**

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

Appendix 13:

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

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

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

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

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

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

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

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

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

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