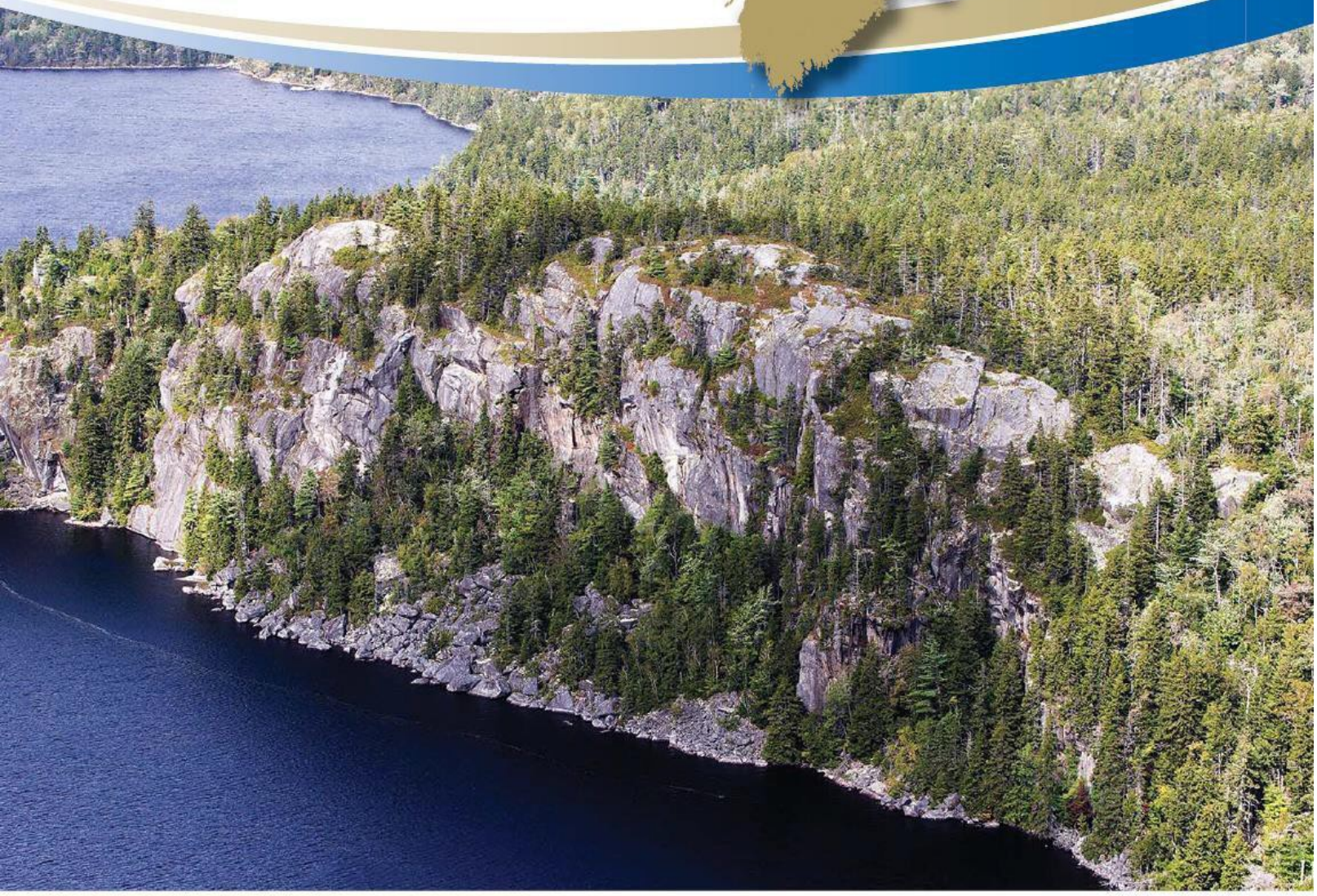
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS
EASTERN GRANITE UPLANDS ECODISTRICT 430

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-430

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 430: Eastern Granite Uplands

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

ISBN 978-1-55457-585-5

This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Eastern Granite Uplands 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 (1992 to 1994) – 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 2015-430

Table of Contents – Part 3

Tables

Appendices

Theme Maps Available on Website

Part 3: Landscape Analysis of Eastern Granite Uplands – *ForForest 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 EcologicalSystem

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

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

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

Elements Within Landscapes (Map 2)

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

Spruce Hemlock Pine Hummocks and Hills is the matrix element, representing 43% of the area in the ecodistrict. Most of the element occurs as large hilly areas with a forest of red spruce and white pine. Hemlock will be found on soils with higher moisture and nutrient content. Drier and less fertile soils are dominated by black spruce, white pine, red pine, red oak, and red maple.

Spruce Pine Hummocks and **Jack Pine Hummocks and Ridges** are the two largest patch elements, representing a combined 53% of the area. Black spruce, white pine, jack pine, and hybrid red and black spruce are the most common species. The other patch elements, in order of size, are **Tolerant Hardwood Drumlins and Hummocks**, **Spruce Pine Flats**, and **Wetlands**.

Valley Corridors, a linear element, consists of four prominent river and lake corridors.

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: moose, sea trout/salmon, trout, people, and eagles.

As an example of flow – element interactions, moose use the Tangier River and Tangier Grand Lake areas for habitat, travel, and cover. The forest communities along the corridors must be kept intact to maintain connectivity among the other element types. The matrix and patch elements along these corridors can be managed to provide the needed browse.

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.

An additional concern inherent in ecological planning is the maintenance of connectivity among conservation areas (including wilderness, old growth, provincial parks, and ecological reserves) that are often not ecologically related.

At the landscape scale of planning, connectivity among these areas is supported by the dominant forest structure. Connectivity will be sustained by applying the natural disturbance regime (NDR) guidelines for landscape composition (Table 7) and recognizing natural linkage opportunities.

Connective management strategies may include:

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

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

All of the landscape flows, moose, seatrout/salmon, trout, people, and eagles are identified with major linkages to adjacent areas or ecodistricts (Map 2).

The hydrological system provides the most obvious physical connection between the Eastern Granite Uplands and its surroundings. The major river corridors are Musquodoboit and the Tangier along with some of the large more prominent lakes, such as like Porters Lake, Lake Charlotte, and Lake Major that move from north to south. The dynamics of these water linkages have downstream effects which start at the small wetlands that capture, filter, and store water to their connections to the overall hydrological system.

Most of these river corridors and estuaries are important nesting areas for bald eagles, habitat for wood turtles, and anadromous fish such as the Atlantic salmon.

Deer and moose move in and out of the upland area, migrating in harsh winter conditions from the Eastern Interior Ecodistrict 440 and Mooseland area into the Taylor Bay Grand Lake area where there is generally reduced snow levels.

People provide linkages among the neighbouring ecodistricts of Eastern Interior, Central Lowlands 630, and Eastern Shore 820 through many activities, such as recreation, transportation, fishing, forest management, utilities, development, and settlements.

The major linkages are Highway 357 that runs between Elderbank and Musquodoboit Harbour, Mooseland Road, and Highway 7 that runs along the southern boundary, Lake Charlotte, Porters Lake and Lake Major.

Transportation and utility linkages from the Eastern Granite Uplands, Eastern Interior, and the Eastern Shore bring tourists to the many rivers, lakes and streams for sport fishing, coastal fishing, hunting, and transportation of goods and services between Sheet Harbour and the Halifax area.

The corridor systems follow the larger lakes and main river valleys and provide linkages to the Eastern Interior, Eastern Shore, and the Central Lowlands ecodistricts.

Future management activities should recognize significant links to neighbouring ecodistricts and manage these forests in the 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 – 23)
- mid (seral score 24 – 37)
- late (seral score 38 – 50)

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Eastern Granite Uplands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Jack Pine Hummocks and Ridges	OW1, OW2, SP1	6.0	SP4, SP6, SP7	31.0	**SP5**	60.0
Spruce Pine Flats	SP7	7.0	SP6, SP7	23.0	SP4, **SP5**	67.0
Spruce Pine Hummocks	SH9, SP1	4.0	SP6, SP7	40.0	SP4, **SP5**, SP7	52.0
Spruce Hemlock Pine Hummocks and Hills	MW4, MW5	7.0	SH5, SH6, SH8, SH9	35.0	MW1, MW2, MW3, SH1, SH2, **SH3, SH4**	50.0
Tolerant Hardwood Drumlins and Hummocks	IH6	35.0	IH7, TH7	25.0	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.

A summary of land use intensities provides an overall ecological emphasis index of 83 to 86 for the ecodistrict (Appendices 12a and 12b). This would suggest that overall intensity of land use for the Eastern Granite Upland Ecodistrict is currently at a relatively unchanged state and the majority of forest structure is still intact.

The 60,224 hectares contained within the Eastern Granite Uplands Ecodistrict are inherently capable of supporting approximately 45,900 hectares of forest, with remaining lands being non-forest ecosystems such as lakes, wetlands, and barrens.

About 51% of the lands inherently capable of supporting forests fall in the extensive ecological emphasis class. Lands in this category are managed for multiple values using ecosystem-based techniques that conserve biodiversity and encourage natural ecosystem conditions and processes.

Currently no lands fall in the intensive EEC, but if present these lands would be intensively managed to optimize resource production from sites maintained in a native state. Despite intensive practices these lands are an important component of landscape structure and composition. Management may eliminate or reduce the duration of some development processes, particularly mature old forest stages, and may result in non-natural succession, produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations or reduce structure and composition below ecologically desirable levels.

The remaining lands are split between the reserve class (44%) and the converted class (<1%). The reserve class is divided into two categories: legal reserves and policy reserves. Legal reserves are those areas that have legal status under the IUCN (International Union for the Conservation of Nature) codes of I, II, or III, such as wilderness areas, protected beaches, and designated provincial parks. Policy reserves are those areas set aside under various provincial policies, such as the Old Forest Policy.

Representation of reserve lands in Eastern Granite Uplands is high because of the large percentage (65%) of Crown land holdings.

Converted lands, representing less than 1% of the ecodistrict, are areas that have been altered by human settlement, farming, urban development, and transportation and utility corridors. Converted lands are predominately located around major river corridors, villages, and towns.

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.

Eastern Granite Uplands has an overall RI value of 4 (Appendix 7, Table 3). This average falls within the Remote range of 0 to 6 and can be described as very low. Seventy percent, or 42,440 hectares, of the ecodistrict has a Remote RI value (Appendix 7, Table 2). Twenty-seven percent of the ecodistrict area has road indices occurring in the Forest Resource and the Mixed Rural categories.

Roads can contribute to habitat fragmentation and environmental degradation. Opportunities for road and trail access improvements include:

- Conserving the relatively low road densities within the matrix (RI of 5) through strategic scheduling of new access and decommissioning where possible. Private woodland owners may be able to decommission select roads and share access.

- Scheduling access systems for regular maintenance or decommissioning, particularly where connectivity or additional reserves are to be established.
- Utilizing old abandoned trails or logging roads as recreational trails before additional trails are established.

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 Eastern Granite Uplands Ecodistrict, there were documented occurrences (under the NSESA) of the following number of formally listed species at risk: seven endangered, two threatened, and two vulnerable. One species (Atlantic salmon) has been designated by COSEWIC as endangered but has no formal listing under provincial or federal species at risk legislation.

In addition to the listed species, the national General Status process also identifies four orange-status species, five yellow-status species, and nine additional species (green-status or undetermined status) that have CDC ranks representing relative rarity for a total of 19 other species of conservation concern in this district.

Species at risk found within the Eastern Granite Uplands Ecodistrict include Atlantic salmon (Southern Uplands population); wood turtle and snapping turtle; boreal, blue, and graceful felt

lichens; moose; and five bird species (olive-sided flycatcher, Canada warbler, rusty blackbird, barn swallow, and chimney swift).

Other species of conservation concern known to the Eastern Granite Uplands Ecodistrict include triangle floater and Eastern lampmussel (mollusks), both found along the shores of the Musquodoboit River; hoary bat (mammal); southern twayblade and historical records of Greenland stitchwort, water beggarticks, saltmarsh starwort and wild celery (plants).

With the many lakes, loons are reasonably common as are breeding populations of waterfowl such as American black duck and to a lesser extent common mergansers *(Mergus merganser)*, ring necks, and wood ducks. Canada goose is becoming more common and can be readily found in the Musquodoboit River and associated wetlands. Eagles *(Haliaeetus leucocephalus)*, a species which prefers being close to water where fish are plentiful, are common and the ecodistrict provides suitable nesting and hunting habitat.

Old Forest

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

Old forest designated stands are well represented (41%) with the majority being found within three wilderness areas: Waverley-Salmon River Long Lake, White Lake, and Tangier Grand Lake.

Birds

As of 2013, there are known occurrences for five at-risk bird species in the ecodistrict. All are listed under the NSESA: Canada warbler, chimney swift, rusty blackbird, and barn swallow as endangered; and olive-sided flycatcher as threatened. Nationally, Canada warbler, chimney swift and olive-sided flycatcher are listed as threatened; rusty blackbird as special concern; and barn swallow has no federal listing status.

There has been a nationwide decline in aerial insectivores such as olive-sided flycatcher, chimney swift, and barn swallow due to declines in insect food species. Chimney swift and barn swallow are also threatened by the loss of human-made structures (old chimneys and barns, respectively, and declines in all five bird species' populations are thought to be attributed, in part, to habitat loss and land use practices, particularly on wintering grounds.

Fish

Two main watersheds, both draining to the Atlantic Ocean, make up the vast majority of the Eastern Granite Uplands Ecodistrict: the Musquodoboit and Tangier rivers watersheds. Atlantic salmon have historically used each of these watersheds for spawning and rearing, and continue to make some use of the habitat available in these river systems. COSEWIC has assigned

designatable units (DU) that refer to the populations of Atlantic salmon that should be assessed independently from one another. The DU that applies to the Atlantic salmon in the Eastern Granite Uplands Ecodistrict is called the Southern Uplands population, which is designated by COSEWIC as endangered but not listed under either the provincial or federal legislation.

Barriers to dispersal and acidification of many areas within these watersheds are thought to have drastically reduced the amount of freshwater habitat that may be used by Atlantic salmon for spawning and rearing, although it is low returns from the marine environment that continues to be considered the most important factor in the decline of Atlantic salmon.

The Musquodoboit and Tangier River watersheds are also known to support gaspereau, sea running trout, resident brook trout populations, lamprey, and American eel, all species that hold recreational fishing interest, making the lakes and watercourses of Eastern Granite Uplands Ecodistrict popular fishing destinations.

Lichens

Three 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. Graceful felt lichen is designated by COSEWIC as endangered and is listed as the same under the NSESA but not the SARA.

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. Areas meeting this description occur within the Eastern Granite Uplands Ecodistrict and occurrences of the species have been found in three concentrations near Bear and Jacket lakes on the edges of the Tangier Grand Lake Wilderness Area and near Webber Lake, west of Lake Charlotte.

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. There are three documented occurrences of blue felt lichen in the ecodistrict, located in the same general areas as the boreal felt lichen occurrences are found.

Graceful felt lichen is known to only five locations in Nova Scotia, two of which fall within the Eastern Granite Uplands Ecodistrict in the same general areas as the boreal and blue felt lichen occurrences are found.

For all three lichen species at risk known to the ecodistrict, surveys in other potential habitat areas may reveal additional occurrences.

All three 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 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 commonly associated with forested landscape habitats that have been altered or disturbed by an event such as fire, wind (e.g. blowdown), disease, or timber harvesting. The habitat requirements of moose are largely dependent on successional forest stages. Early succession hardwood trees and shrubs provide necessary browse vegetation while mature conifer cover is valuable for shelter, thermal cover, and protection in winter and summer. Natural disturbance to the moose habitat on the Crown land of the ecodistrict is only moderately supplemented with human-induced disturbance.

Since 2012, special management practices in support of moose have been made mandatory for forestry activities on Crown land in designated moose concentration areas. These practices aim to conserve thermal refugia, aquatic feeding sites, calving areas, and visible cover. The eastern portion of the Eastern Granite Uplands Ecodistrict falls within a designated moose concentration area, although the majority of locations that are known to provide high-quality habitat for moose in the ecodistrict are protected from forestry activities because of their wilderness area status.

Moose, historically common, are occasionally reported scattered throughout the ecodistrict but most commonly are found in small numbers within the Tangier Grand Lake Wilderness Area. Otherwise, the ecodistrict serves as habitat for moose dispersing among more significant concentration areas in the province

Reptiles

Two reptile species at risk are known to the Eastern Granite Uplands Ecodistrict: wood turtle and snapping turtle. Wood turtle is listed as threatened under both the federal SARA and the NSESA. Wood turtles are uncommon province-wide, with the majority of observations occurring in a few main concentration areas, none of which are located within the ecodistrict. One such concentration is associated with the Musquodoboit River system, which runs through the Eastern Granite Uplands Ecodistrict, although most wood turtle occurrences are observed much further inland in the Central Lowlands Ecodistrict.

Snapping turtle is listed as vulnerable under the NSESA and as special concern under the SARA. While snapping turtles remain fairly common in most watersheds in Nova Scotia, populations are

under increasing threats. Low recruitment of turtles to breed, high juvenile mortality, nest failures exacerbated by turtles nesting in highly disturbed environments (road edges, quarries), illegal harvest, and road mortality all are threats to the province's largest terrestrial/freshwater turtle.

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.

Five of the twelve ecosections – ICSM, WCDM, WFDM, WMKK, and WTLD – found in Eastern Granite Uplands each comprise less than 2% of the ecodistrict (Appendix 3, Table 2).

Conversion is extremely low within the ecodistrict. The WFDM ecosection, with a climax community of sugar maple, yellow birch, and beech, has the highest land use pressure both within the ecodistrict (3.5%) and the ecoregion (11.4%). Most of this conversion is a result of human settlement (housing/cottages).

Old growth stands have been identified on 13,864 hectares within wilderness areas and an additional 60 hectares outside the wilderness areas, or 43% of the Crown lands. All community types have adequate or more than adequate representation under the Old Forest Policy. However, the amount of productive land with sugar maple, yellow birch, and beech under the administration of the Crown is only 557 hectares, or 1.2% of the total productive land within the ecodistrict. Forty-seven hectares, or 8% of those lands, have been selected for representation.

Practices or policies that might be implemented or devised to address conservation issues include:

- Conservation of uncommon forest species for which genetic viability may be threatened as indicated by DNR's endangered species rating system.
- Identification of fine filter management opportunities related to conservation of significant habits.
- Identification of uncommon community conditions (e.g. old age, large live and dead trees, and species associations) and increase representivity in the uncommon old forest
- communities.
- Implementation of restorative measures in community types such as elm, sugar maple, and ash stands along river corridors or jack pine, black spruce, and white pine where conversion to other species or uses is high.

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

430 Eastern Granite Uplands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Spruce Hemlock Pine Hummocks and Hills (Matrix)	ICKK WCKK WMKK	Frequent	red Spruce (rS), white Pine (wP), eastern Hemlock (eH)
Spruce Pine Hummocks (Patch)	ICHO IMHO WCHO	Frequent	rS, black Spruce (bS), wP
Jack Pine Hummocks and Ridges (Patch)	ICRD WCRD	Frequent	bS, wP, jack Pine (jP), red Pine (rP)
Tolerant Hardwood Drumlins and Hummocks (Patch)	WCDM WFDM	Gap	sugar Maple (sM), red Maple (rM), yellow Birch (yB), Beech (Be)
Spruce Pine Flats (Patch)	ICSM	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.

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 and policy protected reserves. This included old forest designation under the policy reserves and also in wilderness areas and operational non designated parks and park reserves (Appendix 5).

Wilderness areas are the legal reserves accounting for 22,732 hectares. Old forest representation includes 13,947 hectares along with operational non designated parks and park reserves of 733 hectares, both under the policy reserve status (Appendix 5).

ELA Summary

Element Interpretation (All appendices andmaps)

Stretching in a narrow ridge 80 kilometres long by 8 to 10 kilometres wide, east of Waverley to Sheet Harbour, this ecodistrict lies north of the coastal Eastern Shore Ecodistrict 820. Rising sharply up to 100 metres above the adjacent coastal area, often with steep cliffs, this rocky ridge is dissected with narrow river gorges, the most notable being the Musquodoboit River. Also of note are long narrow lakes that dissect the ecodistrict, such as Lake Charlotte and Porters Lake. The total area of this ecodistrict is 602 square kilometres, or 9% of the ecoregion.

The granite that underlies this ecodistrict is similar to the granite of the South Mountain Ecodistrict 720 and other outcrops throughout the western and eastern ecoregions. Granite is resistant to erosion and most of the soils associated with this granite are coarse-textured and shallow. Many elements in this ecodistrict have exposed bedrock and are scattered with huge, sometimes house-size, granite boulders deposited by the glaciers. It is estimated that approximately 15% of the ecodistrict is exposed bedrock.

Few bogs and fens are found in this ecodistrict, but there are several notable wetlands bordering the Musquodoboit River. This ecodistrict also has one of the highest concentrations of freshwater lakes with 11% coverage.

The forests of this ecodistrict are predominantly softwood, with red spruce stands on the better-drained and deeper soils associated with hummocky terrain. Elsewhere, shallow soils give rise to forests of black spruce and white pine with scattered red pine indicating fire disturbances in the past. Jack pines are also found on the shallow soils of ridge tops.

Tolerant hardwoods will only be found on the few scattered drumlins. Stands of hemlock occur on the steep slopes of hills and hummocks alongside rivers and streams. The main natural disturbance regime for Eastern Granite Uplands is classified as frequent stand initiating due to wind storms and hurricanes or a soil moisture deficit during the summer months that creates conditions favourable for forest fires.

Spruce Hemlock Pine Hummocks and Hills

(Matrix) (ICKK, WCKK and WMKK ecosections) (22,985 ha)

Spruce Hemlock Pine Hummocks and Hills is a large matrix element, comprising 43% of the ecodistrict area, found in medium to large prominent areas throughout the ecodistrict. Compared to the inherent climax community, the current forest of red and black spruce, along with scattered white pine, is similar in structure and functions. There is a good mixture of seral stages and balanced development classes applicable for the disturbance regime.

The EEI is very high (80 to 84) because 55% of the forest is in the extensive category and 36% is in the reserve class with less than 1% of the forested lands converted to other uses (Appendix 12a).

Flows

Moose (habitat, food, water, shelter); sea trout/salmon (use feeder streams for feeding nurseries); trout (use feeder streams for feeding, egg laying); people (recreation, timber harvest, camps, settlement, Christmas trees); eagles (nesting and fishing).

Composition

Eastern Granite Uplands Ecodistrict 430 (based on statistics up to 2006)

Composition of Spruce Hemlock Pine Hummocks and Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	10%	14%	76% (55 Mat + 21 OF)	21%
Seral Stage	Early	Mid	Late	Unclassified
	7%	35%	50%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	68%	10%	18%	4%

Desired Condition

Late successional softwood stands and softwood-dominated mixedwoods with a variety of patch sizes and development classes applicable to the frequent natural disturbances.

Issues

- Only 7% of the forest is in early successional stage, so there is an opportunity to increase harvesting to increase the forested area within the early seral stages.
- With 35% of the forested lands in the mid-seral stage, there is an opportunity to thin and favour tolerant hardwoods for wildlife habitat and to increase diversity.
- Additional forest in early successional stage is needed.

Spruce Pine Hummocks
(Patch) (ICHO, IMHO and WCHO ecosections) (15,466 ha)

Spruce Pine Hummocks is the largest of the five patch elements, comprising 29% of the ecodistrict. The inherent climax community of red/black spruce and white pine is still intact.

There is more forest in late successional softwoods (52%) than in any other class, followed closely by mid-successional softwoods and hardwoods (40%) (Appendix 10).

There is a good mixture of small to large areas across the ecodistrict. Sixty-five percent of this patch element is located in the reserve class. The EEI is one of the highest of all patch elements at 87 to 89 (Appendix 12a).

Flows

Moose (general habitat east of Lake Charlotte); sea trout/salmon (small remnant population); trout (habitat); people (recreation, harvest, camps, settlements); eagles (fishing, nesting).

Composition

Eastern Granite Uplands Ecodistrict 430 (based on statistics up to 2006)
Composition of Spruce Pine Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	7%	21%	72% (41 Mat + 31 OF)	31%
Seral Stage	Early	Mid	Late	Unclassified
	4%	40%	52%	4%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	83%	3%	11%	3%

Desired Condition

A late successional softwood community of spruce and pine with a mixture of seral stages and development classes, appropriate for the frequent disturbance regime.

Issues

- Ninety-two percent of the forest is in the mid and late seral stages.
- Seventy-two percent of the forest is in the mature multi-aged development classes.
- Only 4% of the forest is in the early seral stage and 7% in the establishment development class.

Jack Pine Hummocks and Ridges
(Patch) (ICRD and WCRD ecosections) (12,762 ha)

Jack Pine Hummocks and Ridges is a large patch element almost entirely located in the western half of the ecodistrict, from the Logging Lake area to Soldier Lake. The inherent climax community is still intact with red spruce, black spruce, and scattered white pine. The drier shallow soils support the jack pine. The forest within this patch element is characterized as softwood-dominated (65%) with mature and multi-aged, late seral stage communities dominating.

Early seral species account for 6% of the forested area. The area within the establishment and young development classes account for 20%. Forty-eight percent of the Jack Pine Hummocks and Ridges is in the reserve class.

The EEI is high at 86 to 87 (Appendix 12a).

Flows

Sea trout/salmon (small remnant population); trout (habitat); people (recreation, harvest, rock climbing - Paces Lake).

Composition

Eastern Granite Uplands Ecodistrict 430 (based on statistics up to 2006)
Composition of Jack Pine Hummocks and Ridges

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	4%	16%	80% (53 Mat + 27 OF)	27%
Seral Stage	Early	Mid	Late	Unclassified
	6%	31%	60%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	65%	10%	24%	1%

Desired Condition

A red spruce-dominated community with inclusions of hardwoods and mixedwoods. Lesser amounts of black spruce and white pine along with jack pine on the dry, shallow soils. A good mixture of seral stages and development classes appropriate for the frequent disturbance regime.

Issues

- Only 4% of the forest is in the establishment development class.
- Eighty percent of the forest is in the mature and multi-aged development class.
- Early seral stage accounts for only 6% of the forested area.

Tolerant Hardwood Drumlins and Hummocks
(Patch) (WCDM and WFDM ecosections) (1,176 ha)

This is a small dissected and isolated patch type located in the Fraser Lakes and Mooseland Road area. The inherent climax community was approximately 90% hardwood, with sugar maple,

yellow birch, and beech dominating. The current forest is 39% hardwood, 15% mixedwood, and 35% softwood. The hardwood stands are now dominated as intolerant hardwood communities or intolerant hardwood mixedwood with red maple, white birch, and aspen dominating. The shift to more softwood communities is dominated with late seral red and black spruce. Late seral species account for only 28% of the total forested area.

Although the amount of forest within the mature and multi-aged development class exceeds 75%, the early and mid-seral stages dominate. In the gap disturbed areas the late seral, tolerant species should be the region forest community. The EEI is 70 to 75.

Flows

Trout (habitat); people (recreation, camps, harvesting).

Composition

Eastern Granite Uplands Ecodistrict 430 (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
	15%	6%	79% (69 Mat + 10 OF)	10%
Seral Stage	Early	Mid	Late	Unclassified
	35%	25%	28%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	35%	39%	15%	11%

Desired Condition

The desired condition of this small patch type is late seral hardwoods of sugar maple, yellow birch, and beech with inclusions of softwood stands of black spruce and white pine. Most of the forested area would be in the late seral stage appropriate for the gap disturbance.

Issues

- Early and mid-seral stages account for 60% of the forest in a gap-disturbed area.
- Tolerant hardwood component has decreased from almost 90% to 39%.
- Mature and multi-aged development classes are dominated with intolerant hardwood.
- Mature late seral stage forest accounts for less than 30%.

Spruce Pine Flats
(Patch) (ICSM ecosection) (518 ha)

Spruce Pine Flats is a small isolated and fragmented patch located in the Paces Lake and Flat Iron Lake area. The forest community still supports a late seral mature softwood community of red and black spruce.

This frequently disturbed area is only 60% forested but most of the forest community is located in the extensively managed category giving it an EEI of 73 to 75.

Flows

Sea trout/salmon (feeder stream nurseries); trout (feeder stream nurseries); people (recreation, harvesting, camps); eagles (fishing).

Composition

Eastern Granite Uplands Ecodistrict 430 (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
	4%	20%	76% (64 Mat + 12 OF)	12%
Seral Stage	Early	Mid	Late	Unclassified
	7%	23%	67%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	76%	6%	17%	1%

Desired Condition

A late seral softwood forest of black spruce and white pine with balanced development classes that are appropriate for the frequent disturbance regime.

Issues

- Early seral stage forest account for 7% of the ecodistrict.
- Seventy-six percent of the forest in the mature and multi-aged development classes.
- Early development class accounts for only 4% of forested lands.

Wetlands

(Patch) (WTLD ecosection) (397 ha)

Wetlands is the smallest of the patch element at 397 hectares. These wetlands are clumped in three general locations: Richardson Lake, Tangier Grand Lake and Myers Deadwater.

Most of these small wetlands are only partially forested and have imperfect to poorly drained soils and stunted spruce.

The majority of the wetlands have not been disturbed and therefore have a high EEI of 91 to 92.

Flows

Moose (temperature regulations); sea trout/salmon (habitat in streams); trout (habitat in streams); people (recreation, trapping, hunting).

Composition

Eastern Granite Uplands Ecodistrict 430 (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
	4%	14%	82% (49 Mat + 33 OF)	33%
Seral Stage	Early	Mid	Late	Unclassified
	9%	40%	48%	3%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	67%	10%	23%	0%

Desired Condition

Although these wetlands do not account for a large percentage of the present forest, they are extremely important. The desired condition is to maintain these wetlands and wetland complexes connected in chains and interconnected to the hydrological systems.

Issues

- Maintaining the present wetlands in their present state.
- Conservation of rare ecosection (WTLD) with less than 2% of the total area of the ecodistrict.

Valley Corridors

(Corridor) (Various ecosections) (224 ha)

This element consists of four prominent river and lake corridors which are dominated by late seral softwoods of red/black spruce and white pine.

The corridors have an increased component of intolerant hardwoods in the early and mid-seral stages.

For the most part, the structure of these corridor systems is still intact, and with less than 8% conversion they have a relatively high EEI of 72 to 74.

Flows

Moose (present habitat on the Tangier); sea trout/salmon (landlocked salmon in the Lake Charlotte and minor remnant populations in Lake Major); trout (present in all corridors but the Musquodoboit and Tangier rivers are the major locations for trout); people (drinking water in Lake Major; Musquodoboit-recreation, timber, harvest, settlement, Christmas trees, transportation, fishing, and historic travel; Tangier/Porters/Lake Charlotte are important for recreation, settlement, and historic travel); eagles (all corridors are important for fishing, travel, and nesting).

Composition

Eastern Granite Uplands Ecodistrict 430 (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
	9%	8%	83% (55 Mat + 28 OF)	28%
Seral Stage	Early	Mid	Late	Unclassified
	7%	30%	55%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	52%	12%	35%	1%

Desired Condition

The desired condition is well-connected slopes and intervales in a natural forest condition.

Issues

- Amount of forested area in the mature and multi-aged development classes (83%).

Ecosystem Issues and Opportunities (All appendicesand maps)

Management of the forest resource in the Eastern Granite Uplands 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:

- Eastern Granite Uplands is located in a very rural area that is heavily forested and has a low intensity of land use as indicated by the Ecological Emphasis Index of 83 to 86, an average of less than 1% conversion, and an average Road Index of 4.
- Early successional forest accounts for less than 7% of the ecodistrict.
- Mid-seral forests exceed 35%, which indicates an opportunity to thin some of these areas to favour late seral species for wildlife habitat and increase species diversity.
- Wetlands account for less than 1% of the ecodistrict.
- High percentage of the forest is in the multi-aged and mature development classes.
- Tolerant hardwood component in the Tolerant Hardwood Drumlins and Hummocks element has decreased to 39% from the inherent climax community of 90% hardwood.
- Establishment development class is slightly low (< 10%) for the ecodistrict and most of its elements. The mature and multi-aged development classes are relatively high (> 70%) considering this ecodistrict has a frequent stand-initiating disturbance regime.

Appendix 1: Flow - Element Interactions

Elements	Moose	Sea Trout/Salmon	Trout	People	Eagles
Matrix Spruce Hemlock Pine Hummocks and Hills	Habitat, food, water, shelter	Uses feeder streams for feeding, nurseries	Uses feeder streams for feeding, egg-laying	Recreation, timber harvest, camps, settlement, Christmas trees.	Nesting and fishing
Valley Corridors Musquodoboit River	No	Yes - major corridor plus feeder streams	major corridor	Recreation, timber harvest, camps, settlement, Christmas trees. - transportation, fishing, and historic travel.	Fishing, travel corridor
Tangier	Present	Yes	Yes - major	Recreation and historic travel	Nesting and fishing
Porters Lake	No	Very little	Yes	Yes - settlement and travel	Nesting, fishing, and travel
Lake Charlotte	No	Yes - landlocked salmon	Yes	Yes - high use settlement, travel	Nesting, fishing, and travel
Lake Major	No	Remnants	Yes	Drinking water reservoir	Yes - nesting and fishing
Patches Spruce Pine Hummocks	General habitat - east of Lake Charlotte	Remnants	Yes	Recreation, harvest, camps settlement	Fishing, nesting
Jack Pine Hummocks and Ridges		Remnants	Yes	Recreation, harvest, rock climbing at Paces Lake	No
Tolerant Hardwood Drumlins and Hummocks	No	No	Yes	Recreation - camps harvesting	No
Spruce Pine Flats	No	Feeder stream Nurseries	Feeder Streams Nurseries	Recreation - camps harvesting	Fishing
Wetlands	Temperature regulations	Important part - Filtering habitat in streams	Important part - Filtering habitat in streams	Recreation trapping, hunting	No

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Spruce Hemlock Pine Hummocks and Hills	Matrix	High	- Waverley-Salmon River Long Lake Wilderness Area - Musquodoboit River - Lake Charlotte - Tangier Grand Lake Wilderness Area - Moose River	Very large prominent softwood matrix over the entire ecodistrict	Frequent (Fire)	Mature late seral softwood of rS, bS, wP with scattered early, mid and late seral mature hardwoods	Predominately rS, bS, wP, jP in the late seral mature development class	Fragmentation - harvesting connectivity in localized areas; east and northwest of Musquodoboit River	Fairly high percentage of mid-seral softwood and mixedwood stands - intact corridors (positive) - maybe major barrier between rivers (Musquodoboit) and major lakes - Porters, Lake Charlotte.	Promote large patch structure - focus management activities on mid-seral to promote more late seral mixedwood stands - maintain and improve connectivity.
Spruce Pine Hummocks	Patch	High	- Tangier Grand Lake Wilderness Area - Trout Lake	Small, medium and large patches	Frequent	Late seral rS, bS, wP in the mature and multi-aged development class	Mature late seral softwood of rS, bS, wP with scattered early, mid and late seral mature hardwoods	Fragmentation in localized areas; Trout Lake, Moose Lake areas.	High percentage of mid-seral in the mature and multi-aged development class	Restore patch structure with early thinnings to promote interior conditions

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Drumlins and Hummocks	Patch	Medium	- Fraser Lakes - Mooseland Road	Very small localized linear hills	Gap	Even distribution of all seral stages with mature class dominating. rS, bS, wP, sM, yB. Intolerant hardwood of wB, rM, gB, bF prominent in early and mid-seral stages	rS, bS, wP mature late seral softwoods	Conversion harvesting	High percentage of early and mid-seral - low percentage of climax hardwoods	Restore patch to climax species of sM, yB.
Jack Pine Hummocks and Ridges	Patch	High	- Waverley-Salmon River Long Lake Wilderness Area - Moose Lake - Logging Lake	Very large patches localized in western half of the ecodistrict	Frequent	rS, bS, wP late seral mature and multi-aged softwood	Mature late seral softwood of rS, bS, wP with scattered early, mid and late seral mature hardwoods	Fragmentation in local areas - Logging Lake	High percentage of mid-seral mixedwood	Maintain and promote large patch structure - Focus management activities on both mid and late seral structures.

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Spruce Pine Flats	Patch	Low-Medium	- Paces Lake - Flat Iron Lake	Small isolated fragmented patches	Frequent	Mature/multi-age late seral bS, rS, wP	Mature late seral softwood of rS, bS, wP with scattered Early, mid and late seral mature hardwoods	Fragmentation - small scale	Small patch structure	Maintain mixture of seral stages and development classes for the disturbance regime.
Wetlands	Patch	High	- Richardson Lake - Tangier Grand Lake - Myers Deadwater	Very small isolated patches	Open Seral	bS	rS, bS, wP	- Small scale - Connectivity	Conversion	Educate public on importance of these wetlands
Valley Corridors	Corridor	High	- Musquodoboit River - Tangier River - Porters Lake - Lake Charlotte - Lake Major	A series of large rivers and lakes that dissect the ecodistrict into a number of large patches.	Frequent	rS, bS, wP in the late seral stages.	rS, bS, wP	increased conversion	Some localized non-continuous forest cover	Maintain continuity

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 430)

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
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
FISH				
American Eel	*Anguilla rostrata*	N/A	N/A	Threatened
Atlantic Salmon (Southern Upland population)	*Salmo salar (Southern Upland pop.)*	N/A	N/A	Endangered
LICHENS				
Blue Felt Lichen	*Degelia plumbea*	Vulnerable	Special Concern	Special Concern
Graceful Felt Lichen	*Eriodermamollissimum*	Endangered	N/A	Endangered
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 430)

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
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
DICOTS			
Water Beggarticks	*Megalodonta beckii*	Sensitive (Yellow)	S3
Greenland Stitchwort	*Minuartiagroenlandica*	Sensitive (Yellow)	S2
Saltmarsh Starwort	*Stellaria humifusa*	Sensitive (Yellow)	S2
FERNS AND THEIR ALLIES			
Southern Bog Clubmoss	*Lycopodiella appressa*	Secure (Green)	S3S4
INSECTS			
Lance-Tipped Darner	*Aeshna constricta*	Secure (Green)	S3
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
MAMMALS			
Hoary Bat	*Lasiurus cinereus*	May Be At Risk (Orange)	S1
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			
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined	S2
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Hop Sedge	*Carex lupulina*	Secure (Green)	S3
Southern Twayblade	*Listera australis*	May Be At Risk (Orange)	S2
Wild Celery	*Vallisneria americana*	May Be At Risk (Orange)	S2

*Atlantic Canada Conservation Data Centre S-Ranks, where S1: extremely rare; S2: rare; S3: uncommon; S4: usually widespread, fairly common; S5: widespread, abundant; S#S#: A range between two consecutive ranks for a species/community denotes uncertainty about the exact rarity (e.g. S1S2); Consult http://www.accdc.com/en/ranks.html for descriptions of other ranks. Provincial General Status Ranks as assessed in 2010 (http://www.wildspecies.ca/wildspecies2010).

Appendix 3: Special Occurrences (Ecodistrict 430)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Birds of Prey: Bald Eagle, Northern Goshawk, Osprey, Owls, Hawks	Species; Habitat	NS Significant Species and Habitats	NS Wildlife Act; Canadian Migratory Bird Convention Act
Freshwater Lakes	Ecosystem	Provincial Database	NS Environment Act; Fisheries Act
Gibraltor Rock	Ecosystem	NS Significant Species and Habitats	
Large River Systems: Musquodoboit River, Tangier River, Chezzetcook River, Salmon/Partridge Rivers, Porters Lake	Ecosystems	Provincial Database	NS Environment Act; Fisheries Act
Provincial Park Reserves: Paces Lake Provincial Park, Lake Charlotte Provincial Park	Candidates for future recreational areas	Provincial Database	NS Environment Act, Protected Areas
Plants: Creeping Sandwort, Flatstem Pondweed,Grass-leaved Goldenrod, Mountain Sandwort	Species	Atlantic Canada Conservation Data Centre	
Recreational Fish Species: Alewife (Gaspereau), Rainbow Smelt, Brook Trout, Sea Trout, White Perch, Rainbow Smelt	Species	NS Significant Species and Habitats	Fisheries Act; Maritime Provinces Fishery Regulations
White-tailed Deer	Species	NS Significant Species and Habitats	NS Wildlife Act
Wetlands	Ecosystems	Provincial Database	NS Environment Act
Wilderness Areas: Waverly-Salmon River Long Lake Wilderness Area, Tangier Grand Lake Wilderness Area	Ecosystems	Provincial Database	NS Environment Act, Protected Areas

Appendix 3: Special Occurrences (Ecodistrict 430)
Table 1d – Heritage Features

Feature	Type	Information Source
Historic Mine Paces Lake	Heritage	NSDNR Database
Historic trail (Ship Harbour/Lake Charlotte)	Heritage	Local Knowledge
Musquodoboit River Historical Canoe Route	Heritage	Canoe NS
Rock Climbing	Heritage	Local Knowledge
Old Mining Sites	Heritage	NSDNR Database

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type* (1, 2, 3)		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3)*		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS wP	9,785	16.2	6,223	10.3	89 to 90	0.1	22,923	3.6	18,110	2.8	76 to 80	2.4
ICKK	rS	6,764	11.2	23,295	38.7	71 to 79	0.3	6,764	1.1	56,711	8.8	71 to 79	0.3
ICRD	rS	4,261	7.1	23,295	38.7	82 to 84	0.2	4,261	0.7	56,711	8.8	82 to 84	0.2
ICSM	bS wP	517	0.9	6,223	10.3	74 to 75	1.3	1,276	0.2	18,110	2.8	64 to 72	3.3
IMHO	bS wP	1,806	3.0	6,223	10.3	72 to 76	0.0	133,869	20.8	18,110	2.8	63 to 73	3.2
WCDM	sM yB Be	704	1.2	1,057	1.8	68 to 75	0.0	704	0.1	89,022	13.9	68 to 75	0.0
WCHO	rS	3,926	6.5	23,295	38.7	89 to 90	0.0	8,109	1.3	56,711	8.8	72 to 76	7.3
WCKK	rS	15,991	26.6	23,295	38.7	84 to 86	0.8	33,442	5.2	56,711	8.8	73 to 80	0.8
WCRD	rS	8,503	14.1	23,295	38.7	88 to 89	0.1	8,503	1.3	56,711	8.8	88 to 89	0.1
WFDM	sM yB Be	471	0.8	1,057	1.8	72 to 76	3.5	29,685	4.6	89,022	13.9	60 to 69	11.4
WMKK	rS	372	0.6	23,295	38.7	88 to 89	0.5	125,446	19.5	56,711	8.8	59 to 69	7.5
WTLD	wetlands	431	0.7	0	0.0	92	0.0	18,686	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)
WCKK	rS	15,991	62.6	7,037	0	202	0	7,240	45.3	0	0.0	7,240	45.3
ICHO	bS wP	9,785	82.2	5,909	0	114	0	6,022	61.5	0	0.0	6,022	61.5
WCRD	rS	8,503	85.4	4,401	0	279	0	4,680	55.0	0	0.0	4,680	55.0
ICKK	rS	6,764	66.0	978	0	61	0	1,039	15.4	0	0.0	1,039	15.4
XXWA	NONE	6,692	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICRD	rS	4,261	76.5	1,457	0	56	0	1,513	35.5	0	0.0	1,513	35.5
WCHO	rS	3,926	93.2	2,353	0	0	0	2,353	59.9	0	0.0	2,353	59.9
IMHO	bS wP	1,806	44.1	72	0	0	0	72	4.0	0	0.0	72	4.0
WCDM	sM yB Be	704	61.8	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	bS wP	517	49.6	0	0	26	0	26	5.0	0	0.0	26	5.0
WFDM	sM yB Be	471	55.3	64	0	0	0	64	13.6	0	0.0	64	13.6
WTLD	wetlands	431	84.2	246	0	54	0	301	69.7	0	0.0	301	69.7
WMKK	rS	372	66.4	216	0	0	0	216	57.9	0	0.0	216	57.9
Total		**60,223**		**22,733**	**0**	**792**	**0**	**23,526**		**0**		**23,526**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act - Designation	Area by Ownership		Policy - Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	22,732	0	Old Forest	13,947	0
			Operational Non Designated Parks and Reserves	733	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 indexvalue.

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	191
Utility corridors	3	8
Gravel Roads and active railways	6	87
Paved streets and roads collectors	10	25
Highways	15	0

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	42,440	70
Forest Resource	7 to 15	11,729	19
Mixed Rural	16 to 24	4,814	8
Agriculture Suburban	25 to 39	1,194	2
Urban	40 to 100	37	0.1
Total		**60,214**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	223	34
Spruce Pine Hummocks	15,465	3
Tolerant Hardwood Drumlins and Hummocks	1,175	7
Jack Pine Hummocks and Ridges	12,762	1
Spruce Pine Flats	518	3
Spruce Hemlock Pine Hummocks and Hills	22,979	5
Wetlands	396	4
Total	**53,522**	**4**

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

Appendix 8: Development Classes and Seral Stages

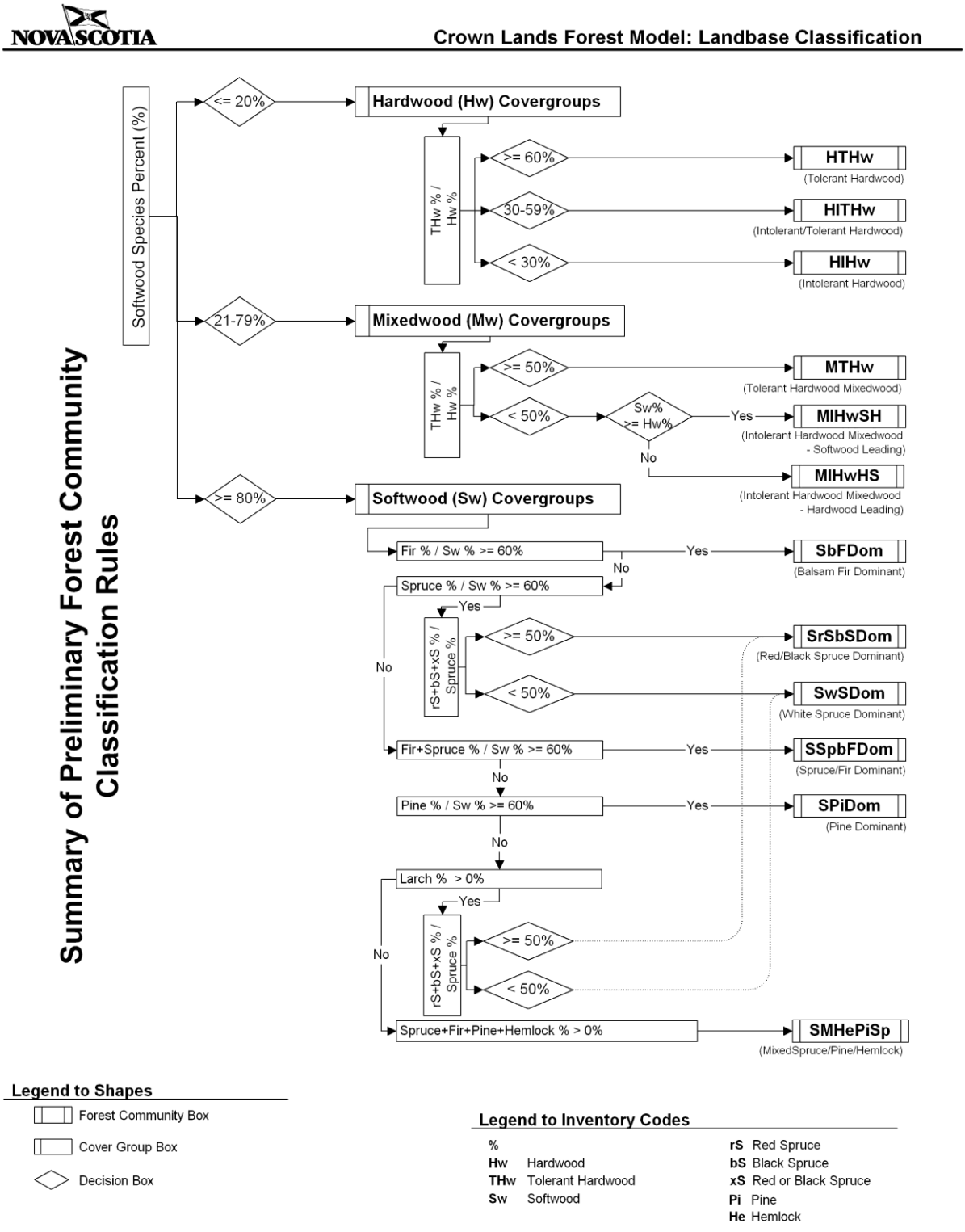
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade intolerant "pioneer" species • peak seed production by forbs and shrubs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

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

Species		Ecodistrict																																								
Code	Name	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	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	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	3	2	2	2	2	2	2	2	2
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	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	3	2	3	3	2	2	2	2	2
RO	oak	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	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	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 (Eastern Granite Uplands 430)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Hummocks	ICHO (63.0%) WCHO (25.0%) IMHO (11.0%)	Softwood	bS wP rS rSwP	Frequent	13,878; 89.7	Early	12	143	52	83	290	10,568; 82.6	EARLY	533; 4.2
						Mid	87	1,073	880	1,841	3,881			
						Late	141	1,223	3,243	1,650	6,257			
						Uncl	140	0	0	0	140			
		Mixedwood	N/A			Early	11	41	9	1	63	1,469; 11.5	MID	5,125; 40.2
						Mid	42	130	579	331	1,082			
						Late	21	18	166	66	271			
						Uncl	53	0	0	0	53			
		Hardwood				Early	5	47	120	3	174	398; 3.1	LATE	6,580; 51.4
						Mid	7	22	123	9	161			
						Late	1	16	34	0	52			
						Uncl	12	0	0	0	12			
		Unclassified				Early	0	1	5	0	7	356; 2.8	UNCL	554; 4.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	349	0	0	0	349			
Total					**15,466***	**# ha**	**881**	**2,715**	**5,210**	**3,985**	**12,791**			
						%	**7.0%**	**21.0%**	**41.0%**	**31.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

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	WCKK (40.0%) ICKK (21.6%) WTLD (15.9%) ICHO (11.8%) IMHO (9.1%) ICRD (<1.0%)	Softwood	rS bS rS wP	Frequent	184; 82.4	Early	0	0	0	0	0	84; 52.2	EARLY	11; 6.9
						Mid	0	4	2	3	9			
						Late	1	4	40	29	73			
						Uncl	1	0	0	0	1			
		Mixedwood				Early	0	0	0	1	1	57; 35.3	MID	48; 29.9
						Mid	0	0	23	9	32			
						Late	0	0	10	3	13			
						Uncl	10	0	0	0	10			
		Hardwood				Early	0	1	9	0	10	19; 11.6	LATE	88; 55.2
						Mid	0	3	3	0	6			
						Late	0	0	2	0	2			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	1; 0.9	UNCL	13; 8.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
Total					**224***	**# ha**	**14**	**13**	**88**	**46**	**160**			
						%	**9.0%**	**8.0%**	**55.0%**	**28.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Jack Pine Hummocks and Ridges	WCRD (67.0%) ICRD (33.0%)	Softwood	rS bS bS wP	Frequent	8,508; 67.0	Early	12	39	16	0	67	7,066; 65.0	EARLY	633; 6.0
						Mid	16	289	271	466	1044			
						Late	20	919	3394	1572	5905			
						Uncl	50	0	0	0	50			
		Mixedwood				Early	4	34	26	20	84	2,556; 24.0	MID	3,370; 31.0
						Mid	35	274	1045	540	1893			
						Late	0	33	185	251	470			
						Uncl	109	0	0	0	109			
		Hardwood				Early	5	100	370	8	482	1,029; 10.0	LATE	6,426; 60.0
						Mid	0	23	410	0	433			
						Late	0	11	40	0	51			
						Uncl	63	0	0	0	63			
		Unclassified				Early	0	0	0	0	0	84; 1.0	UNCL	306; 3.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	84	0	0	0	84			
Total					**12,762***	**# ha**	**399**	**1,722**	**5,757**	**2,857**	**10,736**			
						%	**4.0%**	**16.0%**	**53.0%**	**27.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

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 Hemlock Pine Hummocks and Hills	WCKK (69.0%) ICKK (29.0%) WMKK (2.0%)	Softwood	rS bS bS wP	Frequent	20,275; 88.0	Early	21	167	203	71	462	13,951; 68.3	EARLY	1,413; 7.0
						Mid	64	854	1,632	1,021	3,571			
						Late	58	1,084	5,907	2,255	9,303			
						Uncl	614	0	0	0	614			
		Mixedwood				Early	79	94	65	17	256	3,663; 17.9	MID	6,992; 35.0
						Mid	76	340	1,482	567	2,465			
						Late	95	37	333	214	679			
						Uncl	263	0	0	0	263			
		Hardwood	sM yB Be	Gap	3; <1.0	Early	19	188	423	15	644	1,950; 9.5	LATE	10,298; 50.0
						Mid	13	88	806	50	957			
						Late	1	15	295	4	316			
						Uncl	33	0	0	0	33			
		Unclassified				Early	2	7	43	0	51	851; 4.2	UNCL	1,710; 8.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	799	0	0	0	799			
Total					**22,985***	**# ha**	**2,137**	**2,875**	**11,188**	**4,215**	**20,414**			
						%	**10.0%**	**14.0%**	**55.0%**	**21.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

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	WCDM (59.0%) WFDM (41.0%)	Softwood	bS wP rS bS	Frequent	123; 10.0	Early	0	0	17	8	25	364; 35.0	EARLY	363; 35.0
						Mid	2	3	30	40	75			
						Late	0	30	174	46	250			
						Uncl	14	0	0	0	14			
		Mixedwood				Early	6	14	32	0	51	154; 15.0	MID	250; 25.0
						Mid	0	4	78	4	86			
						Late	0	4	12	1	17			
						Uncl	0	0	0	0	0			
		Hardwood	sM yB Be	Gap	1,048; 89.0	Early	17	8	258	4	287	404; 39.0	LATE	295; 28.0
						Mid	3	0	86	0	90			
						Late	0	0	28	0	28			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	113; 11.0	UNCL	128; 12.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	113	0	0	0	113			
Total					**1,176***	**# ha**	**155**	**62**	**716**	**102**	**1,035**			
						%	**15.0%**	**6.0%**	**69.0%**	**10.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats	ICSM (99.0%)	Softwood	bS wP rS bS	Frequent	310; 60.0	Early	4	6	0	3	14	360; 76.0	EARLY	34; 7.0
						Mid	0	19	6	14	39			
						Late	0	49	214	33	296			
						Uncl	12	0	0	0	12			
		Mixedwood				Early	0	2	0	0	2	83; 17.0	MID	108; 23.0
						Mid	0	6	43	8	56			
						Late	0	5	15	0	20			
						Uncl	4	0	0	0	4			
		Hardwood				Early	0	5	10	0	15	28; 6.0	LATE	316; 67.0
						Mid	0	0	13	0	13			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	4	0	4	4; 1.0	UNCL	16; 3.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**518***	**# ha**	**20**	**93**	**304**	**58**	**474**			
						%	**4.0%**	**20.0%**	**64.0%**	**12.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Eastern Granite Uplands 430)

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 (98.0%)	Softwood	bS rS rS wP	Open Seral	200; 50.0	Early	0	5	4	0	9	152; 66.5	EARLY	20; 9.0
						Mid	0	7	26	10	43			
						Late	0	9	48	38	95			
						Uncl	5	0	0	0	5			
		Mixedwood				Early	2	1	1	0	4	53; 23.4	MID	92; 40.0
						Mid	0	3	16	16	35			
						Late	0	0	5	9	14			
						Uncl	1	0	0	0	1			
		Hardwood				Early	1	2	4	0	7	23; 10.1	LATE	110; 48.0
						Mid	0	4	7	4	15			
						Late	1	0	0	0	1			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.0	UNCL	6; 3.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**397***	**# ha**	**10**	**32**	**111**	**76**	**228**			
						%	**4.0%**	**14.0%**	**49.0%**	**33.0%**	**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 Eastern Granite Uplands 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 Hummocks	ICHO WCHO IMHO	Frequent	bS wP rS wP rS	S	SrSbSDom	7,023	56.5%	L	**Well-drained**: Early VT: rM wB Mid VT: bF bS rS Late VT: bS rS wp eH yB **Moist to Wet**: All VT: Edaphic climax communities of bS bFrM wP
				S	SSpbFDom	2,560	20.6%	M	
				S	SbFDom	451	3.6%	E	
				S	SMHePiSp	414	3.3%	L	
				S	SPiDom	120	1.0%	L	
				M	MIHwSH	1,076	8.7%	E/M	
				M	MIHwHS	298	2.4%	E/M	
				M	MTHw	95	0.8%	L	
				H	HIHw	293	2.4%	E/M	
				H	HTHw	60	0.5%	L	
				H	HITHw	45	0.4%	E/M	
Total						**12,436**	**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 Eastern Granite Uplands 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	WCKK ICKK WTLD ICHO IMHO ICRD	Frequent	rS bS rS wP	S	SrSbSDom	81	51.5%	L	**Well-drained:** All VT: all
				S	SSpbFDom	2	1.1%	M	
				M	MIHwSH	39	24.8%	E/M	
				M	MIHwHS	11	7.2%	E/M	
				M	MTHw	6	4.1%	L	
				H	HIHw	15	9.7%	E/M	
				H	HTHw	2	1.6%	L	
Total						**157**	**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 Eastern Granite Uplands 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
Jack Pine Hummocks and Ridges	WCRD ICRD	Frequent	rS bS bS wP	S	SrSbSDom	6,071	57.0%	L	**Dry:** All VT -Exposed rockland and woodlands of jP rP wP bS rM rO **Well-drained:** Early VT: rM wB Mid VT: bF bS rS Late VT: bS rS wP
				S	SSpbFDom	563	5.3%	M	
				S	SMHePiSp	221	2.1%	L	
				S	SPiDom	120	1.1%	L	
				S	SbFDom	91	0.9%	E	
				M	MIHwSH	1,748	16.4%	E/M	
				M	MIHwHS	702	6.6%	E/M	
				M	MTHw	105	1.0%	L	
				H	HIHw	899	8.4%	E/M	
				H	HITHw	79	0.7%	E/M	
				H	HTHw	51	0.5%	L	
Total						**10,651**	**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 Eastern Granite Uplands 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 Hemlock Pine Hummocks and Hills	WCKK ICKK WMKK	Frequent	rS bS bS wP	S	SrSbSDom	10,796	55.2%	L	**Well-drained**: Early VT: rM wB Mid VT: bF bS rS Late VT:bS rS wP eH yB **Moist**: Early VT: rM bF Mid VT: bF bS Late VT: bS wP
				S	SSpbFDom	2,006	10.3%	M	
				S	SbFDom	668	3.4%	E	
				S	SMHePiSp	341	1.7%	L	
				S	SPiDom	140	0.7%	L	
				M	MIHwSH	2,359	12.1%	E/M	
				M	MIHwHS	1,057	5.4%	E/M	
				M	MTHw	248	1.3%	L	
				H	HIHw	1,228	6.3%	E/M	
				H	HITHw	396	2.0%	E/M	
				H	HTHw	326	1.7%	L	
Total						**19,564**	**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 Eastern Granite Uplands 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	WCDM WFDM	Gap	bS wP rS bS	S	SrSbSDom	294	31.8%	L	**Well-drained**: Early VT -rM wB Mid VT: rM yB Late VT:rM sM yB (Be) **Moist**: Early VT -rM wB bF Mid VT: bF rS wP yB Late VT:rS eH wPyB
				S	SSpbFDom	37	4.1%	M	
				S	SbFDom	29	3.2%	E	
				S	SMHePiSp	2	0.3%	L	
				S	SPiDom	1	0.1%	L	
				M	MIHwSH	84	9.2%	E/M	
				M	MIHwHS	62	6.7%	E/M	
				M	MTHw	8	0.8%	L	
				H	HIHw	358	38.8%	E/M	
				H	HTHw	28	3.0%	L	
				H	HITHw	18	1.9%	E/M	
Total						**922**	**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 Eastern Granite Uplands 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	Frequent	bS wP rS bS	S	SrSbSDom	303	64.4%	L	**Moist to Wet:** Edaphic climax communities of bS bFtl rM
				S	SSpbFDom	24	5.2%	M	
				S	SMHePiSp	15	3.1%	L	
				S	SbFDom	14	2.9%	E	
				S	SPiDom	4	0.9%	L	
				M	MIHwSH	53	11.3%	E/M	
				M	MIHwHS	25	5.2%	E/M	
				M	MTHw	5	1.1%	L	
				H	HIHw	25	5.4%	E/M	
				H	HITHw	2	0.5%	E/M	
Total						**471**	**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 Eastern Granite Uplands 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 rS rS wP	S	SrSbSDom	104	45.7%	L	**Wet:** Wetland and Edaphic climax communities of bS bF tl rM
				S	SSpbFDom	35	15.5%	M	
				S	SbFDom	9	3.9%	E	
				S	SMHePiSp	4	1.6%	L	
				M	MIHwSH	36	15.7%	E/M	
				M	MIHwHS	10	4.5%	E/M	
				M	MTHw	8	3.4%	L	
				H	HIHw	22	9.8%	E/M	
Total						**227**	**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
Red Spruce	23,295	38.7%	56,711	8.8%
Rockland	8,685	14.4%	8,685	1.4%
Black Spruce	8,208	13.6%	222,732	34.7%
Black Spruce-White Pine	6,223	10.3%	18,109	2.8%
Red Spruce -White Pine	5,796	9.6%	52,293	8.1%
Sugar Maple-Yellow Birch-Beech	1,057	1.8%	89,021	13.9%
Total	**53,264**	**88.4%***	**447,551**	**69.7%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

Ecological Emphasis Class	Conservation Factor	Description
Reserve	**1**	• Reserved lands which meet biodiversity conservation goals through preservation of natural conditions and processes. Resource management activities are not usually permitted except where required to perpetuate desired natural conditions. This class is assigned based on the types of laws and policies governing the management (for example: Wilderness, Parks, Conservation Easement, Old 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

	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Spruce Hemlock Pine Hummocks and Hills	22,970	8,474	12,632	0	138	1,726	18,379 to 19,243	80 to 84
Spruce Pine Hummocks	15,453	8,443	6,451	0	10	549	13,419 to 13,693	87 to 89
Jack Pine Hummocks and Ridges	12,754	6,193	6,333	0	14	214	10,996 to 11,103	86 to 87
Tolerant Hardwood Drumlins and Hummocks	1,175	65	964	0	17	129	820 to 885	70 to 75
Spruce Pine Flats	517	26	466	0	7	19	380 to 390	73 to 75
Wetlands	396	269	121	0	0	6	362 to 365	91 to 92
Valley Corridors	222	44	150	0	16	12	160 to 166	72 to 74
Total	**53,487**	**23,514**	**27,117**	**0**	**201**	**2,656**	**44,516 to 45,844**	**83 to 86**

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	9,784	6,022	3,448	0	9	305	8,684 to 8,837	89 to 90
ICKK	6,764	1,039	4,683	0	22	1,021	4,806 to 5,316	71 to 79
ICRD	4,260	1,513	2,610	0	10	128	3,502 to 3,566	82 to 84
ICSM	517	26	465	0	7	19	380 to 389	73 to 75
IMHO	1,806	72	1,584	0	1	149	1,297 to 1,372	72 to 76
WCDM	704	0	609	0	0	95	480 to 528	68 to 75
WCHO	3,925	2,353	1,466	0	1	106	3,479 to 3,532	89 to 90
WCKK	15,991	7,240	7,923	0	129	699	13,357 to 13,706	84 to 86
WCRD	8,503	4,680	3,731	0	5	86	7,500 to 7,543	88 to 89
WFDM	471	64	355	0	17	35	339 to 357	72 to 76
WMKK	372	216	145	0	2	10	327 to 332	88 to 89
WTLD	431	301	125	0	0	6	396 to 398	92
Total	**53,529**	**23,525**	**27,144**	**0**	**201**	**2,659**	**44,547 to 45,877**	**83 to 86**

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

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

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

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

Literature Referenced

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

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

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

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

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

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

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

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

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

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

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

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

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

Nova Scotia Department of Natural Resources. 2006. Guidelines for the development of

long range management frameworks. Nova Scotia Department of Natural Resources, Regional Services, Halifax. 33 pp.

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

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

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

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

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

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

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