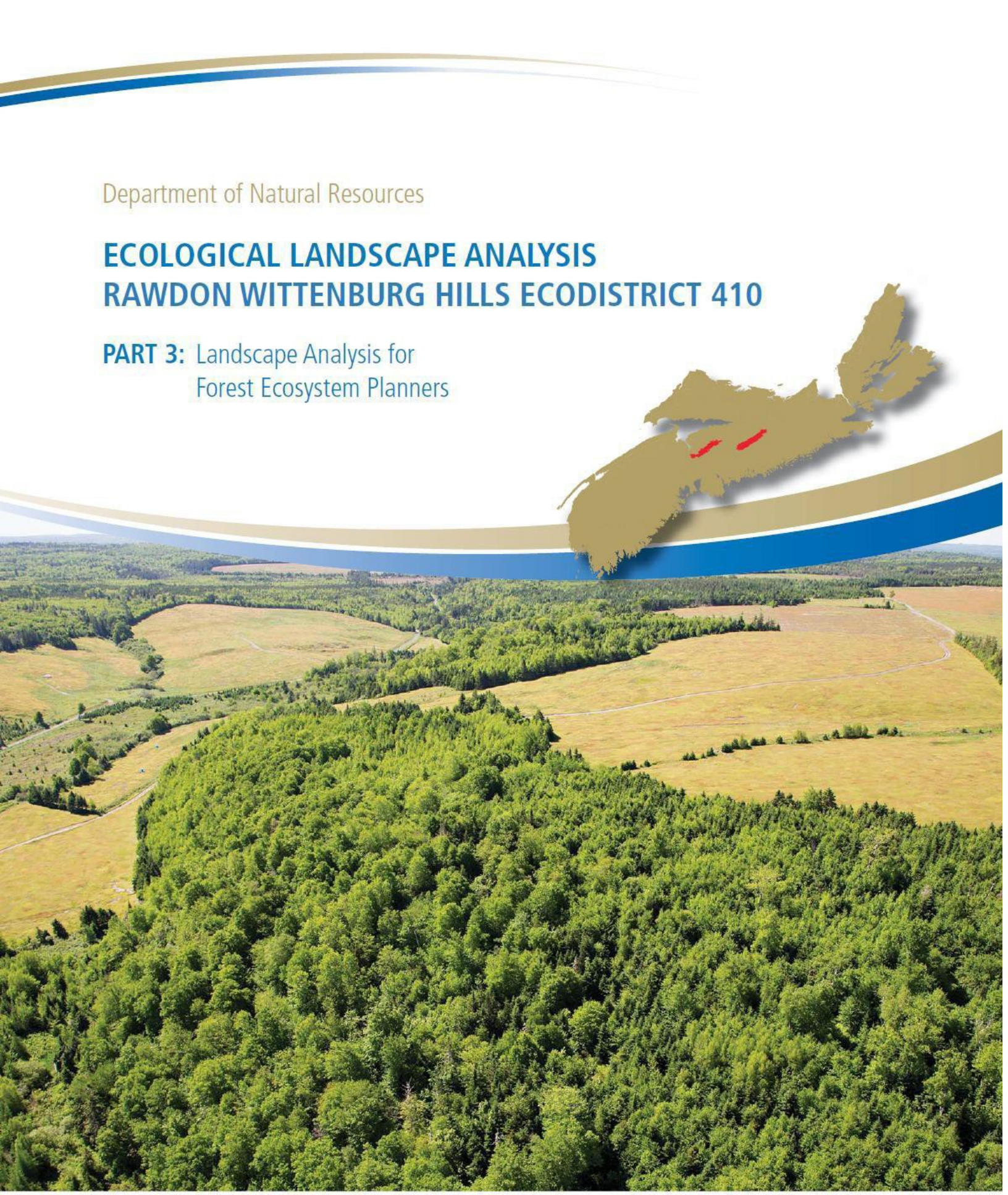
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS RAWDON WITTENBURG HILLS ECODISTRICT 410

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-410

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 410: Rawdon Wittenburg Hills

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos, and resources of the Rawdon Wittenburg Hills 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.

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Part 3: Landscape Analysis of Rawdon Wittenburg Hills – *For Forest Ecosystem Planners*

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

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

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Understanding the Landscape as an Ecological System

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

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

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

Elements Within Landscapes (Map 2)

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

Tolerant Hardwood Hills is the matrix element, representing 70% of the area of the ecodistrict. The crests and upper slopes of the element support a forest of sugar maple and yellow birch with some beech and white ash. Lower slopes support a mixedwood forest of red spruce, hemlock, and yellow birch.

Tolerant Mixedwood Hummocks, the largest patch element, supports a climax forest of red spruce and includes a variety of hardwood species. Much of the element has been converted to other uses and abandoned farmland has been reforested to white spruce or white pine or been cultivated into wild blueberry fields. The other patch elements, in order of size, are **Tolerant Mixedwood Slopes**, **Wetlands**, and **Floodplain**.

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

Flow – Element Interactions (Appendix 1; Map 2)

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

The most important flow areas are the transportation and utility corridors and the major rivers and streams.

As an example of the interactions, deer use the large red spruce areas for habitat, cover, and travel. This softwood covertype has been altered by human intervention (settlement, agriculture, and harvesting) and is now changed to an early and mid-seral mixedwood and softwood-dominated forest. One objective would be to reduce the early and mid-seral species to favour red and black spruce, hemlock, white pine, and any tolerant hardwoods by employing forest management strategies that include pre-commercial and commercial thinning and the creation of larger stand sizes. This will also increase browse for deer and moose.

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

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

River corridors promote connectivity.

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.

The Rawdon Wittenburg Hills Ecodistrict is currently dominated by a changed structure within some of the elements that does not represent the inherent natural conditions that once characterized these areas. Human land use, transportation systems, harvesting, and utility corridors have fragmented some of the element types, reducing the connective function of the corridors for some species and possibly increasing the barrier effect of the corridors for species that must move across the ecodistrict.

An additional concern, inherent in ecological planning, is the maintenance of connectivity among conservation areas (including wilderness areas, old growth, provincial parks, and ecological reserves), which 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.

Mitigating the potentially negative barrier effects of concentrated land use in the valley corridors by sustaining and restoring natural communities in key areas could be helped by the following:

- Enhancing connectivity among conservation areas by applying appropriate medium and high biodiversity emphasis standards when managing areas with natural linkage potential.
- Improving ecoregional connectivity by sustaining and restoring natural conditions at important linkage points among ecodistricts.

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

Most of the landscape flows with major linkages to adjacent areas or ecodistricts are identified in Map 2.

The hydrological system provides the most obvious physical connection between Rawdon Wittenburg Hills and surrounding areas. The major river corridors are the St. Croix, Meander, and Herbert. All these river systems are important deer wintering habitat and important streams for smelts, salmon, and sea trout. There are also numerous smaller first to third order streams linked to these larger systems that are important as nursery sites for various fish species. Some of these systems contain rare plants or plants that are of concern, such as the yellow Canada lily or yellow nodding ladies' tresses.

Deer flow in and out of the ecodistrict, migrating in winter from the hills to the lower elevations where there is sufficient softwood cover. An example is the Stewiacke and Otter Brook area, which is one of the largest deer wintering areas locally.

People provide linkages among neighbouring ecodistricts of the Central Lowlands 630, Central Uplands 380, Eastern Interior 420, Governor Lake 440, St. Margarets Bay 780, and South Mountain 720 through their many activities of transportation, recreation, fishing, utilities, development, and settlement.

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Rawdon Wittenburg Hills

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Tolerant Hardwood Hills	OF1, OF2, OF3, OF4, IH3, IH4, IH5, IH6	26.0	IH7, TH7,TH8	30.0	**TH1, TH2,** TH3, TH4	22.0
Tolerant Mixedwood Hummocks	OF1, OF2, OF3, OF4, IH3, IH4, IH5, IH6, MW5	26.0	IH7, MW4, SH5, SH6, SH7, SH8, SH9, SH10, SP4, SP6, SP7	29.0	**MW1, MW2, MW3,** SH1, **SH3,** SP5	19.0
Tolerant Mixedwood Slopes	IH4, IH6, MW5	14.0	IH7, MW4, SH5	22.0	MW1, MW2, **MW3, SH1, SH2,** SH3, SH4	37.0
Floodplain	FP6	43.0	FP3	22.0	**FP1**	20.0
Wetlands	WC1, WC2, WC5, WC6, WC7, WC8, 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) (http://www.gov.ns.ca/natr/wildlife/habitats/protection)
- Converted, lands altered for agriculture, roads, or other human activities

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

The Rawdon Wittenburg Hills Ecodistrict has an EEI range of 53 to 64 (Appendices 12a and 12b). This would suggest that overall intensity of land use for the ecodistrict is currently at a somewhat changed state affecting both the structure and function to support some habitat and for biodiversity conservation.

The 61,222 hectares contained within the Rawdon Wittenburg Hills Ecodistrict are inherently capable of supporting approximately 52,383 hectares of forest, with remaining lands being non-forest ecosystems such as lakes, wetlands, and barrens.

A GIS-based classification of current land use employing the four ecosystem emphasis classes, indicates that 62% of the land area falls within the extensive ecological emphasis class (Map 3). Lands in this category are managed for multiple values using ecosystem-based techniques that conserve biodiversity and encourage natural ecosystem conditions and processes.

An additional 3% of these lands fall in the intensive EEC and are intensively managed 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, 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.

The remaining lands are split between the reserve class (<1%), converted class (12%), and unclassified lands (22%).

The reserve class is divided into two categories: legal reserves and policy reserves. Legal reserves are 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 set aside areas under various provincial policies such, as the Old Forests Policy. Representation within the Rawdon Wittenburg Hills Ecodistrict is relatively low because of the low percentage of Crown land holdings.

Converted lands are areas that have been altered by human settlement, farming, urban development, and transportation and utility corridors. These converted lands are predominately located around the major river corridors, villages, and towns. These lands are given a zero EEI in their present state but some locations, especially along the river

corridors, show opportunity for restorative measures to the predicted climax stands of red spruce, hemlock, sugar maple, white pine, and yellow birch.

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.

Currently, Rawdon Wittenburg Hills has an overall RI value of 11 (Appendix 7, Table 3). This average falls within the Forest Resource RI range of 7 to 15 and may be described as moderately low. Only 3 percent of the ecodistrict has a Remote RI of 0 to 6 (Appendix 7, Table 2). Seventy-six percent of the ecodistrict area has road indices occurring in the Forest Resource and the Mixed Rural categories.

The highest road densities occur around the settlements and main transportation systems often found in the Valley Corridors element. An RI of 33 in this element places them in the Agriculture Suburban category (Appendix 7, Tables 2 and 3 and Map 5). These high RI values are found in numerous areas of the ecodistrict because of the number of river corridors and human settlement contributing to habitat fragmentation.

Opportunities for road and trail access because of the low percentage of Crown lands will rely on private owners and could include:

- Conserving the relatively low road densities within the matrix through strategic scheduling of new access and decommissioning where possible. Private woodland owners may be able to decommission select roads and share access.
- Accessing systems must be scheduled for regular maintenance or decommissioning particularly where connectivity or additional reserves are to be established.
- Promoting recreational trail use that utilizes old abandoned trails or logging roads before additional trails are established.
- Seeking to improve the distribution and connectivity between the few low road density areas where this may improve connectivity among natural areas and linkages to neighbouring ecodistricts (Map 5).

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

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

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

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

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

The primary species data used in this report are from the Atlantic Canada Conservation Data Centre and DNR's Significant Habitat Database. Efforts are made to ensure data are as accurate and up-to-date as possible. Lists and maps indicate what is currently known. Due diligence tied to planning, management, and stewardship may require that surveys be carried out to update information or to fill gaps in our knowledge. Priority species may require special actions in terms

of forest management and other activities that alter habitat and the landscape. If more information is required or if management specific to a priority species need to be developed, a regional biologist, Wildlife Division staff, or other species experts should be contacted.

This section includes species at risk (refer to Table 1a, Appendix 3), species of conservation concern (Table 1b, Appendix 3), other conservation features (Table 1c, Appendix 3), and heritage features (Table 1d, Appendix 3, where available). *The list of species at risk and species of conservation concern 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 (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 Rawdon Wittenburg Hills Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species: four endangered, three threatened, and two vulnerable. In addition to the listed species, the National General Status process also identifies 10 orange-listed species, 22 yellow-listed species, 21 green-listed species, and three undetermined species for a total of 56 other species of conservation concern in this ecodistrict.

Designated species at risk found within the Rawdon Wittenburg Hills Ecodistrict include wood turtle, little brown myotis, ram's-head lady's-slipper, monarch butterfly, black ash, pygmy pocket moss, and several bird species (common nighthawk, eastern wood-pewee, bobolink, barn swallow, wood thrush, Canada warbler).

Other species of conservation concern in this ecodistrict include four-toed salamander (amphibians); turkey vulture, killdeer, and cliff swallow (birds); Wulf's peat moss (bryophytes); blue cohosh, eastern leatherwood, and bog willow (dicots); northern maidenhair fern and Appalachian polypody (ferns and their allies); ocellated darner and mustard white (insects); triangle floater (mollusks); and yellow lady's-slipper (monocots).

Birds

As of 2013, six species of birds found to be present in the ecodistrict are designated at risk. Five of these are listed under the NSESA: barn swallow and Canada warbler as endangered; common nighthawk as threatened; bobolink and eastern wood-pewee as vulnerable. Nationally, two species are listed under SARA: common nighthawk and Canada warbler as threatened. COSEWIC has designated five species – common nighthawk, bobolink, barn swallow, wood thrush, and Canada warbler – as threatened and the eastern wood-pewee as special concern.

Generally there has been a nationwide decline in aerial insectivores, which is commonly attributed to a decline in flying insects. The population decline is likely influenced by multiple causes, such as habitat loss, change across the landscape, and a decline in insects.

The common nighthawk prefers open habitats such as beaches, dunes, grasslands, barrens, pastures, recently cleared lands, and flat graveled rooftops in urban areas. The decline in the common nighthawk population is likely attributed to habitat loss and modifications along with reduced availability of flying insects.

Eastern wood-pewee can be found in deciduous forests typically along the edges and clearings with closed canopy and open understory conditions. This species has declined over the past few decades and almost exclusively feeds on flying insects. The decline in population is most likely attributed to a combination of loss of habitat in the wintering range, current forestry practices, and climate change.

The bobolink is associated with large open grasslands and hayfields. Declines are due to mortality from agricultural practices, habitat loss and fragmentation, and bird control methods.

Barn swallows have declined across North America since the 1980s. They nest at artificial sites

such as barns, under bridges, culverts near farmlands, marshes, lakes, and rural areas. The loss of important artificial nesting substrates and changes to farming practices may have an impact on population declines.

The wood thrush prefers mature deciduous or mixed forest habitats and feeds primarily on insects and fruit. Population declines are associated with habitat loss on its wintering grounds and habitat fragmentation on its breeding grounds.

The Canada warbler has shown significant declines over the past few decades. Warblers can be found occupying a variety of different habitat types, but prefer mixed forests with dense undergrowth. Population declines are not well understood but habitat loss in the wintering range is most likely a significant influence.

Bryophytes

Pygmy pocket moss is designated by COSEWIC as special concern but has no provincial or federal listing. In the Rawdon Wittenburg Hills Ecodistrict, there is only one documented occurrence – on the northern boundary of the ecodistrict. Pygmy pocket moss has a limited documented population in Canada, with the majority occurring in Ontario. It is typically found in woodlands, primarily on disturbed clay soils.

Dicots

In 2013, black ash was listed under the NSESA as threatened. There are an estimated 1,000 individuals and only 12 mature trees in the province. There are two occurrences of black ash on the northern boundary of this ecodistrict, which may overlap with the Central Lowlands Ecodistrict.

Insects

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

Monarch habitat in Nova Scotia includes fields, meadow, abandoned farmland, and along roadsides that have a presence of milkweed. Monarchs will only lay their eggs on the leaves of milkweed, which is the primary food for the developing caterpillars. Monarch butterflies may occasionally be observed in the Rawdon Wittenburg Hills Ecodistrict.

Mammals

In 2013, the little brown myotis, along with two other bat species, were listed under the NSESA as endangered. The population level of these species has experienced an alarming decline due to a disease known as white-nose syndrome caused by the fungus *Pseudogymnoascus destructans.* This disease has killed nearly seven million bats in eastern North America in the past eight years and estimates of a 90% decline in Nova Scotia over three years. Currently, there is no known cure for

the disease and it affects all bats that hibernate in caves and abandoned mines during the winter. There are documented bat hibernation sites in the Rawdon Wittenburg Hills Ecodistrict, often associated with old mine workings and cave environments with past species records.

Monocots

The ram's-head lady's-slipper is listed as endangered under the provincial NSESA and has no designation or listing under COSEWIC or SARA. It is a small, herbaceous, perennial orchid found in open forest with cool soils and a neutral pH. In Nova Scotia, the ram's-head lady's-slipper has only been found in Hants and Cumberland counties and is associated with gypsum bedrock and sinkholes. Threats to this species include loss and destruction of habitat due to gypsum mining, forestry, agriculture, and development. Competition with exotic species, off-highway vehicle (OHV) disturbance, and collection by humans are also potential threats. Currently there are few documented occurrences of this species in the Rawdon Wittenburg Hills Ecodistrict.

Reptiles

Wood turtle is designated by COSEWIC as threatened and listed under the federal SARA and provincial NSESA as the same. Wood turtle occurrences in this ecodistrict include the Herbert and Musquodoboit river systems.

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. (http://novascotia.ca/natr/library/forestry/reports/Old-Forest-Policy-2012.pdf).*

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.

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

410 Rawdon Wittenburg Hills Ecodistrict

Landscape Element and Type	Ecosections*	Dominant Natural Disturbance Regime	Dominant Climax Type
Tolerant Hardwood Hills (Matrix)	IFKK WMKK WFKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Tolerant Mixedwood Hummocks (Patch)	IFHO IMHO WCHO WMHO	Infrequent	red Spruce (rS), eastern Hemlock (eH), white Pine (wP), sM , yB
Tolerant Mixedwood Slopes (Patch)	WCDS WMDS	Gap	sM, yB, Be, rS, eH, wP
Wetlands (Patch)	ICSM PMHO	Open Seral (Frequent)	black Spruce (bS), tamarack (tL) red Maple (rM)
Floodplain (Patch)	IMSM	Infrequent	American Elm (aE), sM, white Ash (wA)
Valley Corridors (Corridor)	Various	Various	Various

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

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

Eight of the 12 ecosections found in the ecodistrict – ICSM, IFHO, IMSM, PMHO, WCDS, WCHO, WFKK, WMDS – each comprise less than 2% of the ecodistrict (Map 7).

Three of the smaller ecosections – IMSM, WCHO, and WFKK – have very high land use pressures, with 44%, 42%, and 43%, respectively, converted to human settlement, farming, and other development activities. These same ecosections also form less than 2% in the ecoregion, but land use pressures are substantially less, with 8%, 7%, and 16%, respectively converted. Noecosection is more than 44% converted.

Five of the seven forest communities have adequate representation (>8%) and two communities – red spruce-white pine along with red spruce – have less than the required 8% under the Old Growth Policy. There is not enough Crown land ownership to achieve the required 8% representation for these two community types.

Opportunities for future management and implementation of existing policies to develop additional, effective practices to address fine filter conservation issues include:

- Identifying uncommon forest species for which genetic viability may be threatened as indicated by DNR's Endangered Species Rating System.
- Using fine filter management opportunities related to conservation of significant habitats.
- Identifying uncommon community conditions (e.g. old age, large live, and dead trees and species' associations) and increasing representivity in uncommon old forest communities.
- Implementing restorative measures in community types such as sugar maple, yellow birch, and beech found in the Tolerant Hardwood Hills element or the red spruce, hemlock, white pine, sugar maple, yellow birch located on the flats.

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 in the ecodistrict where only policy protected reserves are in place. There are no legally protected reserves in this ecodistrict. An old forest area of 214.8 hectares was identified as the policy reserve (Appendix 5).

Since provincial Crown lands only represent 3% of the ecodistrict, opportunities to improve representation will have to be directed to private lands in the form of programs by the Eastern Habitat Joint Venture group, Nature Conservancy of Canada, and Nova Scotia Nature Trust.

Priority sites and strategies to improve representation could include:

- Conservation of uncommon or rare climax community types – such as red spruce-hemlock-white pine-sugar maple-yellow birch and beech – which represent less than 2% in the ecodistrict and less than 8% in the ecoregion and are under heavy land use pressures.
- Conservation of additional old forest area in the red spruce community and the red spruce-white pine community.
- Improving connectivity among wetlands and river corridors.

ELA Summary

Element Interpretation (All appendices and maps)

In the Rawdon Wittenburg Hills Ecodistrict, two narrow hill complexes underlain by slate bedrock and trending southwest to northeast rise notably above the surrounding lowlands of the Stewiacke, Musquodoboit, and Kennetcook rivers in central Nova Scotia. With elevations of 180 to 210 metres, the hills of Rawdon and Wittenburg are significant landscape features.

Climatically, temperatures are cooler, especially in winter, and considerably moister than the adjacent lowlands. The total area of this ecodistrict is 612 square kilometres, or about 10% of the Eastern Ecoregion.

The deeply dissected hills comprise folded Meguma Group slate. Even small streams along their margins occupy deep indentations. Sandy clay loams and clay loams occur on the side slopes of these ridges. On top of the hills, well-drained soils of sandy loams and loams derived from slates and siltstones (shales) will be found.

The north-facing slopes of the Wittenburg area supply the headwater streams for the St. Andrews River and the South Branch Stewiacke River. Streams departing the south-facing slopes feed into the Musquodoboit River. The north-facing slopes of the Rawdon Hills provide the headwater streams for the Herbert and Meander rivers and contribute to the Kennetcook River. The Nine Mile River comes off the south-facing slopes and feeds into the Shubenacadie River.

Where these rivers and larger streams leave the hills and enter the lowlands, extensive floodplains have formed and are now often used for farming. A few smaller floodplains occur in the hills and have natural forests, often with the potential for rare or endangered plants.

Fresh water accounts for 0.5%, or 303 hectares, of the ecodistrict.

Red spruce forests are common, occurring predominantly on the hummocky terrain on top of the hills. Where soils are wetter, black spruce is dominant. Tolerant hardwood forests with sugar maple tend to the upper slopes where there are well-drained nutrient rich soils. On the middle and lower slopes where soils are enhanced with moisture and nutrients, tolerant mixedwood forests of yellow birch and red spruce are prominent.

Most of this ecodistrict is influenced by gap and infrequent disturbance regimes and have developed forest communities typical of the Acadian Forest.

Tolerant Hardwood Hills
(Matrix) (IFKK, WFKK and WMKK ecosections) (42,991 ha)

This matrix element represents 70% of the ecodistrict area and has a uniform distribution over the ecodistrict. Almost half of the element has an inherent climax community of sugar maple, yellow birch, and beech located on the well-drained upper slopes.

The mixedwood community of red spruce, hemlock, white pine, sugar maple, yellow birch, and beech is found on the moist middle and lower slopes.

These inherent communities have undergone substantial change and the once dominant tolerant hardwoods have been reduced to less than 20% of the element with the early and mid-seral intolerant hardwoods of red maple and birch currently dominating.

Flows

People (timber, agriculture – blueberries, hunting, trapping, tower sites); deer (general habitat); owls (nesting, feeding); bats (general habitat, hibernation sites – karst topography).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (based on statistics up to 2006)

Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	12%	56% (41 Mat + 15 OF)	15%
Seral Stage	Early	Mid	Late	Unclassified
	26%	30%	22%	22%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	40%	20%	33%	7%

Desired Condition

The desired condition is a hardwood covertype of sugar maple, yellow birch, and beech on the well-drained upper slopes and a mixedwood covertype of red spruce, hemlock, sugar maple, yellow birch, and beach on the moist flats and lower elevations.

Issues

- less than 1% of the element in the reserve class
- 14% of the element converted to other uses
- 56% of the community type in the early or mid-seral stages
- 56% of the current forest is in the mature and multi-aged development classes (gap disturbance)
- 22% of the forest unclassified
- minor Crown ownership
- heavily harvested
- sufficient old growth representation to meet the 8% old growth policy has been identified
- only 184 hectares of the 42,991 hectares has been set aside under the reserve class

Tolerant Mixedwood Hummocks

(Patch) (IFHO, IMHO, WCHO and WMHO ecosections) (15,749 ha)

This is the largest of the patch elements, comprising 26% of the total area of the ecodistrict. There are many small, medium, and large areas making up this element, the larger patches around Wittenburg Mountain and Millen Mountain.

The inherent climax community has been altered by human settlement, agriculture, transportation systems, utility corridors, and harvesting. The current forest predominantly comprises early (26%) and mid-seral (29%) balsam fir, red maple, grey birch, white birch, aspen, and white spruce. The late seral stage is under 20% of the present forest. Twenty-six percent of the area is unclassified by seral stage, probably as a result of the high percentage of harvesting that has occurred within this element type. Red and black spruce dominate the softwood species but there is an increased presence of intolerant hardwoods.

Only 42% of the forest is in the mature and multi-aged development class.

Flows

People (highway 101, railway, hunting, trapping); deer (general habitat and wintering); owls (nesting/feeding).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (based on statistics up to 2006)

Composition of Tolerant Mixedwood Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	40%	18%	42% (29 Mat + 13 OF)	13%
Seral Stage	Early	Mid	Late	Unclassified
	26%	29%	19%	26%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	53%	11%	26%	10%

Desired Condition

A mixedwood covertype with late seral red spruce, eastern hemlock, pine, sugar maple, yellow birch, and beech with at least 60% of the forest communities in the mature development class.

Issues

- very high percentage of the forest in the early and mid-seral stage
- 29% of the forest in the mature development class (unbalanced development class for the disturbance regime).
- 26% of the forest is unclassified
- increased harvesting

- Crown ownership less than 5%
- less than 1% of the area within this element is identified for legal or policy reserve

Tolerant Mixedwood Slopes
(Patch) (WCDS and WMDS ecosections) (653 ha)

This is a small patch element comprising some 653 hectares. Five small fragmented areas located in the western section of the ecodistrict make up the Tolerant Mixedwood Slopes element. These fragmented areas are mostly steep slopes that follow some of the major brooks and rivers: Meander River at Ardoise and Ashdale, Herbert River at Greenhill, and Glen Brook at West Gore. The current forest community has undergone some changes over time toward more softwood covertypes (34%) and what was once 100% mixedwood is now only 42% mixedwood.

Sixty-four percent of the forest is in the mature and multi-aged development class. Approximately 32% of the forest community is in the establishment development class, somewhat higher than recommended 0 to 15% for the gap disturbance regime. The intolerant hardwoods of aspen, birch, and red maple dominate many areas within this element.

Flows

People (road corridor, upper slopes); deer (general habitat and wintering); owls (nesting/feeding); bats (south of Woodville – habitat).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Slopes

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	4%	64% (50 Mat + 14 OF)	14%
Seral Stage	Early	Mid	Late	Unclassified
	14%	22%	37%	27%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	34%	18%	42%	6%

Desired Condition

A mixture of late seral tolerant spruce, pine, maple, birch, and beech with at least 60% of the forest in the mature development class.

Issues

- 27% of the forest unclassified by seral stage
- 37% of the forest in the late seral stage
- no Crown ownership within Tolerant Mixedwood Slopes
- 32% of the forest in the establishment development class

- fairly high percentage of intolerant hardwoods
- no legal or policy reserves identified for this element

Wetlands
(Patch) (ICSM and PMHO ecosections) (200 ha)

A relatively small patch type made up of two smaller areas at Cooks Brook and Cox Brook. These wetlands are generally hummocky to smooth, partially treed with stunted black spruce, fir, larch, and poor quality intolerant hardwoods.

These wetlands are still fairly well intact, with minimal conversion and a relatively high EEI range of 71 to 75.

Flows

People (fishing); deer (general habitat and wintering); owls (nesting/feeding).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (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
	17%	47%	36% (17 Mat + 19 OF)	19%
Seral Stage	Early	Mid	Late	Unclassified
	28%	41%	20%	11%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	78%	11%	11%	0%

Desired Condition

All wetlands and/or wetland complexes connected and interconnected to the hydrological system.

Issues

- ownership (Crown does not currently have any ownership of these wetlands)
- maintain these important wetlands without any conversions or impediments to functionality
- educate public and increase awareness on the importance to these wetlands
- no areas have been identified for representation within this element type

Floodplain

(Patch) (IMSM ecosection) (98 ha)

A very small, isolated, single patch type located along Newton Brook in the Dean area. Most of the species associated with the inherent climax community are still present in the current forest but changes have occurred over time.

The covertype is now 38% softwood, 53% mixedwood, and 8% hardwood. The seral stage is 65% early and mid-seral with the intolerant hardwoods of aspen, grey birch, white birch, and red maple dominating.

Approximately 30% of this element has been converted to other uses, such as human settlement, transportation systems, utility corridors, and agriculture.

Flows

People (transportation systems, utility corridors, fishing, hunting, trappings); deer (general habitat, wintering); owls (nesting/feeding).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (based on statistics up to 2006)

Composition of Floodplain

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	30%	12%	58% (38 Mat + 20 OF)	20%
Seral Stage	Early	Mid	Late	Unclassified
	43%	22%	20%	15%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	8%	53%	1%

Desired Condition

A hardwood and mixedwood community of spruce, hemlock, pine, sugar maple, and yellow birch with a mixture of seral stages and development classes appropriate for the disturbance regime.

Issues

- small isolated patch
- conversion to other uses
- 65% of the forest in the early and mid-seral stage
- low EEI of 44 to 49
- high Road Index of 31
- no representation identified within Floodplain element

Valley Corridors

(Corridor) (Various ecosections) (1,426 ha)

The Valley Corridors are the main river corridors that dissect the ecodistrict in three locations (Newton Mills, Greenhill area, and Newport Station). These corridors generally contain late seral mixedwoods of spruce, hemlock, white pine, sugar maple, and yellow birch. These areas are infrequent to gap disturbed.

The development classes are fairly well balanced with 61% of the forest in the mature and multi-aged class.

Some of the lower reaches of some of these rivers and streams have been significantly altered (e.g. Newton Brook) by human settlement, agriculture, roads, and other linear features (Appendix 12a). Almost 21% of the area within these corridors has been converted to other uses. Less than 1% of the total area is identified as reserves.

Flows

People (hydro, fishing, recreation, paddling); deer (general habitat and wintering); wood turtle (presence and habitat on the Meander and Hebert rivers); migratory fish (salmon, smelts, sea trout); owls (nesting and feeding).

Composition

Rawdon Wittenburg Hills Ecodistrict 410 (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
	24%	15%	61% (41 Mat + 20 OF)	20%
Seral Stage	Early	Mid	Late	Unclassified
	25%	34%	21%	20%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	51%	14%	31%	4%

Desired Condition

A series of connected slopes and intervales in a natural forest condition that also act as flows and/or linkages between other elements and ecodistricts.

Issues

- 21% of the element has been converted

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Rawdon Wittenburg Hills 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:

- Rawdon Wittenburg Hills is located in a relatively rural area that is heavily forested but it has a high intensity of land use as indicated by the ecological emphasis index of 53 to 64, an average of 12% conversion, and an average RI value of 11.
- Early and mid-seral species comprise as much as 65% of the forested area of some of the element types (Appendix 10).
- Unclassified lands account for 22% of the total area of the ecodistrict (Appendix 12a).
- Conversion exceeds 44% for the IMSM ecosection (Appendix 3, Table 2).
- Less than 3% of the area is under administration and control of the Crown.
- The ecodistrict has poor connectivity among the few wetlands.
- Gap and infrequent stand-initiating disturbance dominate with only 20% of the area in the late seral stage.
- Hardwood stands are being converted to softwoods.
- EEI ranges in the ecodistrict go from 41 to 75.
- Thirty-three percent of the Floodplain patch element has been converted to other uses.
- Over 20% of the Valley Corridors element has been converted to other land uses.
- Increased wetland loss from agriculture and urbanization is evident in the ecodistrict.
- Certain vegetation types are being removed from the Valley Corridors element.
- Less than 1% of the matrix element is in the reserve class.
- Within the Tolerant Hardwood Hills element, only 21% of the area is in the late seal stage.
- Frequency of the rS eH wP sM yB Be community group is relatively low on provincial Crown lands (0.4% in the ecodristrict and 2.3% in the ecoregion) and area set aside for reserve status is less than 1% (Appendix 4 and Appendix 3, Table 2).

Appendix 1: Flow - Element Interactions

Element	People	Deer	Wood Turtles	Migratory Fish	Owls	Bats
Matrix Tolerant Hardwood Hills	Timber, Agriculture (Blueberries) Hunting, Trapping, Tower Sites	General Habitat	_____	_____	Nesting/Feeding	General Habitat, Hibernation sites (Karst topography)
Valley Corridors St. Croix	Hydro, Fishing	General habitat and wintering	_____	Smelts and Salmon	Nesting/Feeding	
Meander River	Fishing and Recreation	General habitat and wintering	Presence/habitat	Salmon, sea trout	Nesting/Feeding	
Herbert River	Paddling	General habitat and wintering	Presence/habitat	Salmon, sea trout	Nesting/Feeding	
Patches Tolerant Mixedwood Hummocks	101 Highway / Railway	General habitat and wintering	_____	_____	Nesting/Feeding	
Tolerant Mixedwood Slopes	Road Corridor, Upper Slopes	General habitat and wintering	_____	_____	Nesting/Feeding	Habitat - South of Woodville
Floodplain	Transportation systems, utility corridors, fishing trapping, hunting	General habitat and wintering	_____	_____	Nesting/Feeding	
Wetlands	Fishing	General habitat and wintering	_____	_____	Nesting/Feeding	_____

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Matrix	High	elevation - towers - catchment	- large contiguous element that has changed over time	Wind	sM yB Be	rS eH sM Be yB wP	Ownership - conversion	over harvesting -converted ownership	encourage climax species
Tolerant Mixedwood Hummocks	Patch	High	elevation - towers - catchment	large broken patches	Wind	rS eH sM Be yB wP	sM yB Be	Ownership - conversion	over harvesting -converted ownership	encourage climax species
Tolerant Mixedwood Slopes	Patch	Low	- Rawdon - steep valleys	small isolated patches occurring in the Rawdon area	Wind	rS eH wP sM yB Be	rS eH sM Be yB wP	Slopes, soils	small ownership	maintain climax species
Floodplain	Patch	Low	Roulston Corner area - Newton Brook	small isolated patches occurring in the Rawdon area	Wind	rS eH wP sM yB Be	rS eH sM Be yB wP	very small ownership, drainage	small ownership	maintain climax species
Wetlands	Patch	High	- Cooks Brook - Cox Brook	small isolated patch type	Open Seral	bS alders	rS eH sM Be yB wP	very small isolated patches	isolated	maintain wetland s SMZ's Maintain link to corridors

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 410)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS				
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Northern Bobwhite	*Colinus virginianus*	N/A	Endangered	Endangered
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Wood Thrush	*Hylocichla mustelina*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
BRYOPHYTES				
Pygmy Pocket Moss	*Fissidens exilis*	N/A	N/A	Special Concern
DICOTS				
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
Butternut	*Juglans cinerea*	N/A	Endangered	Endangered
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS				
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
MONOCOTS	-	-	-	-
Ram's-Head Lady's-Slipper	*Cypripedium arietinum*	Endangered	N/A	N/A
REPTILES				
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 410)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS			
Four-toed Salamander	*Hemidactylium scutatum*	Secure (Green)	S3
BIRDS			
Turkey Vulture	*Cathartes aura*	Sensitive (Yellow)	S2S3B
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3B
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S3S4B
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S3B,S5M
BRYOPHYTES			
Wulf's Peat Moss	*Sphagnum wulfianum*	Sensitive (Yellow)	S2S3
DICOTS			
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Running Serviceberry	*Amelanchier stolonifera*	Secure (Green)	S3?
Swamp Milkweed	*Asclepias incarnata ssp. pulchra*	Undetermined	S2S3
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2
Eastern Leatherwood	*Dirca palustris*	May Be At Risk (Orange)	S1
Purple-veined Willowherb	*Epilobium coloratum*	Sensitive (Yellow)	S2?
Philadelphia Fleabane	*Erigeron philadelphicus*	Sensitive (Yellow)	S2
Round-lobed Hepatica	*Hepatica nobilis var. obtusa*	May Be At Risk (Orange)	S1S2
Balsam Groundsel	*Packera paupercula*	Secure (Green)Sensitive	S3
Climbing False Buckwheat	*Polygonum scandens*	(Yellow) Secure (Green)	S3
Marsh Mermaidweed	*Proserpinaca palustris*	Secure (Green)Sensitive	S3
Pink Pyrola Bog	*Pyrola asarifolia*	(Yellow) Secure (Green)	S3
Willow Bloodroot	*Sanguinaria canadensis*	May Be At Risk (Orange)	S2
Clustered Sanicle	*Sanicula odorata*	Sensitive (Yellow)	S3S4
Fringed Blue Aster	*Symphyotrichum ciliolatum*		S1
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow) Sensitive (Yellow)	S2S3
Dwarf Bilberry	*Vaccinium caespitosum*	Sensitive (Yellow)	S2
Northern Bog Violet	*Viola nephrophylla*	May Be At Risk (Orange)	S2
Golden Alexanders	*Zizia aurea*		S2
			S1
FERNS AND THEIR ALLIES			
Northern Maidenhair Fern	*Adiantum pedatum*	May Be At Risk (Orange)	S1

Appendix 3: Special Occurrences (Ecodistrict 410)

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***
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Common Scouring-rush	*Equisetum hyemale var. affine*	Secure (Green)	S3S4
Variegated Horsetail	*Equisetum variegatum*	Secure (Green)	S3
Northern Clubmoss	*Lycopodium complanatum*	Secure (Green)	S3S4
Appalachian Polypody	*Polypodium appalachianum*	Undetermined	S3?
INSECTS			
Ocellated Darner	*Boyeria grafiana*	Sensitive (Yellow)	S3
Baltimore Checkerspot	*Euphydryas phaeton*	Secure (Green)	S3
Harlequin Darner	*Gomphaeschna furcillata*	Sensitive (Yellow)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
MOLLUSKS			
Triangle Floater	*Alasmidonta undulata*	Secure (Green)	S2S3
MONOCOTS			
Pubescent Sedge	*Carex hirtifolia*	Sensitive (Yellow)	S2S3
Rosy Sedge	*Carex rosea*	Secure (Green)	S3
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Small Yellow Lady's-Slipper	*Cypripedium parviflorum var. makasin*	Sensitive (Yellow)	S2
Yellow Lady's-slipper	*Cypripedium parviflorum var. pubescens*	Sensitive (Yellow)	S2
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Deer-tongue Panic Grass	*Dichanthelium clandestinum*	Secure (Green)	S3
Spreading Wild Rye	*Elymus hystrix var. bigeloviana*	May Be At Risk (Orange)	S1
Downy Rattlesnake-Plantain	*Goodyera pubescens*	May Be At Risk (Orange)	S2
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green) Secure	S3
Small Burreed	*Sparganium natans*	(Green) Sensitive	S3
Yellow Ladies'-tresses	*Spiranthes ochroleuca*	(Yellow)	S2S3
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

*Atlantic Canada Conservation Data Centre S-Ranks, where S1: extremely rare; S2: rare; S3: uncommon; S4: usually widespread, fairly common; S5: widespread, abundant; S#S#: A range between two consecutive ranks for a species/community denotes uncertainty about the exact rarity (e.g. S1S2); Consult http://www.accdc.com/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 410)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Farwell's Water-Milfoil	Species	Provincial Database	
Alewife	Species	Provincial Database	Wildlife Act
Alpine Bluegrass	Species	Provincial Database	
American Eel	Species	Provincial Database	Wildlife Act
American Shad	Species	Provincial Database	Wildlife Act
Atlantic Sturgeon	Species	Provincial Database	Maritime Provinces Fishery Regulations
Bald Eagle Nest	Species	Provincial Database	Wildlife Act
Blue Spotted Salamander	Species	Provincial Database	
Brook Trout	Species	Provincial Database	Wildlife Act
Brook Floater	Species	Provincial Database	
Clammy Hedge-Hyssop	Species	Provincial Database	
Common Loon	Species	Provincial Database	Migratory Bird Convention Act
Deer Wintering Area	Species	Provincial Database	
Eastern Lamp Mussel	Species	Provincial Database	
Eastern Pearlshell	Species	Provincial Database	
Flatstem Pondweed	Species	Provincial Database	
Round-Leaved Liverleaf	Species	Provincial Database	
Sea Lamprey	Species	Provincial Database	Maritime Provinces Fishery Regulations
Sharp-tailed Sparrow	Species	Provincial Database	
Wetlands	Ecosystem	Provincial Database	
Snapping Turtle	Species	Provincial Database	
Spring - Elmsvale public use	Feature	Local	
Striped Bass	Species	Provincial Database	Maritime Provinces Fishery Regulations
Tomcod	Species	Provincial Database	Maritime Provinces Fishery Regulations
Yellow Canada Lily	Species	Provincial Database	
Communication Tower- Fire Tower	Feature	Local	
Forestry Education Middle Musquodoboit	Feature	Local	
Gun Range - Glenmore	Feature	Local	
Pallet Mill - Enligna	Feature	Local	
Shale Pit - Glenmore, Rawdon, Benvie Hill (Private land)	Feature	Local	
Slate Quarry - Roulston Corner	Feature	Local	
Sugar bush - Glenmore, Newton Mills	Feature	Local	
Two Dam Sites - Panuke power for pulp mill	Feature	Local	
Unregistered potable water supply - Benvie Hill	Feature	Local	
Blue Spotted Salamander	Feature	Local	
Waterfall - Findlay Brook, Butcher Hill		Provincial Database	
Indian Reserve lands – St. Croix		Provincial Database	
Blueberry Processing - Upper Rawdon, Gore		Local	
Blueberry Packaging Plant - Glenmore		Local	

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	%		
ICSM	wetlands	32	0.1	0	0.0	72 to 75	0.0	1,276	0.2	0	0.0	64 to 72	3.3
IFHO	rS	779	1.3	11,978	19.6	50 to 60	16.6	6,777	1.1	56,711	8.8	58 to 64	15.1
IFKK	sM yB Be	8,906	14.5	6,234	10.2	52 to 65	11.7	8,906	1.4	97,421	15.2	52 to 64	11.7
IMHO	rS	11,199	18.3	11,978	19.6	55 to 70	5.1	133,869	20.8	56,711	8.8	63 to 73	3.2
IMSM	rS eH wP sM yB Be	222	0.4	15,092	24.7	38 to 42	44.1	12,386	1.9	15,092	2.3	63 to 69	7.7
PMHO	wetlands	167	0.3	0	0.0	71 to 75	0.0	1,072	0.2	0	0.0	73 to 74	0.5
WCDS	rS eH wP sM yB Be	118	0.2	15,092	24.7	50 to 67	10.9	118	0.0	15,092	2.3	50 to 67	10.9
WCHO	rS wP	205	0.3	164	0.3	42	41.6	8,109	1.3	52,293	8.1	72 to 76	7.3
WFKK	sM yB Be	327	0.5	22,805	37.3	42	43.4	11,791	1.8	89,022	13.9	56 to 63	16.4
WMDS	rS eH wP sM yB Be	607	1.0	15,092	24.7	58 to 69	3.3	607	0.1	15,092	2.3	56 to 68	3.3
WMHO	rS eH wP sM yB Be	3,767	6.2	15,092	24.7	54 to 66	10.3	48,445	7.5	15,092	2.3	63 to 71	4.7
WMKK	sM yB Be	34,590	56.5	22,805	37.3	53 to 63	14.3	125,446	19.5	89,022	13.9	59 to 69	7.5

*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 reserveproposals)		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)
WMKK	sM yB Be	34,590	1.1	0	0	132	0	132	0.4	0	0.0	132	0.4
IMHO	rS	11,199	6.0	0	0	22	0	22	0.2	0	0.0	22	0.2
IFKK	rS sM yB Be	8,906	6.1	0	0	61	0	61	0.7	0	0.0	61	0.7
WMHO	rS eH wP sM yB Be	3,767	1.7	0	0	0	0	0	0.0	0	0.0	0	0.0
IFHO	rS	779	14.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WMDS	rS eH wP sM yB Be	607	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WFKK	sM yB Be	327	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
XXWA	NONE	302	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IMSM	rS eH wP sM yB Be	222	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WCHO	rS wP	205	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
PMHO	wetlands	167	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WCDS	rS eH wP sM yB Be	118	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	wetlands	32	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**61,221**		**0**	**0**	**215**	**0**	**215**		**0**		**215**	

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)
	0	0	Old Forest	215	0

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

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

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

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

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

The 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	798
Utility corridors	3	58
Gravel Roads and active railways	6	364
Paved streets and roads collectors	10	144
Highways	15	7

Table 2: Distribution of Road Index Classes

Road Index		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	1,790	2.9
Forest Resource	7 to 15	24,282	39.8
Mixed Rural	16 to 24	22,298	36.5
Agriculture Suburban	25 to 39	12,324	20.2
Urban	40 to 100	344	0.6
Total		**61,038**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	1,426	33
Floodplain	98	31
Tolerant Hardwood Hills	42,949	11
Tolerant Mixedwood Slopes	653	16
Tolerant Mixedwood Hummocks	15,608	9
Wetlands	200	8
Total	**60,934**	**11**

*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

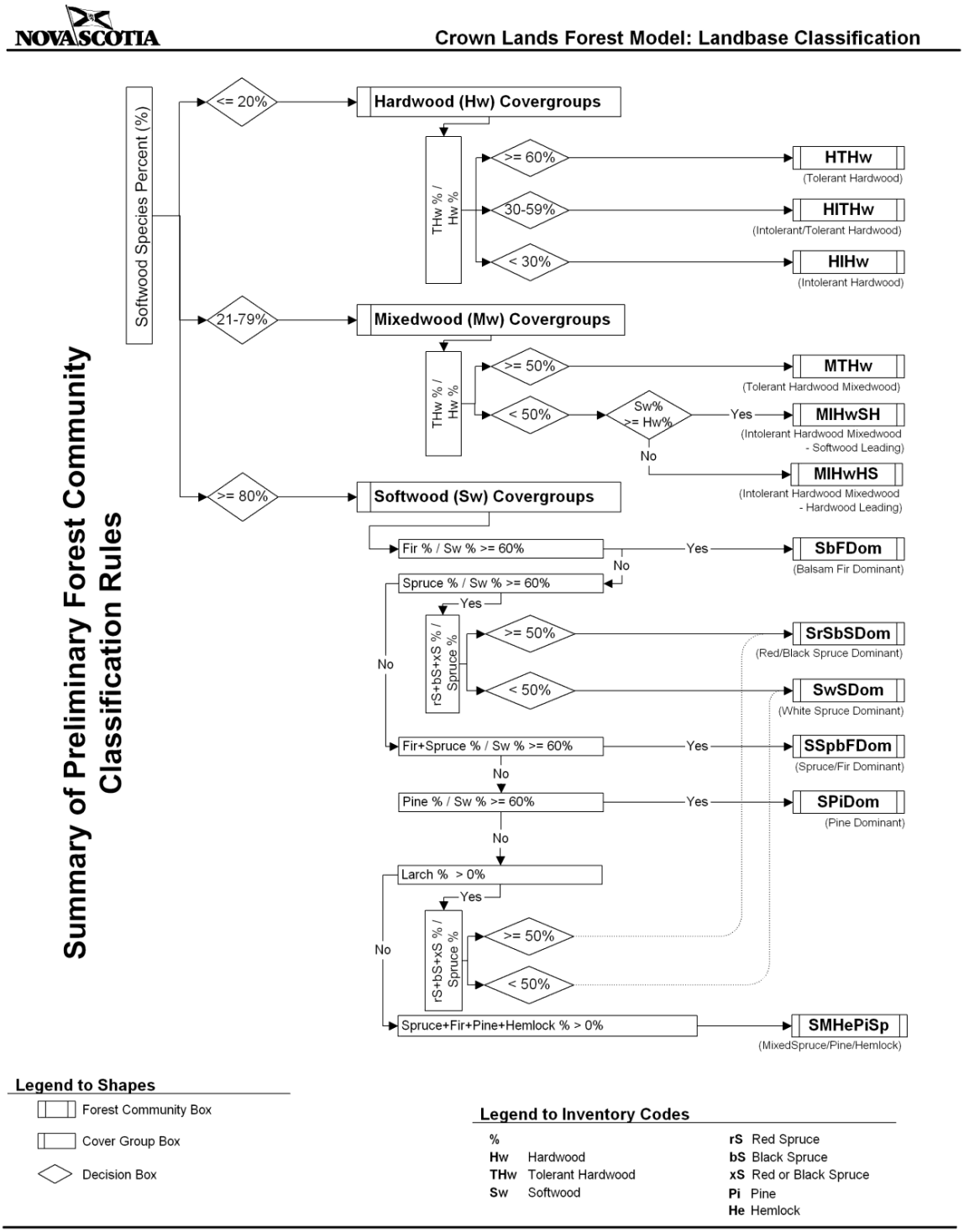
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade intolerant "pioneer" species • peak seed productionby forbs and shrubs • approximate age 0 to 25years	Early Seral Species (Score 10 to 23) • new growth dominated by pioneertree species or unclassifiedregeneration Mid Seral Species (Score 24 to 37) • regeneration composed of a mixture of pioneer, mid-climax, and climaxspecies Late Seral Species (Score 38 to 50) • regeneration dominated by climax species
2. Young Forest (Height 7 to 11m) • 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 40years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneer treespecies Mid Seral Species (Score 24 to 37) • canopy composed of a mixture ofpioneer, mid-climax, and climaxspecies Late Seral Species (Score 38 to 50) • canopy dominated by climaxspecies
3. Mature Forest (Height > 11m) • stands dominated by upper canopy with full differentiation into dominanceclasses • self-thinning processreduced • tree seed production prominent andregular • individual tree mortality creates canopy gaps that are soon closed by neighbouring treegrowth • increased light initiates regenerationand early understory development • approximate age 40 to 125years	Early Seral Species (Score 10 to 23) • canopy dominated by pioneerspecies • over maturity initiates canopybreakup and understorydevelopment 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 climaxspecies • over maturity initiates gap dynamic processes leading to multi-aged andold 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 recruitmentto overstory	Early Seral Species (Score 10 to 23) • canopy likely to break up and be replaced by developingunderstory 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 dynamicprocesses

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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon Wittenburg Hills 410)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Hummocks	IMHO (71.0%) WMHO (23.0%) IFHO (5.0%) WCHO (1.0%)	Softwood	rS rS wP	Infrequent	12,047; 77.0	Early	544	805	413	151	1,912	7,492; 53.0	EARLY	3,773; 26.0
						Mid	224	537	545	398	1,704			
						Late	191	480	923	307	1,902			
						Uncl	1,974	0	0	0	1,974			
		Mixedwood	rS eH wP sM yB Be	Infrequent	3,662; 23.0	Early	321	237	182	91	831	3,657; 26.0	MID	4,106; 29.0
						Mid	77	202	762	633	1,675			
						Late	4	23	257	114	399			
						Uncl	753	0	0	0	753			
		Hardwood	sM yB Be	Infrequent	39; <1.0	Early	68	107	248	48	471	1,619; 11.0	LATE	2,664; 19.0
						Mid	130	106	386	105	727			
						Late	13	8	322	19	363			
						Uncl	59	0	0	0	59			
		Unclassified				Early	477	12	70	0	559	1,451; 10.0	UNCL	3,677; 26.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	892	0	0	0	892			
Total					**15,749***	**#ha**	**5,727**	**2,518**	**4,109**	**1,866**	**14,219**			
						%	**40.3%**	**17.7%**	**28.9%**	**13.1%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon Wittenburg Hills 410)

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)				
Floodplain	IMSM (100.0%)	Softwood				Early	0.0	1.8	2.6	1.5	5.8	22; 38.0	EARLY	25; 43.0
						Mid	0.0	0.5	2.8	1.0	4.2			
						Late	0.0	0.0	9.8	0.0	9.8			
						Uncl	2.5	0.0	0.0	0.0	2.5			
		Mixedwood	rS eH wP sM yB Be	Infrequent	98; 100.0	Early	8.4	4.4	2.2	2.0	17.0	31; 53.0	MID	13; 22.0
						Mid	0.0	0.0	0.0	5.9	5.9			
						Late	0.0	0.0	0.2	1.2	1.4			
						Uncl	6.5	0.0	0.0	0.0	6.5			
		Hardwood				Early	0.0	0.1	1.4	0.0	1.4	5; 8.0	LATE	12; 20.0
						Mid	0.0	0.0	2.3	0.5	2.8			
						Late	0.0	0.0	0.6	0.0	0.6			
						Uncl	0.0	0.0	0.0	0.0	0.0			
		Unclassified				Early	0.0	0.0	0.8	0.0	0.8	1; 1.0	UNCL	9; 15.0
						Mid	0.0	0.0	0.0	0.0	0.0			
						Late	0.0	0.0	0.0	0.0	0.0			
						Uncl	0.0	0.0	0.0	0.0	0.0			
Total					**98***	**#ha**	**17.4**	**6.7**	**22.6**	**12.0**	**58.8**			
						%	**29.6%**	**11.5%**	**38.5%**	**20.4%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon Wittenburg Hills 410)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills	WMKK (80.0%) IFKK (20.0%) WFKK (<1.0%)	Softwood	rS eH bS	Gap	4,365; 10.0	Early	888	1,591	1,343	548	4,371	14,586; 40.0	EARLY	9,421; 26.0
						Mid	277	674	1,195	788	2,934			
						Late	211	346	2,381	628	3,566			
						Uncl	3,716	0	0	0	3,716			
		Mixedwood	rS eH wP sM yB Be rS sM yB Be	Gap	16,175; 38.0	Early	741	637	1,059	537	2,974	12,052; 33.0	MID	10,995; 30.0
						Mid	225	574	2,907	1,658	5,364			
						Late	8	54	1,205	478	1,744			
						Uncl	1,972	0	0	0	1,972			
		Hardwood	sM yB Be	Gap	22,450; 52.0	Early	468	182	682	66	1,399	7,091; 20.0	LATE	7,968; 22.0
						Mid	296	234	1,646	521	2,697			
						Late	47	58	2,248	306	2,659			
						Uncl	331	0	5	0	337			
		Unclassified				Early	432	24	222	0	678	2,710; 7.0	UNCL	8,056; 22.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2,032	0	0	0	2,032			
Total					**42,991***	**#ha**	**11,645**	**4,374**	**14,893**	**5,529**	**36,441**			
						%	**32.0%**	**12.0%**	**40.9%**	**15.2%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon Wittenburg Hills 410)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Wetlands	WTLD	Softwood				Early	4	13	10	6	33	111; 78.0	EARLY	40; 28.0
						Mid	3	29	3	12	47			
						Late	1	13	2	1	17			
						Uncl	14	0	0	0	14			
		Mixedwood				Early	0	4	0	0	4	16; 11.0	MID	58; 41.0
						Mid	0	3	3	1	8			
						Late	0	0	1	1	2			
						Uncl	2	0	0	0	2			
		Hardwood				Early	0	3	0	0	3	16; 11.0	LATE	28; 20.0
						Mid	0	1	0	3	4			
						Late	0	0	6	3	9			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0		UNCL	17; 11.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**200***	**#ha**	**24**	**68**	**25**	**26**	**143**			
						%	**17.1%**	**47.2%**	**17.2%**	**18.5%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon Wittenburg Hills 410)

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	IFKK (32.0%) WMKK (25.0%) IMSM (9.0%) WMHO (7.0%) WMDS (5.0%) IMHO (5.0%) IFHO (2.0%) WCHO (<1.0%)	Softwood	rS eH rS bS	Infrequent	181; 12.0	Early	11	54	42	13	120	438; 51.0	EARLY	217; 25.0
						Mid	4	14	36	30	85			
						Late	2	24	62	30	119			
						Uncl	113	0	0	0	113			
		Mixedwood	rS eH wP sM yB Be rS sM yB Be	Infrequent	736; 52.0	Early	7	13	15	14	50	262; 31.0	MID	287; 34.0
						Mid	2	4	86	57	150			
						Late	0	5	27	5	36			
						Uncl	26	0	0	0	26			
		Hardwood	sM yB Be	Gap	312; 22.0	Early	5	11	23	0	40	117; 14.0	LATE	179; 21.0
						Mid	0	3	26	23	52			
						Late	0	0	24	0	25			
						Uncl	0	0	0	0	0			
		Unclassified				Early	4	0	4	0	8	39; 4.0	UNCL	171; 20.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	32	0	0	0	32			
Total					**1,426***	**#ha**	**207**	**128**	**347**	**173**	**856**			
						%	**24.2%**	**14.9%**	**40.6%**	**20.3%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Rawdon / Wittenburg Hills 410)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Slopes	WMDS (82.0%) WCDS (18.0%)	Softwood	rS eH wP sM yB Be	Infrequent	653; 100.0	Early	3	0	24	1	29	211; 34.0	EARLY	85; 14.0
						Mid	2	0	7	0	9			
						Late	0	0	77	34	112			
						Uncl	61	0	0	0	61			
		Mixedwood				Early	7	2	6	7	23	260; 42.0	MID	137; 22.0
						Mid	9	12	39	15	75			
						Late	0	0	80	9	89			
						Uncl	73	0	0	0	73			
		Hardwood				Early	9	1	13	4	28	112; 18.0	LATE	233; 37.0
						Mid	2	8	28	14	52			
						Late	0	0	29	3	32			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	6	0	6	37; 6.0	UNCL	165; 27.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	31	0	0	0	31			
Total					**653***	**#ha**	**198**	**24**	**309**	**88**	**619**			
						%	**32.0%**	**3.9%**	**49.9%**	**14.3%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Rawdon / Wittenburg Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Hummocks	IMHO WMHO IFHO WCHO	INFREQ INFREQ INFREQ INFREQ	rS rS rS wP rS eH wP sM yB Be	S	SrSbSDom	3,606	28.2%	L	**Moist** - Early: bF rM wB ltA tA - Mid: rS bF rM yB - Late: rS eH yB (wP) **Well/Moist** - Early: bF rM wB ltA tA - Mid: rS bF rM yB wA - Late: rS eH sM yB Be
				S	SbFDom	2,214	17.3%	E	
				S	SspbFDom	1,199	9.4%	M	
				S	SwSDom	370	2.9%	E	
				S	SpiDom	41	0.3%	L	
				S	SMHePiSp	63	0.5%	L	
				M	MIHwSH	1,900	14.9%	E/M	
				H	HTHw	728	5.7%	L	
				M	MIHwHS	1,029	8.1%	E/M	
				H	HTHw	413	3.2%	L	
				H	HIHw	954	7.5%	E/M	
				H	HITHw	252	2.0%	M/L	
Total						**12,768**	**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 Rawdon / Wittenburg Hills 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
Floodplain	IMSM	Infrequent	rS eH wP sM yB Be	S	SrSbSDom	11	19.1%	L	**Moist** - Early: wS bCh rM ltA - Mid: rO rM wA bPo - Late: rS eH sM yB wA (aE)
				S	SbFDom	5	9.2%	E	
				S	SMHePiSp	3	5.3%	L	
				S	SSpbFDom	3	4.8%	M	
				M	MIHwHS	14	25.1%	E/M	
				M	MIHwSH	10	17.3%	E/M	
				M	MTHw	7	11.8%	L	
				H	HITHw	2	4.0%	M/L	
				H	HIHw	2	3.3%	E/M	
Total						**57**	**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 Rawdon / Wittenburg Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WMKK IFKK WFKK	Gap	sM yB Be rS sM yB Be sM yB Be	S	SrSbSDom	5,950	17.6%	L	**Well-drained** - Early: rM wB - Mid: rM yB - Late: sM yB Be
				S	SbFDom	4,314	12.8%	E	
				S	SSpbFDom	2,173	6.4%	M	
				S	SwSDom	1,764	5.2%	E	
				S	SPiDom	65	0.2%	L	
				S	SMHePiSp	319	0.9%	L	**Well/Moist** - Early: bF rM wB ltAtA - Mid: rS bF rM yB wA - Late: rS eH sM yB Be
				M	MIHwSH	5,967	17.7%	E/M	
				M	MIHwHS	3,582	10.6%	L	
				M	MTHw	2,505	7.4%	E/M	
				H	HTHw	2,953	8.8%	L	
				H	HIHw	2,707	8.0%	E/M	**Moist** - Mid: bS tL rM bF
				H	HITHw	1,432	4.2%	M/L	
Total						**33,730**	**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 Rawdon / Wittenburg Hills 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	PMHO ICSM	Open Seral	N/A	S	SbFDom	57	39.9%	L	**Wet** - Wetlands (bogs, swamps)
				S	SrSbSDom	43	30.0%	E	
				S	SSpbFDom	11	7.6%	M	
				S	MIHwHS	7	5.0%	E/M	
				S	MTHw	5	3.6%	L	
				S	MIHwSH	4	2.7%	E/M	
				H	HTHw	9	6.6%	L	
				H	HIHw	5	3.2%	E/M	
					HITHw	2	1.4%	M/L	
Total						**143**	**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 Rawdon / Wittenburg Hills 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	IFHO IFKK IMHO IMSM WCHO WMDS WMHO WMKK	INFREQ GAP INFREQ INFREQ INFREQ INFREQ INFREQ GAP	rS rS sM yB Be rS rS eH wP sM yB Be rS wP rS eH wP sM yB Be rS eH wP sM yB Be sM yB Be	S	SrSbSDom	182	22.3%	L	All
				S	SbFDom	135	16.5%	E	
				S	SSpbFDom	68	8.3%	M	
				S	SwSDom	36	4.4%	E	
				S	SMHePiSp	16	2.0%	L	
				S	SPiDom	1	0.2%	L	
				M	MIHwSH	141	17.3%	E/M	
				M	MIHwHS	82	10.0%	E/M	
				M	MTHw	39	4.8%	L	
				H	HIHw	79	9.6%	E/M	
				H	HTHw	25	3.1%	L	
				H	HITHw	13	1.6%	M/L	
						816	**100**		

*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 Rawdon / Wittenburg Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Slopes	WMDS WCDS	Gap Infrequent	rS eH wP sM yB Be	S	SrSbSDom	128	22.0%	L	**Well-drained** - Early: rM bF - Mid: rS bF rM - Late: rS eH sM yB Be
				S	SMHePiSp	30	5.2%	L	
				S	SwSDom	22	3.8%	E	
				S	SSpbFDom	21	3.6%	M	
				S	SbFDom	6	1.0%	E	
				S	SPiDom	4	0.6%	L	
				M	MIHwSH	122	20.9%	E/M	
				M	MTHw	89	15.3%	L	
				M	MIHwHS	49	8.4%	E/M	
				H	HIHw	64	11.0%	E/M	
				H	HTHw	32	5.5%	L	
				H	HITHw	16	2.8%	M/L	
						583	**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
sM yB Be	22,805	37.3%	89,022	13.9%
rS eH wP sM yB Be	15,092	24.7%	15,092	2.3%
rS	11,978	19.6%	56,711	8.8%
rS sM yB Be	6,234	10.2%	97,421	15.2%
rS eH	3,557	5.8%	13,901	2.2%
bS	891	1.5%	222,732	34.7%
rS wP	1,649	0.3%	52,293	8.1%
Total	**62,206**	**99.4%***	**547,172**	**85.2%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Hills	42,946	184	26,439	1,583	5,888	8,853	22,622 to 27,048	53 to 63
Tolerant Mixedwood Hummocks	15,746	22	9,891	354	1,159	4,320	8,609 to 10,769	55 to 68
Valley Corridors	1,221	8	697	37	299	179	585 to 674	48 to 55
Tolerant Mixedwood Slopes	652	0	412	36	33	171	361 to 446	55 to 68
Wetlands	200	0	183	0	0	16	141 to 149	71 to 75
Floodplain	98	0	54	1	33	10	43 to 48	44 to 49
Total	**60,863**	**215**	**37,676**	**2,011**	**7,413**	**13,549**	**32,361 to 39,136**	**53 to 64**

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
ICSM	32	0	30	0	0	2	23 to 24	72 to 75
IFHO	779	0	453	32	129	164	389 to 471	50 to 60
IFKK	8,906	61	5,309	315	1,039	2,182	4,667 to 5,758	52 to 65
IMHO	11,199	22	7,078	222	575	3,302	6,212 to 7,863	55 to 70
IMSM	222	0	109	1	98	15	85 to 93	38 to 42
PMHO	167	0	152	0	0	15	118 to 125	71 to 75
WCDS	118	0	65	0	13	40	59 to 79	50 to 67
WCHO	205	0	112	6	85	2	86 to 87	42
WFKK	327	0	178	0	142	7	136 to 139	42
WMDS	607	0	405	36	20	145	350 to 422	58 to 70
WMHO	3,767	0	2,383	97	386	901	2,037 to 2,487	54 to 66
WMKK	34,590	132	21,440	1,305	4,933	6,781	18,233 to 21,624	53 to 63
Total	**60,222**	**215**	**37,715**	**2,014**	**7,420**	**13,555**	**32,394 to 39,171**	**53 to 64**

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

Appendix 13:

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

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

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

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

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

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

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

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

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

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