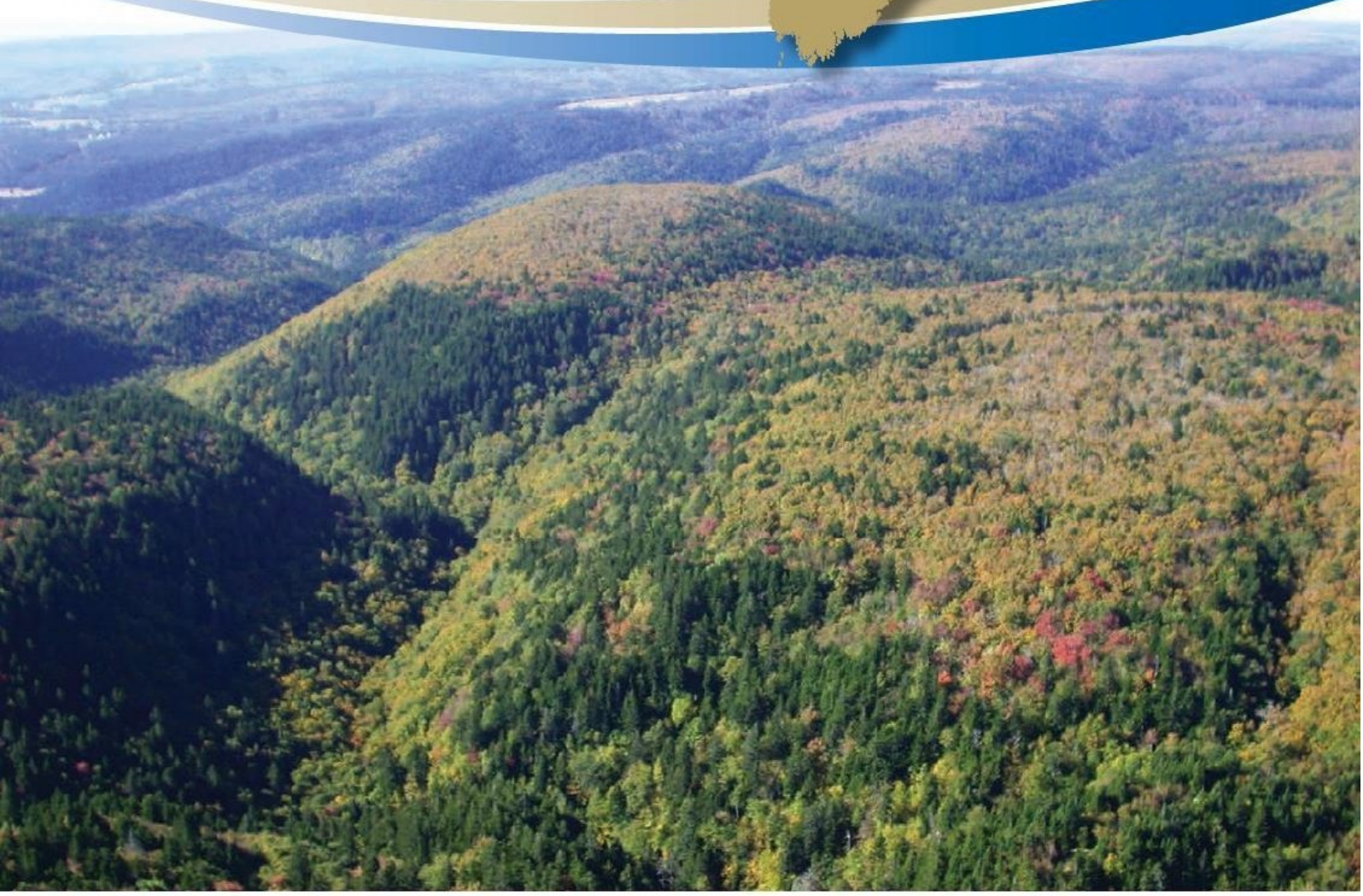
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS CUMBERLAND HILLS ECODISTRICT 540

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-540

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 540: Cumberland Hills

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ISBN 978-1-55457-590-9

This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Cumberland 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 (1995) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

Conventions

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

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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 nine distinctive elements in the Cumberland Hills Ecodistrict – one matrix, seven 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).

Comparisons with current conditions determined that a large portion of the ecological structure has been altered within this ecodistrict. Most of the elements are under moderate to heavy land use pressures.

Tolerant Mixedwood Hills, the matrix element representing about half of the ecodistrict, has been altered from what was once a climax forest of shade-tolerant hardwoods – sugar maple, yellow birch, and beech (60%) – and tolerant softwoods – red spruce, hemlock, and white pine (40%) – to a forest with a relatively equal area in all covertypes.

In **Tolerant Mixedwood Hummocks**, much of the largest patch element has been converted to agricultural or other uses. Abandoned farmland has been reforested to white spruce or cultivated to grow wild blueberries. Other patch elements, in order of size, are **Spruce Pine Hummocks**, **Red Spruce Hummocks**, **Wetlands**, **Spruce Hemlock Pine Hummocks and Hills**, **Floodplain**, and **Spruce Pine Flats**.

Numerous valley bottoms and slope systems, represented by **Valley Corridors**, a corridor element, follow the main river valleys and provide linkages to adjacent ecodistricts.

Flow – Element Interactions (Appendix 1; Map 2)

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

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.

As an example of the flow – element interactions, moose and deer move away from the harsh winter climate in the Chignecto Ridges Ecodistrict and into the lower slopes of the Cumberland Hills and Cobequid Hills ecodistricts. Numerous deer wintering areas are found partly or entirely within the Cobequid Hills, usually along the river valleys (Map 2). A high percentage of the forest within the ecodistrict is found in the establishment and young development classes leaving fewer softwood areas for cover and thermal protection. The increased rate of harvest over the past 20 years has altered the ecodistrict to a smaller patch size, where historically, the gap disturbance regime would have much larger patches.

One strategy would be to mimic the gap and infrequent disturbance regime areas by utilizing silviculture treatments such as pre-commercial and commercial thinning that would speed

development of late successional species such as red and black spruce, pine, hemlock, and tolerant hardwoods, creating larger patches and interior conditions.

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

Four of the landscape flows – people, water, deer, and fish – are identified with major linkages to adjacent areas or ecodistricts (Map 2). The hydrological system provides the most obvious physical connection among the Cumberland Hills, Chignecto Ridges, Northumberland Lowlands, Cobequid Hills, Cumberland Marshes, and Parrsboro Shore ecodistricts. Cumberland Hills is the source of several significant rivers that generally have a south to north flow.

The Black River is the major river in the eastern section of the ecodistrict and drains into the Northumberland Strait. In the western portion of the ecodistrict, many second and third order streams feed into the Maccan River which drains into the Cumberland Basin. Tributaries in the far western tip feed into the Apple River, which drains into the Chignecto Bay.

Other major rivers that provide connection to other ecodistricts are the Fox River, River Hébert, River Philip, Leamington Brook, Wallace River, and the Little Forks River.

Deer move in and out of the Cumberland Hills, shifting south in winter out of the Atkinson Brook, Kelley River, and Apple River toward their wintering areas along the Parrsboro Shore, Halfway River, and Shulie Lake area. Deer also move out of the north-facing lowlands toward wintering areas located at Collingwood Corner and Williamsdale.

People provide linkages among the neighbouring ecodistricts of the Cobequid Hills, Cumberland Marshes, Chignecto Ridges, Parrsboro Shore, and the Northumberland Lowlands through their many activities (recreation, transportation, fishing, forest management, utilities development, and settlements). The major linkages are at Apple River, Harrison Settlement/Newville Lake, Southampton, Leamington Brook, Springhill, Stanley, Collingwood Corner, Wentworth, Greenville, Westchester Station, and Millvale.

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 Cumberland Hills

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Floodplain	FP4, FP5, FP6	13.0	FP3	22.0	**FP1**	49.0
Spruce Pine Hummocks	IH1, IH4, IH6, OW2, OW4, SP1, SP2, SP10	15.0	SP3, SP4, SP6, SP8	26.0	**SP5**, SP7	45.0
Red Spruce Hummocks	IH1, IH3, IH4, IH5, IH6	28.0	MW2, MW4, MW5, SH5, SH6, SH7, SH8, SH10	29.0	**SH1**, SH2, **SH3**, SH4	27.0
Spruce Pine Flats	IH4, IH6, OW2, OW4, SP1, SP2, SP10	9.0	SP6, SP8	21.0	SP5, **SP7**	53.0
Spruce Hemlock Pine Hummocks and Hills	IH3, IH4, IH5, IH6	8.0	MW2, MW4, MW5, SH5, SH6, SH7, SH8, SH10	19.0	MW1, MW3, **SH1**, SH2, **SH3**, SH4	56.0
Tolerant Mixedwood Hills	IH3, IH5, IH6	23.0	IH7, MW2, MW4, MW5, SH5, SH6, SH8, SH10, TH7	33.0	**MW1, MW3**, SH1, SH2, SH3, TH1, TH2, TH3, TH4, TH8	32.0
Tolerant Mixedwood Hummocks	IH3, IH5, IH6	23.0	IH7, MW2, MW4, MW5, SH5, SH6, SH8, SH10, TH7	27.0	**MW1, MW3**, SH1, SH2, SH3, TH1, TH2, TH3, TH4, TH8	32.0
Wetlands	WC1, WC2, WC3, WC4, WC5, WC6, WC7, WD1, WD2, WD3, WD5, WD6, WD7, WD8					

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

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

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

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

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

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

- Reserve, such as parks or wilderness areas

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

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

A summary of these land use intensities provides an overall EEI of 57 to 64 for the ecodistrict (Appendices 12a and 12b). This suggests that overall intensity of land use for Cumberland Hills is currently at a moderately changed state that may affect both the structure and function to support habitat (for all species) and for biodiversity conservation.

A GIS-based classification of current land use employing the four ecosystem emphasis classes indicates that 67% of the land inherently capable of supporting forest land falls within the extensive EEC. Lands are managed for multiple values using ecosystem-based techniques that conserve biodiversity and encourage natural ecosystem conditions and processes.

An additional 4% 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 plantations containing exotic species, old field white spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels.

The remaining lands are split between the reserve class (2%) and the converted class (14%). Fifteen percent of the land falls in the unclassified category.

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. The second type of reserve is one set aside under various provincial policies, such as for old forests or the Eastern Habitat Joint Venture lands. Representation within Cumberland Hills is relatively low because of the low percentage of Crown land holdings. There is opportunity to add additional lands to the reserve class under the Old Forest Policy by selecting community types that presently have insufficient representation or community types that are rare within the ecodistrict and/or ecoregion.

The converted lands are those 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 class in their present state but some locations, especially along the river corridors, show opportunity for restorative measures to the predicted climax stands of spruce, elm, sugar maple, and white ash.

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.

Cumberland Hills currently has an average RI value of 12 (Appendix 7, Table 3) that falls within the forest resource range of 7 to 15, considered to have mainly forest access roads and trails.

Forty-one percent of the ecodistrict, or 37,055 hectares, falls within this category. Six percent of the ecodistrict has a remote road index value between 0 and 6. These areas of few roads in the remote range are concentrated in the central part of the ecodistrict and are mostly associated with steep dissected ridges, wetland complexes, sensitive areas that surround rivers, or are in close proximity to water supply areas.

As would be expected, the highest road densities occur around the highest settlement areas or transportation systems found in Springhill, Salt Springs, Stanley, Wentworth, and Westchester Valley. Indexes in these areas are in the agriculture and suburban to urban categories (Appendix 7, Table 2 and Map 5). The road index mapping (Map 5) also highlights the area around Halfway River, Southampton, Mapleton, Leamington, and Collingwood Corner and along Highway 204 near West Leicester where high densities of roads bisect the ecodistrict, contributing to habitat fragmentation.

Opportunities for road and trail access in the design phase:

- Improve the distribution and connectivity among the low road density areas (west and east of Springhill, west of Pettigrew Settlement, and South Brook/East Mapleton area) where this may improve the connectivity among natural areas and linkages to the neighbouring ecodistricts of Chignecto Ridges and Cobequid Hills.
- Locate any recreational trails away from wetlands, special management zones, rare and unique wildlife habitat, and utilize old abandoned trails or logging roads before additional trails are constructed.
- Schedule access systems for regular maintenance or decommissioning particularly where connectivity or additional reserves are to be established.
- Include the analysis of road density impacts in all land management planning.
- Conserve the distribution of present areas with low road density.

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 were obtained from the Atlantic Canada Conservation Data Centre (ACCDC) databases, current to 2013*.

Species at Risk

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

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

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

As of 2013 in the Cumberland Hills Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species: five endangered, five threatened, and two vulnerable. In addition to the listed species, the National General Status process also identifies seven orange species, 21 yellow species, 20 green species, and two undetermined species for a total of 50 other species of conservation concern in this ecodistrict.

Designated species at risk found within Cumberland Hills include Atlantic salmon, mainland moose, black ash, wood turtle, eastern waterfan lichen, brook floater mussel, and several bird species (common nighthawk, olive-sided flycatcher, eastern wood-pewee, bobolink, barn swallow, bank swallow, and Canada warbler).

Other species of conservation concern known in Cumberland Hills Ecodistrict include yellow-bellied flycatcher and common loon (birds); aloe-like rigid screw moss and toothed-leaved nitrogen moss (bryophytes); red ash, smooth sweet cicely, and northern blueberry (dicots); northern clubmoss and ground-fir (ferns and their allies); mustard white and question mark (insects); cougar (mammals); triangle floater and tidewater mucket (mollusks); Canada lily and hairlike sedge (monocots).

Birds

As of 2013, nine species of birds found to be present in the ecodistrict are designated at risk. Eight of these are listed under the NSESA: barn swallow, chimney swift, rusty blackbird, and Canada warbler as endangered; common nighthawk and olive-sided flycatcher as threatened; bobolink and eastern wood-pewee as vulnerable. Nationally, five species are listed under SARA: common nighthawk, olive-sided flycatcher, chimney swift, and Canada warbler as threatened; rusty blackbird as special concern. COSEWIC has designated all nine species: common nighthawk, olive-sided flycatcher, barn swallow, bobolink, bank swallow, chomneu swift, and Canada warbler as threatened; blackbird and eastern wood-pewee as special concern.

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

The common nighthawk prefers open habitat such as beaches, dunes, grasslands, barrens, pastures, recently cleared lands, and flat graveled roof tops 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.

The olive-sided flycatcher prefers spruce and fir swamps and bogs with open water. This species has experienced long-term declines attributed to habitat loss in wintering grounds, a decline in insects, and climate change.

Eastern wood-pewee can be found in deciduous forests, typically along the edges and in 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. These swallows 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 be implicated with population declines.

The bank swallow has shown a decline over the past number of years. Bank swallows nest in exposed bank faces that include river banks, hardened sawdust piles, coastal bluffs, and gravel pits. Declines are attributed to loss of nesting, breeding, and foraging habitat.

The Canada warbler has shown significant declines over the past few decades. These warblers can be found in 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.

Plants

Only one plant species at risk is documented for the Cumberland Hills Ecodistrict: black ash. 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 only three documented locations in the ecodistrict, two on the River Philip and one near Maccan.

Fish

There are several significant rivers and their tributaries in the Cumberland Hills Ecodistrict, including River Hébert and the Philip, Black, Little Forks, Maccan, Halfway, Southampton, and Wallace rivers. Historically, Atlantic salmon have utilized many of these rivers for spawning and continue to make some use of the available habitat. The inner Bay of Fundy salmon population has steadily declined over the last 20 years and has been designated as endangered by COSEWIC and protected under the federal SARA. The decline in Atlantic salmon is not well understood but evidence suggests that low marine survival is a primary cause which may be due to ecological

changes in the Bay of Fundy. Other threats to this species include environmental contaminants, habitat loss and degradation, lack of riparian buffers along waterways, water passage obstruction, and lack of pools.

Insects

Monarch butterflies are designated by COSEWIC and listed under SARA as special concern but have no provincial listing. Monarchs 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 United States and southern Canada, and is one of the few butterflies that are migratory.

Monarch habitat in Nova Scotia includes fields, meadows, abandoned farmland, and 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. The monarch may occasionally be observed in the Cumberland Hills Ecodistrict, along with parts of the province.

Mammals

Moose on the mainland of Nova Scotia have been listed as endangered under the NSESA (2003). Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy. The Cumberland Hills Ecodistrict is an important area for moose as it falls within a large area that has been identified as a significant concentration area for mainland moose. This area is considered to be “occupied moose habitat” (an area with recurrent observations of moose over time) and moose are reported to occur throughout the ecodistrict in low numbers.

Moose are commonly associated with forested landscape habitat that has been altered or disturbed by events such as fire, wind, disease, or timber harvesting. Habitat requirements of moose are largely dependent on successional forest stages. Early successional hardwood trees and shrubs provide important browse while mature conifer cover are valuable for shelter, thermal cover, and protection in winter and summer. Secluded wetland areas with an abundance of emergent vegetation are used for both feeding and cooling during the summer. The availability of suitable habitat for endangered mainland moose is important in maintaining its future presence.

Special management practices for mainland moose are applied for forestry activities on Crown land in designated concentration areas
(See http://novascotia.ca/natr/wildlife/habitats/terrestrial/pdf/SMP_Mainland_Moose.pdf).

Application of these practices during forest management planning specifically aims to conserve calving areas, aquatic feeding areas, and thermal refugia. The Forest / Wildlife Guidelines and Standards provide minimal habitat specifications for moose on Crown land through the 8% retention for old growth and maintenance of reasonable age class distribution.

Reptiles

Wood turtles are designated by COSEWIC as threatened and listed under the federal SARA and NSESA. Based on species occurrence information, the Cumberland Hills Ecodistrict is not likely to support a large number of wood turtles. Infrequent sighting reports are associated with River Hébert, Newville Lake, Wallace River, and River Philip. Wood turtles are uncommon province-wide, with the majority of observations occurring at a few main concentration areas. Currently, none of these areas are within this ecodistrict.

Molluscs

Only one mollusk species at risk is documented for Cumberland Hills: the brook floater. In 2013, this freshwater mussel was listed under the NSESA as threatened with only five known locations in the province. The brook floater prefers shallow rivers or streams with a moderate to high water flow. Occasionally they have been found in small lakes with sandy bottoms. Threats to this species include changes to water quality and quantity, often the result of shoreline development, sedimentation, and agricultural practices. One report of this mussel is known for the ecodistrict.

Lichens

The eastern waterfan is designated by COSEWIC as threatened. This lichen prefers shaded streams where it grows at or below water level in cool, clear environments. Environmental changes to these habitats by activities that cause stream siltation, microclimate alterations, changes to water quality, and climate change pose threats to this species. Eastern waterfan is reported at one site near the western boundary of this ecodistrict.

Old Forest

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

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.

Seven of the fourteen ecosections (ICSM, IFHO, IFSM, WCDS, WFHO, WFKK, and WTLD) found in the Cumberland Hills Ecodistrict 540 each comprises less than 2% of the ecodistrict (Map 7).

Two of the elements, Spruce Hemlock Pine Hummocks and Hills and Spruce Pine Flats,

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

540 Cumberland Hills Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Mixedwood Hills (Matrix)	WCKK WMKK WFKK	Gap	red Spruce (rS), white Pine (wP), sugar Maple (sM), yellow Birch (yB), Beech (Be)
Tolerant Mixedwood Hummocks (Patch)	WCHO	Infrequent	rS, yB
Spruce Pine Hummocks (Patch)	ICHO IMHO IFHO	Frequent	black Spruce (bS), wP
Red Spruce Hummocks (Patch)	WMHO WFHO	Frequent	rS
Wetlands (Patch)	WTLD	Open Seral (Frequent)	red Maple (rM), bS, tamarack (tL)
Spruce Hemlock Pine Hummocks and Hills (Patch)	WCDS	Infrequent	rS, eastern Hemlock (eH), wP
Floodplain (Patch)	IMSM	Gap	american Elm (aE), sM, white Ash (wA)
Spruce Pine Flats (Patch)	IFSM ICSM	Frequent	bS, wP, jack Pine (jP), red Pine (rP)
Valley Corridors (Corridor)	Various	Various	Various

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

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

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

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

comprise ecosections (WCDS, IFSM, and ICSM) that form less than 2% of the ecodistrict. These same ecosections form less than 2% of the ecoregion.

The WFKK ecosection found within the matrix has a climax community of sugar maple, yellow birch, and beech and forms less than 2% of the ecodistrict and only 4% of the ecoregion. This ecosection is under the highest conversions pressure for any ecosection within the ecoregion, exceeding 50%.

The black spruce community within the IFHO ecosection is also less than 2% of the ecodistrict and under heavy land use pressure. Conversion rates for the black spruce is 44% for the ecodistrict and 22% for the ecoregion. No ecosection is more than 70% converted.

Old growth stands have been identified on 1,200 hectares, or 9.4% of the Crown lands, under the Old Forest Policy.

There is adequate representation, under the policy, for all community types with the exception of the red spruce and eastern hemlock, along with sugar maple, yellow birch, and beech. An additional 60 hectares is required for red spruce and hemlock and 43 hectares for the sugar maple, yellow birch, and beech. The Crown has exceeded the 8% target for all other community types within this ecodistrict.

Opportunities for the design phase and for future management are to implement existing policies and develop additional, effective practices to address fine filter conservation issues such as:

- Uncommon forest species for which genetic viability may be threatened as indicated by DNR's Endangered Species Rating System – yellow and red listed.
- Fine filter management opportunities related to conservation of significant habits.
- Uncommon community conditions (e.g. old age, large live and dead trees, and species associations). Increase representivity in the uncommon old forest communities as above.
- Implement restorative measures in those community types like yellow birch, sugar maple, and beech stands or the red spruce, hemlock, and white pine where conversion to other species or uses are high.

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.

Designated provincial parks and park reserves, wilderness areas, operational non-designated parks and park reserves, and sites of ecological significance under moratorium are the legal reserves under the IUCN I, II, III, accounting for 90 hectares, or 0.1%, of this ecodistrict (Appendix 4).

An additional 1,219 hectares are defined as policy reserves, including old forest sites set aside under the provincial Old Forest Policy along with designated provincial parks and park reserves, operational non-designated parks and park reserves, and wildlife habitat sites under Eastern Habitat Joint Ventures. These two reserve classes – legal and policy – account for 1,309 hectares, or 1.4%, of the area of Cumberland Hills.

Since provincial Crown lands only represent about 14% of the ecodistrict, opportunities to improve representation may have to be directed to private lands in the form of Eastern Habitat Joint Venture programs, Nature Conservancy of Canada, Nova Scotia Nature Trust, and other groups. Priority sites and strategies to improve representation in the design phase should include:

- Uncommon or rare climax community types, such as black spruce (< 2% in the IFHO ecosection in the ecodistrict and less than 2% in the ecoregion), red spruce, hemlock, and white pine (< 1% in the WCDS ecosection within the ecodistrict and ecoregion) and those under heavy land use pressures, such as sugar maple, yellow birch, and beech (in the WFKK ecosection forming less than 2% in the ecodistrict and less than 5% in the ecoregion) and under conversions that exceed 50% in the ecodistrict and 25% in the ecoregion.
- Additional old forest in the red spruce and hemlock community.
- Improved connectivity between and among the wetland complexes and the river corridors.

ELA Summary

Element Interpretation (All appendices and maps)

The Cumberland Hills Ecodistrict is defined by rounded hills that seldom exceed 150 metres above sea level. Exceptions occur near Springhill and Leicester where elevations are just over 180 metres.

The bedrock geology is generally Carboniferous era sedimentary rocks such as sandstone, shale, conglomerate, and coal. Leicester Ridge divides two watersheds, with the Little River draining east to the River Philip, and the Little Forks River flowing west to the Maccan River. Near Springhill, the Black River flows to the Maccan River.

The majority of soils in this ecodistrict are derived from sandstones and conglomerates creating well-drained, coarse-textured, sandy loams. A few areas of finer-textured soils such as clay loams have developed from shales and mudstone, and are usually imperfectly drained.
The upland sites are a mixture of tolerant softwood and hardwood stands, including red spruce, sugar maple, beech, and yellow birch. Imperfectly drained sites are occupied by black spruce.

Areas with coarse-textured soils are prone to moisture deficits in the summer and are susceptible to fire. Examples of jack pine, white pine, and black spruce on fire-disturbed sites are scattered near Springhill and along the Little Forks River.

Along with fire, natural disturbances on the better-drained sites with tolerant species include blowdown and insect mortality.

Tolerant Mixedwood Hills
(Matrix) (WCKK, WMKK and WFKK ecosections) (45,500ha)

This matrix element is approximately 45,500 hectares and extends throughout the entire ecodistrict. This element is almost evenly split between the three covertypes: softwood, mixedwood, and hardwood.

Late successional red and black spruce dominate the softwood stands.

Mixedwood stands now comprise some 33% of the area with mid-seral species of red spruce, balsam fir and red maple dominating.

The once dominating hardwood covertype has been reduced to 28% of the element with early and mid-successional species of grey birch, white birch, and red maple dominating.

Flows

People (roads, timber, recreation, hunting, fishing, trapping, sugar maple,); water (catchment, filter, groundwater recharge); deer (browse, shelter general percolation); moose (browse, shelter); furbearers (travel, hunting).

Composition

Cumberland Hills Ecodistrict 540 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	12%	56% (50 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	23%	33%	32%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	33%	28%	33%	6%

Desired Condition

The desired condition is a mixedwood covertype of late seral softwoods; red spruce, hemlock, and white pine on the flats and lower elevations along with hardwood stands of sugar maple and yellow birch on the well-drained upper slopes.

Issues

- A high percentage of forested lands within these limits that has been converted to other uses as reflected in the lower EEC Index range (Appendix 12b). The higher land use pressures and conversions are associated with these ecosections: WCKK, WMKK, and WFKK.
- A high percentage of the forest area within the establishment development class and early and mid-seral successional stages.
- Element is characterized by a structure that has resulted in fragmentation.
- Overall, 8% of the Crown lands have been set aside under the Old Forest Policy within this ecodistrict. There is a slight gap of 75 to 100 hectares required within the sugar maple, yellow birch, and beech community type**.**

Tolerant Mixedwood Hummocks

(Patch) (WCHO ecosection) (17,180 ha)

This element type historically contained a mixture of softwood and hardwood stands located on well-drained rocky, fertile, sandy loams of the Rodney and Westbrook soil series. It is a series of small, medium, and fairly large areas distributed over the entire ecodistrict.

This patch still contains softwood and hardwood covertypes but 32% (Appendix 10) of the forested area is now mixedwood stands of red maple, white birch, red spruce, balsam fir, aspen, and scattered sugar maple and yellow birch. There is a slight overabundance of forest in the establishment class located predominately in the unclassified lands, late seral softwoods, mid-seral mixedwoods, and early seral hardwood stands. There is only 32% of the forest in late successional species dominated by red and black spruce, scattered pine, hemlock, sugar maple, and yellow birch. Fifty percent of the forest is in the early and mid-successional stages with aspen, red maple, balsam fir, white birch, white spruce, and red spruce dominating.

Flows

People (forestry, roads, hunting, trapping, settlement and recreation); water (catchment, filter); deer (wintering area); moose (local population); furbearers (habitat - fisher).

Composition

Cumberland Hills Ecodistrict 540 (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
	32%	10%	58% (Mat 51+ 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	23%	27%	32%	18%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	39%	24%	32%	5%

Desired Condition

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

Issues

- Relatively small stand or area size within this element type.
- High percentage of early and mid-successional species of aspen, red maple, white birch, and balsam fir in the mixedwood and hardwood stands.
- Sixteen percent of the WCHO has been converted to other uses. Restorative measures are needed around Halfway River, River Hebert, Rodney, River Philip, and Millvale.
- Improving connectivity to larger areas that have low road densities, such as the Rodney and Polly Brook areas.
- Create browse for moose and deer.
- Manage on medium to long rotation (presently 50% of the forest within this element is made up of early and mid-successional species).
- There is no representation within the WCHO ecosection under legal reserves. Fifteen percent of the area under Crown lands has been set aside under policy reserves.

Spruce Pine Hummocks

(Patch) (ICHO, IMHO and IFHO ecosections) (14,472 ha)

This element type comprises several areas in a variety of sizes. The larger areas are most prominent at Springhill, South Brook, and Little Forks. There is a good distribution of the forest in all development classes and seral stages. The mid-successional species of red and black spruce, balsam fir, and red maple dominate the mixedwood stands.

Aspen, red maple, white birch, and balsam fir dominate the hardwood stands. Mature black spruce dominates the softwood covertypes. Conversion to other land uses for the dominant ecosections (ICHO) is less than 5%. The EEI range is 60 to 68.

Flows

People (forestry, roads, hunting, trapping, agriculture, fish ponds); water (filter, catchment basins, groundwater recharge, headwaters); deer (habitat, deer wintering areas); furbearers (habitat, otter, bobcats, fisher).

Composition

Cumberland Hills Ecodistrict 540 (based on statistics up to 2006) **Composition of Spruce Pine Hummocks**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	21%	11%	68% (63 Mat + 5 OF)	5%
Seral Stage	Early	Mid	Late	Unclassified
	15%	26%	45%	14%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	49%	18%	29%	4%

Desired Condition

Late seral softwood stands of black spruce in a variety of patch sizes and seral stages. Inclusions of both intolerant and tolerant hardwoods on the better-drained knolls. Improved connectivity (for wildlife) between softwood patches, wetlands, and corridors.

Issues

- Fragmentation issues around Little River/Little Forks and Springhill area.
- Unbalanced successional stages in the mixedwood and hardwood stands with early and mid-seral species dominating.
- 44% conversion to non-forest uses within the IFHO ecosection.
- Only 2.6% of element type has policy representation. Twelve percent of the Crown lands have policy reserves under the Old Growth Policy with no legal representation on Crown or private lands for these ecosections within this element type.

Red Spruce Hummocks
(Patch) (WMHO and WFHO ecosections) (5,102 ha)

A fairly prominent well-drained element type that is somewhat fragmented and now found in three general locations: Athol Road, Little River and West New Annan. The element is inherently a red spruce community that has shifted to fairly balanced covertypes of softwood, mixedwood, and hardwood.

Intolerant hardwoods stands of aspen, red maple, white birch, balsam fir, and spruce now dominate the patch type. Softwood stands of mature late seral red and black spruce, white pine with minor amounts of balsam fir and white spruce comprise some 30% of the element. The development classes are fairly well-balanced for the disturbance regime.

The ecological emphasis class is fairly high at 63 to 70 (Appendix 12b). The ecosections (WMHO, WFHO) have relatively low conversions. These same two ecosections are under much higher land use pressure within the ecoregion, where conversions to other uses are 34% and 27%.

Flows

People (settlement, farming, hunting, fishing, trapping, recreation); water (filter, catchment, groundwater recharge); deer (general habitat); furbearers (habitat, fisher, mink, otter); osprey (hunting, nesting); eagles (hunting, nesting).

Composition

Cumberland Hills Ecodistrict 540 (based on statistics up to 2006)
Composition of Red Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	18%	12%	70% (64 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	28%	29%	27%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	30%	38%	28%	4%

Desired Condition

Late successional softwood stands and softwood-dominated mixedwoods with a variety of area sizes and development classes applicable to the natural disturbance regime (NDR).

Issues

- A high percentage of mid-successional species in the mature mixedwood stands and also early successional species in the hardwood stands (Appendix 10).
- Relatively high conversion rates for this community type within these ecosections in other ecodistricts of this ecoregion (Appendix 3, Table 2).
- Relatively small stands size/fragmentation around Little River and Thompson Reid Meadow.
- Maintaining a balance of the forests within each of the development classes.
- Small percentage of Crown land (9%) (Appendix 4) within this element type.
- Element represents only 5.6% (Appendix 12b) of the area of the ecodistrict.
- Uneven distribution of ecosections by ownership.

Wetlands
(Patch) (WTLD ecosection) (1,046 ha)

Two fairly large but isolated wetland complexes are located at Thompson Reid Meadow and the Stanley Road, north of Highway 104 in the Black River Area. These wetland patches are characterized by imperfect to poorly drained soils, stunted black/red spruce, white pine, balsam fir, and poor-quality intolerant hardwoods.

These wetlands have an extremely high importance as catchment basins, filters, and groundwater recharge areas, habitats for muskrats and beavers. Old forest representation is present around these complexes.

Flows

People (recreation, fishing, trapping, duck hunting); water (filter, catchment, groundwater recharge); deer (food, habitat); moose (limited seasonal use); furbearers (habitat-muskrats and beaver); osprey (nesting, feeding); fish (trout).

Composition

Cumberland Hills Ecodistrict 540 (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
	23%	35%	42% (38 Mat + 4 OF)	4%
Seral Stage	Early	Mid	Late	Unclassified
	11%	18%	58%	13%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	77%	7%	12%	4%

Desired Condition

Wetlands and wetland complexes all connected and interconnected to hydrological system.

Issues

- Loss of wetlands and destruction of these ecosystems.
- Low connectivity which may lead to a barrier or impediment to functionality.
- Education and public awareness of the importance of wetlands.

Spruce Hemlock Pine Hummocks and Hills
(Patch) (WCDS ecosection) (896 ha)

This patch element is fairly small and localized to the Mapleton and Leamington Brook areas. The element is inherently a well-drained coarse-textured series of dissections running in a north-south direction with spruce, pine, and hemlock dominating. Thirty-seven percent of the area is now dominated by mature, late seral hardwood stands of yellow birch and sugar maple. Mixedwood stands for red and black spruce, aspen, balsam fir, red maple, sugar maple, and yellow birch represent 28% of this element type.

The development classes are fairly well-balanced for the infrequent disturbance regime. The ecosection type in this element represents less than 2% of the ecodistrict and ecoregion. Conversion is 4% (Appendix 3, Table 2) within the ecodistrict and ecoregion.

Flows

People (hunting, fishing, trapping, forestry); water (major drainage - steep slopes to small interval areas); deer (travel); furbearers (habitat-fisher, otter); osprey (hunting); eagles (hunting).

Composition

Cumberland Hills Ecodistrict 540 (based on statistics up to 2006)
Composition of Spruce Hemlock Pine Hummocks and Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	18%	3%	79% (72 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	8%	19%	56%	17%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	31%	37%	28%	4%

Desired Condition

A mixture of late seral dominated softwood stands of spruce, hemlock, and pine with tolerant hardwood-dominated mixedwoods of sugar maple, yellow birch, hemlock, spruce, and pine. The element would also contain tolerant hardwood stands of yellow birch and sugar maple on the better-drained slopes and hilltops.

Issues

- 17% of the rare ecosection in this element is unclassified.
- Element has low percentage of softwood covertype (31%).
- Mixedwood covertype has high percentage of forests in the mid-successional stage.
- Small patch type has local presence only which may be an impediment to functionality.
- Only 3% of this element type has representation. There are no old forest selections or policy reserves for this rare ecosection type.

Floodplain
(Patch) (IMSM ecosection) (682 ha)

Long narrow wetland complexes parallel to the main corridors located at Halfway River, River Hébert, West Brook, Southampton River, Leamington Brook, and the Wallace River. These wetlands are smooth, low imperfectly to poorly drained areas that are partially treed with stunted spruce, larch, fir, scattered pine, and poor-quality intolerant hardwoods.

On the outer edges of these wetlands, where the soils are well-drained to imperfectly drained, there are scattered elm, sugar maple, and ash.

Flows

People (recreation, fishing, trapping, duck hunting); water (filter, catchment, groundwater recharge); deer (food, habitat); moose (limited seasonal use); furbearers (habitat-muskrats and beaver); osprey (nesting, feeding); fish (trout).

Composition

Cumberland Hills Ecodistrict 540 (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
	21%	13%	66% (58 Mat + 8 OF)	8%
Seral Stage	Early	Mid	Late	Unclassified
	13%	22%	49%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	57%	16%	26%	1%

Desired Condition

Undisturbed wetlands and wetland complexes connected to and parallel to the river corridors.

Issues

- High conversion rates within both the ecodistrict (21% conversion) and the ecoregion (29%).
- Small element size (682 ha).
- Only 4% of this element type has representation with the majority of that area under policy reserves.

Spruce Pine Flats
(Patch) (IFSM and ICSM ecosections) (605 ha)

This is a small, isolated softwood element of 605 hectares, located in West Leicester. This patch element type is predominately red and black spruce, scattered balsam fir, eastern hemlock with small mixedwood and hardwood stands dominated by red maple, aspen, and white birch. Scattered yellow birch can be found on the deeper well-drained soils. The development classes are fairly well-balanced for the disturbance regime. Fifty-three percent of the forest within this element is in the late seral stage. This element type has a fairly high EEC of 61 to 68.

Flows

People (agriculture, recreation-snowmobiling, cross country skiing, hiking, fishing, trapping, local transportation); water (filter, catchment basins); deer (habitat); furbearer (mink, fisher, and otter); osprey (nesting, hunting); eagles (hunting, nesting).

Composition

Cumberland Hills Ecodistrict 540 (based on statistics up to 2006) **Composition of Spruce Pine Flats**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	22%	9%	69% (59 Mat + 10 OF)	10%
Seral Stage	Early	Mid	Late	Unclassified
	9%	21%	53%	17%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	66%	22%	11%	1%

Desired Condition

Spruce-dominated softwood stands with a mixture of hemlock and white pine along with mixedwood stands of spruce, pine, hemlock, red maple, and white birch in a variety of development classes and seral stages.

Issues

- Approximately 23% of the red spruce, hemlock, and pine has been converted to non-forest uses.
- A high percentage of mid-successional species in this element type.
- High land use pressures especially in the red spruce, hemlock, and white pine communities.
- Small element size.
- Under-representation in the two climax communities of black spruce and also red spruce, eastern hemlock, and white pine. No representation of these two ecosections – IFSM and ICSM – within Cumberland Hills.

Valley Corridors

(Corridor) (Various ecosections) (4,654ha)

Valley Corridors is for the most part river corridors that dissect the ecodistrict in several locations. The Cobequid Hills Ecodistrict contains the headwaters of several rivers. The headwater streams are important rivers in the eastern section of the ecodistrict, which drains north into the Northumberland Strait.

In the western section, many of the second and third order streams feed into the Maccan River which drains into the Cumberland Basin. The tributaries at the western tip of the ecodistrict feed into the Apple River, which drains into Chignecto Bay.

This element is generally late successional black spruce, red spruce, hemlock, and white pine with the higher slopes and knolls being gap-disturbed with elm, sugar maple, yellow birch, and ash. Red and black spruce dominate the softwood communities along with scattered balsam fir,

white spruce, and white pine. Mature mid-successional species such as red maple, balsam fir, and red spruce dominate the mixedwood stands that comprise 25% of the corridor communities.

Mature early successional species of aspen, white birch, and balsam fir dominate the hardwood stands. Only 2% of the forest within the corridors is long-lived late successional hardwoods of sugar maple, yellow birch, elm, and ash.

Flows

People (trapping, hunting, fishing, forestry, transportation, agriculture, hiking, recreation, water supply - Leamington Brook, settlement, mining - North East Branch Maccan River); Water (filter, catchment, drainage, headwaters - Little Forks River (Chase Lake); deer (seasonal travel, water, habitat, deer wintering areas - Millvale, River Hébert (Newville Lake), Fox River); Moose (seasonal travel - Fox River, River Hébert, River Philip, Millvale, Leamington Brook, Little Forks River); furbearers (basic habitat, movement, food); osprey (hunting, nesting - River Hébert, River Philip, Wallace River, West Branch Wallace River, East Branch Maccan, North East Branch Maccan River); eagles (hunting and nesting - Fox River, River Hébert, River Philip, Wallace River, West Branch Wallace River, North East Branch Maccan River).

Composition

Cumberland Hills Ecodistrict 540 (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
	22%	17%	61% (50 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	23%	26%	35%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	56%	17%	25%	2%

Desired Condition

A series of well-connected slopes and intervales in a natural forest condition.

Issues

- Non continuous forest cover as a result of settlement, agriculture, and forestry.
- Slightly unbalanced development class. Fifty-one percent of the forest is in an early and mid-seral stage.
- Quantity of representation within the element type is a gap.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Cumberland 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:

- Gaps within the Cumberland Hills Ecodistrict are usually directly related to an under representation in both the forest community types (sugar maple, yellow birch as beech as well as the red spruce, hemlock) and rare or uncommon ecosystems.
- High percentage of forested lands converted to other uses (associated with WFKK, ICSM, IFHO, IMSM, WMKK, and WCHO ecosections).
- Preservation of wetlands and wetland complexes with their unique, rare, uncommon, or threatened species.
- Fragmentation around Little River and Thompson Reid Meadow.
- The high percentage of early and mid-seral species in most element types.

Cumberland Hills is now a somewhat changed structure that does not represent the inherent natural conditions that once characterized this landscape. Human land use, transportation systems, and utility corridors have fragmented some of the element types, reducing the connective function of the corridors for some species and may also increase the barrier effect of the corridors for species that must move across (Map 5).

An additional concern inherent in ecological planning is the maintenance of connectivity among conservation areas (including wilderness, 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 NDR guidelines for landscape composition and recognizing natural linkage opportunities.

Recommendations for connective management strategies include:

- Mitigating the potentially negative barrier effects of concentrated land use in the valley corridors by sustaining and restoring natural communities in key areas such as those identified during the landscape analysis.
- Enhance connectivity between conservation areas by applying appropriate medium and high biodiversity emphasis standards when managing areas with natural linkage potential.
- Improve ecoregional connectivity by sustaining and restoring natural conditions at important linkage points among ecodistricts, as identified in the section Links to Neighbouring Ecodistricts section.

Future management opportunities include implementing existing policies and developing additional, effective practices to address fine filter conservation issues such as:

- Conservation of uncommon forest species for which genetic viability may be threatened as indicated by endangered species' rating systems.
- Conservation of significant habitss.
- Uncommon community conditions (e.g. old age, large live and dead trees and species associations) and increased representivity in the uncommon old forest communities.
- Implementation of restorative measures in community types such as yellow birch, sugar maple, and beech stands or the red spruce, hemlock, and white pine stand where conversion to other species or uses is high.

Appendix 1: Flow - Element Interactions

Matrix Element	People	Water	Deer	Moose	Furbearers (Otters/fishers /beavers)	Wood Turtles	Osprey	Eagles	Fish
Tolerant Mixedwood Hills									
Includes Mature Tolerant Hardwood	Timber, Fishing, trapping, hunting, sugar maple, roads, hiking	Filter, catchment	Browse, shelter, general percolation	browse, shelter, general percolation	travel				
Includes Mature Softwood	Timber, Fishing, trapping, hunting, roads, hiking	Filter, catchment	winter shelter	winter shelter	hunting area				

Valley Corridors	People	Water	Deer	Moose	Furbearers (Otters/fishers /beavers)	Wood Turtles	Osprey	Eagles	Fish
Fox River	Trapping, fishing, hunting, transportation, forestry	Moderate slopes - Movement is from north to south - drainage	Food, water, shelter, movement	Seasonal travel, water	Basic habitat, dispersal	No	No	Hunting	Trout
Stewarts Brook		Movement is from east to west - drainage	movement	Seasonal travel, water	habitat, dispersal				Trout
River Hébert - Newville Lake/West Brook	Recreation, timber, fishing, trapping, hunting, roads, hiking, transportation route, agriculture, forestry	Movement is from south to north - major drainage	Habitat, Deer wintering area	Season travel	travel, food, shelter	Habitat	Hunting, nesting	Hunting, nesting	Salmon, gaspereau, shad, mussels, eels

Appendix 1: Flow - Element Interactions

Valley Corridors	People	Water	Deer	Moose	Furbearers (Otters/fishers /beavers)	Wood Turtles	Osprey	Eagles	Fish
River Philip	Fishing, Canoeing, forestry	Flat flood plain - Movement is from south west to north east - major drainage	Habitat	Season travel	basic habitat dispersal		hunting, nesting	Hunting, nesting	smelts, salmon, brown trout, gaspereau
Apple River - Morang Branch - Rapid Brook - Fowler Brook - East Branch Apple River	Timber	- Filter - Ground water recharge	Fall Seasonal Use	Travel Shelter	Travel Food Shelter	Potential habitat	Hunting, nesting	Hunting, nesting	Salmon trout
Millvale	Agriculture, forestry, fishing	South west to north east movement - drainage	Deer wintering area, habitat, movement	seasonal travel	Habitat				speckled trout
Leamington Brook	Springhill water supply, forestry	South east to north west movement - drainage	Habitat	Seasonal travel	Habitat				Trout
Wallace River	Hunting, trapping, fishing, canoeing (early spring)	Lowland flows - South to north movement, - drainage	Habitat		Habitat		Hunting, nesting	Hunting, nesting	Salmon, brown trout
West Branch Wallace River	Hunting, fishing, trapping, canoeing	South to North movement - major drainage	habitat, water, movement		Habitat		Hunting, nesting	Hunting, nesting	Salmon, brown trout, rainbow trout

Appendix 1: Flow - Element Interactions

Valley Corridors	People	Water	Deer	Moose	Furbearers (Otters/fishers /beavers)	Wood Turtles	Osprey	Eagles	Fish
Little Forks River	Fishing, hunting, trapping	starts at Chase Lake(headwaters) flows south west - major drainage	habitat	Seasonal travel	Habitat				Perch, gaspereau
Black River	Fishing, canoeing, trapping, agriculture, forestry	Flows south to north - Leamington to Salt Springs area - Oxford to River Philip	Habitat – Deer wintering area		Habitat - Beaver, Muskrats				Speckled trout, brown trout, gaspereau, smelts
East Branch Maccan River	Fishing, forestry, agriculture	Moderate to steep slopes - flows east to west - major drainage	Habitat		Habitat		Hunting, nesting		Salmon, trout
North East Branch Maccan River	Settlement, mining, forestry, agriculture	Shallow river, south west flow	movement		Habitat		Hunting, nesting	Hunting, nesting	Trout
Patch Elements	**People**	**Water**	**Deer**	**Moose**	**Furbearers (Otters/fishers /beavers)**	**Wood Turtles**	**Osprey**	**Eagles**	**Fish**
Spruce Pine Hummocks	Forestry, roads, hunting, trapping, agriculture, fish ponds	Filter, catchment basins, groundwater recharge - headwaters (Wallace River)	Habitat - Deer wintering areas - travel		Habitat - Bobcats, otter, fisher				
Spruce Hemlock Pine Hummocks and Hills	Hunting, fishing, trapping, forestry	Major drainages steep slopes to small interval areas	Travel		Habitat - otter, fisher		Hunting	Hunting	

Appendix 1: Flow - Element Interactions

Patch Elements	People	Water	Deer	Moose	Furbearers (Otters/fishers /beavers)	Wood Turtles	Osprey	Eagles	Fish
Red Spruce Hummocks	Settlement, farming, hunting, fishing, trapping, recreation	Filter, catchment basins, ground water recharge	General habitat	_____	Habitat - fisher, otter, mink	_____	Nesting, hunting	Nesting, hunting	_____
Spruce Pine Flats	Agriculture, recreation - snowmobiling, cross country skiing, hiking fishing, trapping camps, local transportation	Filter, catchment basins	Habitat - travel, browse	_____	Beaver, mink, fisher, otter	_____	Nesting, hunting	Nesting, hunting	Trout
Tolerant Mixedwood Hummocks	Forestry, roads, hunting, trapping, settlement, recreation	Filter, catchment	Deer wintering area	Local Population	Habitat - fisher	_____	_____	_____	_____
Floodplain	Recreation, fishing, trapping duck hunting	Filter, catchment basins, ground water recharge (major wetlands - south Stanley Road and Thompson Reid Meadow)	Food, habitat	Limited seasonal use	Habitat - Muskrats and beaver	_____	Nesting and feeding	_____	Trout

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Mixedwood Hills	Matrix	High	Halfway River, Harrison Settlement - multiple values and uses - neighbouring to River Hébert and Newville Lake corridor system	Fairly large prominent softwood and hardwood matrix extending throughout the entire ecodistrict with variety of small and medium patches.	Gap	Mature late seral softwoods of rS, bS and mid seral mixedwood of rM, rS, bF scattered late seral hardwoods of sM and yB	Mature rS/bS within the Chignecto Ridges and early to mid-seral communities of eL, gB, wB, wS, bF, rM and rS/bS within the Northumberland Lowlands	- natural disturbance - converted land use (11%) - fragmentation - forest succession	Gap disturbed - high percentage of the forest in early and mid-seral stages	- promote larger patch structure associated with disturbance regime - maintain low road density and/or low impact road types. - focus management activities on early and mid-seral species in the mixedwood and hardwood stands and promote late seral species of rS, bS, eH, sM and yB
Spruce Pine Hummocks	Patch	Medium	South Brook, Springhill, Little Forks	Medium to very small patches concentrated west of River Philip	Frequent	Almost equal representation of late seral softwood (rS, bS, eH, wP) and intolerant hardwood mixedwoods - scattered intolerant and tolerant hardwood stands	The rS/bS community in the matrix and also within the Chignecto Ridges, rS community around the Athol Road and the softwood mixedwood stands throughout the ecodistrict	- size fragmentation - connectivity	- high percentage of mixedwood and hardwood stands - high percentage of forest in the early and mid-seral stage in the mixedwood and hardwood covertypes.	- improve connectivity and stand size - focus silviculture investments in the mixedwood and hardwood stands to favour the late successional species of rS, bS, wP, eH, sM, yB
Spruce Pine Hummocks and Hills	Patch	Low	Leamington Brook	Local	Infrequent	- rS, bS, bF, sM, yB, eH	Predominately rS, bS with mixedwoods of intolerant hardwoods (rM, wB) and early to late successional softwood (bF, rS)	local presence only	low percent of softwood - mixedwood covertype has high percent of the forest in mid-successional stage	- maintain low road density - maintain development stages in accordance with disturbance regime - slight increase in forest area is needed in the young development stages

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Red Spruce Hummocks	Patch	Medium	Athol Road West New Annan	local	Frequent	rS, bS, scattered wP and wS along with mixedwood stands of intolerant hardwoods - wB, rM, bF, rS	rS, bS matrix of the Chignecto ridges along with bS patches	- local - isolation fragmentation		- maintain good mixture of development classes and seral stages for the disturbance regime - pre-commercial thin and promote late seral species of rS, bS, wP, yB in those mixedwoods that have a high percentage of mid-successional species as well as the hardwood stands that have high percentages of early successional species.
Tolerant Mixedwood Hummocks	Patch	High	- River Philip Centre - Lower Greenville West Brook/ Gilbert Mountain	Largest patch type found throughout most of the ecodistrict	Infrequent	rS bS scattered bF, large percentages of intolerant hardwood - mixedwoods (rS, rM, wB, tA and intolerant hardwoods (rM, wB). Only scattered amounts of yB, sM.	rS bS	fragmentation connectivity forest succession	land use pressures	- large percentage of the forest in the establishment class - pre-commercial thinning to promote faster growth on climax species - balance/improve development class percentages - increase late successional species by thinning the mid-successional mixedwoods and early successional hardwood stands.
Spruce Pine Flats	Patch	Low	West Leicester	Local	Frequent	Predominately intact rS, bS with scattered bF, eH and both intolerant (wB, rM, tA) and tolerant hardwood (yB, sM)	bS rS bS	small scale	land use pressures - conversion to other uses	good distribution of development classes and seral stages - conversion of forest land in the ICSM ecosection is high (>20%) - reduce pressures - maintain low road index or low impact roads.

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Wetlands	Patch	High	Thompson Reid Meadow Stanley Road	Local	Open Seral - Frequent - Gap	bS, bF on the imperfect to poorly drained areas and rM, bS, rP, eL with scattered jP and wP on the well to imperfectly drained locations	bS bS, rS	Connectivity	Conversion	Reduce conversions of wetlands
Floodplain	Patch	High	River Hébert, West Brook, Wallace River, Halfway River, Leamington Brook, Southampton River	Local	Frequent and Gap	Partially treed with black spruce, larch, balsam fir, scattered pine and poor-quality intolerant hardwood, Some elm, sugar maple, and ash on the better-drained edges of these wetlands	rS, bS	_____	_____	Leave no human footprint
Valley Corridors	Corridors	High	Black River, South Branch Apple River, River Hébert, River Phillip, Leamington Brook, Maccan River	Fairly large and significant river corridors dissecting the ecodistrict	Frequent and Gap	bS rS, eH, wP rS, eH yB, wA aE, sM, wA	rS, bS	Settlement/ development	Non continuous forest cover (settlement/ agriculture/ forestry)	

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 540)

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
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
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
Bank Swallow	*Riparia riparia*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
Chimney Swift	*Chaetura pelagica*	Endangered	Threatened	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
DICOTS				
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
FISH				
Atlantic Salmon Inner Bay of Fundy population	*Salmo salar pop. 1*	N/A	Endangered	Endangered
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
LICHENS				
Eastern Waterfan	*Peltigera hydrothyria*	N/A	N/A	Threatened
MAMMALS				
Moose	*Alces americanus*	Endangered	N/A	N/A
MOLLUSKS				
Brook Floater	*Alasmidonta varicosa*	Threatened	N/A	Special Concern
REPTILES				
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 540)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
BIRDS	-		
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Willow Flycatcher	*Empidonax traillii*	Sensitive (Yellow)	S2B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
BRYOPHYTES			
Aloe-Like Rigid Screw Moss	*Aloina rigida*	May Be At Risk (Orange)	S1
Toothed-leaved Nitrogen Moss	*Tetraplodon angustatus*	Sensitive (Yellow)	S2S3
DICOTS			
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Swamp Milkweed	*Asclepias incarnata ssp. incarnata*	Secure (Green)	S3
Red Ash	*Fraxinus pennsylvanica*	May Be At Risk (Orange)	S1
Northern Comandra	*Geocaulon lividum*	Sensitive (Yellow)	S3
American False Pennyroyal	*Hedeoma pulegioides*	Sensitive (Yellow)	S2S3
Southern Mudwort	*Limosella australis*	Sensitive (Yellow)	S3
Yellow-seeded False Pimperel	*Lindernia dubia*	Secure (Green)	S3S4
Whorled Water Milfoil	*Myriophyllum verticillatum*	Sensitive (Yellow)	S2
Smooth Sweet Cicely	*Osmorhiza longistylis*	May Be At Risk (Orange)	S2
Halberd-leaved Tearthumb	*Polygonum arifolium*	Sensitive (Yellow)	S2
Alder-leaved Buckthorn	*Rhamnus alnifolia*	Sensitive (Yellow)	S3
Satiny Willow	*Salix pellita*	Undetermined (Undetermined)	S2S3
Northern Blueberry	*Vaccinium boreale*	May Be At Risk (Orange)	S2
Blue Vervain	*Verbena hastata*	Secure (Green)	S3
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2
FERNS AND THEIR ALLIES			
Cut-leaved Moonwort	*Botrychium dissectum*	Secure (Green)	S3
Variegated Horsetail	*Equisetum variegatum*	Secure (Green)	S3
Northern Clubmoss	*Lycopodium complanatum*	Secure (Green)	S3S4
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?

Appendix 3: Special Occurrences (Ecodistrict 540)

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***
INSECTS			
Harvester	*Feniseca tarquinius*	Secure (Green)	S3S4
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Bronze Copper	*Lycaena hyllus*	Secure (Green)	S1
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
MOLLUSKS			
Triangle Floater	*Alasmidonta undulata*	Secure (Green)	S2S3
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
Tidewater Mucket	*Leptodea ochracea*	Sensitive (Yellow)	S1
MONOCOTS			
Short-awned Foxtail	*Alopecurus aequalis*	Sensitive (Yellow)	S2S3
Slim-stemmed Reed Grass	*Calamagrostis stricta ssp. stricta*	Sensitive (Yellow)	S1S2
Hairlike Sedge	*Carex capillaris*	Sensitive (Yellow)	S2
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Lesser Rattlesnake-plantain	*Goodyera repens*	Sensitive (Yellow)	S3
Sharp-Fruit Rush	*Juncus acuminatus*	Sensitive (Yellow)	S3S4
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Small Round-leaved Orchid	*Platanthera orbiculata*	Secure (Green)	S3

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

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

Appendix 3: Special Occurrences (Ecodistrict 540)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Kelley River Wilderness Area		NSDNR Database	Environment Act
Deer Wintering Area	Ecosystems	NSDNR Database	
Bald Eagle	Species	Significant Species and Habitat Database	NS Wildlife Act
Old Forest	Ecosystems	DNR Database	Policy
Salt Marsh	Ecosystems	Significant Species and Habitat Database	NS Environment Act
Lakes - Shulie, Newville, Welton, Chase	Ecosystems	NSDNR Database	NS Environment Act NS Forest Act

Appendix 3: Special Occurrences

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

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

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS	10,029	11.0	17,125	19.0	63 to 71	5.0	49,697	11.0	70,430	15.0	63 to 72	6.0
ICSM	rS eH wP	386	0.0	16,242	18.0	48 to 55	23.0	2,777	1.0	18,108	4.0	71 to 74	32.0
IFHO	bS	1,742	2.0	17,125	19.0	39 to 42	44.0	41,970	9.0	70,430	15.0	50 to 57	22.0
IFSM	bS	451	0.0	17,125	19.0	67 to 73	2.0	1,204	0.0	70,430	15.0	78 to 84	9.0
IMHO	bS	3,473	4.0	17,125	19.0	64 to 74	2.0	111,432	24.0	70,430	15.0	55 to 64	12.0
IMSM	bS	3,430	4.0	17,125	19.0	55 to 60	21.0	6,672	1.0	70,430	15.0	51 to 55	29.0
WCDS	rS eH wP	1,007	1.0	16,242	18.0	65 to 73	4.0	1,053	0.0	18,108	4.0	83 to 93	4.0
WCHO	rS eH wP	18,039	20.0	16,242	18.0	53 to 61	16.0	40,921	9.0	18,108	4.0	54 to 61	15.0
WCKK	sM yB Be	35,466	39.0	34,764	39.0	57 to 66	9.0	43,054	9.0	36,757	8.0	55 to 62	10.0
WFHO	rS	516	1.0	5,125	6.0	64 to 68	8.0	2,157	0.0	133,552	28.0	48 to 52	27.0
WFKK	sM yB Be	102	0.0	34,764	39.0	24 to 29	55.0	17,182	4.0	36,757	8.0	46 to 52	26.0
WMHO	rS	4609	5.0	5,125	6.0	63 to 70	6.0	51,448	11.0	133,552	28.0	41 to 47	34.0
WMKK	sM yB Be	10,346	11.0	34,764	39.0	54 to 59	19.0	23,220	5.0	36,757	8.0	51 to 58	19.0
WTLD	wetlands	298	0.0	0	0.0	67 to 68	10.0	7,234	2.0	0	0.0	51 to 53	1.0

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
WCKK	sM yB Be	35,466	12.0	46	0	181	0	227	1.0	0	0.0	227	1.0
WCHO	rS eH wP	18,039	6.0	0	0	163	0	163	1.0	0	0.0	163	1.0
WMKK	sM yB Be	10,346	24.0	19	0	226	0	245	2.0	0	0.0	245	2.0
ICHO	bS	10,029	17.0	0	0	192	0	192	2.0	0	0.0	192	2.0
WMHO	rS	4,609	9.0	0	0	77	0	77	2.0	0	0.0	77	2.0
IMHO	bS	3,473	50.0	0	0	220	0	220	6.0	0	0.0	220	6.0
IMSM	bS	3,430	12.0	0	0	148	0	148	4.0	0	0.0	148	4.0
IFHO	bS	1,742	1.0	0	0	12	0	12	1.0	0	0.0	12	1.0
WCDS	rS eH wP	1,007	11.0	25	0	0	0	25	3.0	0	0.0	25	3.0
WFHO	rS	516	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFSM	bS	451	93.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	rS eH wP	386	3.0	0	0	0	0	0	0.0	0	0.0	0	0.0
XXWA		320	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	298	18.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WFKK	sM yB Be	102	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**90,214**		**90**	**0**	**1,219**	**0**	**1,309**		**0**		**1,309**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act Designation	Area by Ownership		Policy Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Designated Provincial Parks and Park Reserves	46	0	Old Forest	1,201	0
Wilderness Areas	26	0	Designated Provincial Parks and Park Reserves	143	0
Operational Non Designated Parks and Reserves	19	0	Eastern Habitat Joint Venture	60	0
Sites of Ecological Significance Under Moratorium	19	0	Operational Non Designated Parks and Reserves	0.7	0

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

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

representing the landscape in question. The calculation provides a measure of the density of the transportation network and the specific distance to the transportation features. The resulting index values are scaled to provide a potential range of 0 to 100. For the purpose of map interpretation these values have been grouped into benchmark ranges that reflect characteristic patterns of land use in Nova Scotia.

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

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

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

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	62
Utility corridors	3	1,637
Gravel roads and active railways	6	379
Paved streets and roads collectors	10	244
Highways	15	29

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	5,759	6
Forest Resource	7 to 15	37,055	41
Mixed Rural	16 to 24	28,859	32
Agriculture Suburban	25 to 39	17,086	19
Urban	40 to 100	1,450	2
Total		**90,209**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Mixedwood Hills	45,500	9
Tolerant Mixedwood Hummocks	17,180	13
Spruce Pine Hummocks	14,472	10
Red Spruce Hummocks	5,102	9
Wetlands	1,046	9
Spruce Hemlock Pine Hummocks and Hills	896	10
Floodplain	682	51
Spruce Pine Flats	605	15
Valley Corridors	4,654	34
Total	**90,137**	**12**

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

Appendix 8: Development Classes and Seral Stages

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

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

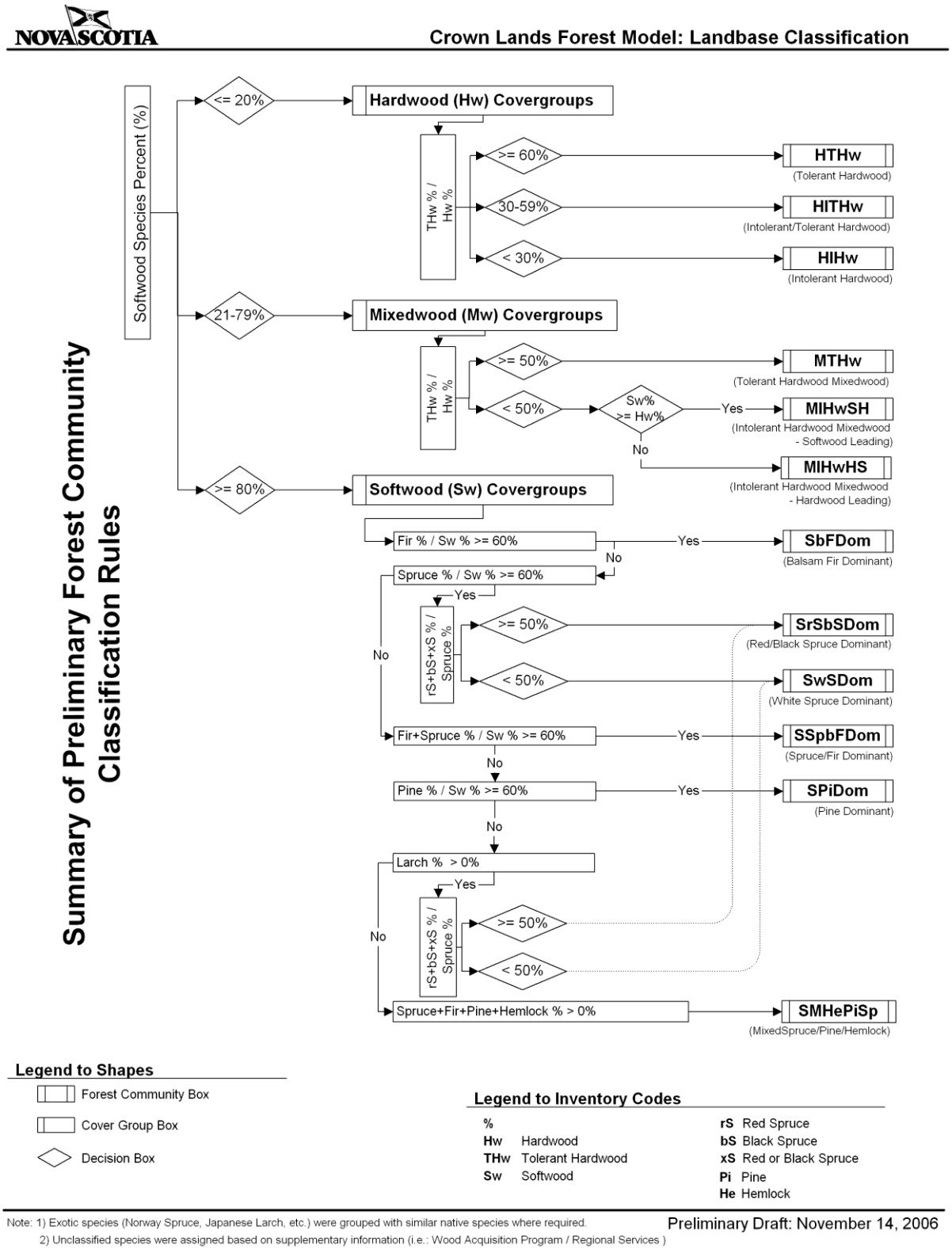
Species **Ecodistrict**

0 1 2 1 2 3 4 5 6 7 8 1 2 3 4 5 1 2 3 4 5 6 1 2 3 1 2 3 4 5 6 7 8 1 2 3 4 1
1 2 2 3 3 3 3 3 3 3 3 4 4 4 4 4 5 5 5 5 5 5 6 6 6 7 7 7 7 7 7 7 7 8 8 8 8 9

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cumberland Hills 540)

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 Mixed-wood Hills	WCKK (77.0%) WMKK (23.0%) WFKK (<1.0%)	Softwood	rS eH rSeHwP	Gap Gap	18200; 40.0	Early	124	324	537	61	1,046	12,965; 33.0	EARLY	9,172; 23.0
						Mid	393	573	912	138	2,016			
						Late	2,297	903	4,020	505	7,725			
						Uncl	2,177	0	0	0	2,177			
		Mixedwood				Early	485	317	527	108	1,437	12,732; 33.0	MID	12,453; 32.0
						Mid	1,838	1,183	3,463	778	7,262			
						Late	209	190	1,698	372	2,469			
						Uncl	1,560	0	4	0	1,564			
		Hardwood	sMyBBe	Gap	27300; 60.0	Early	759	682	3,203	218	4,862	11,144; 28.0	LATE	12,687; 32.0
						Mid	210	250	2,556	154	3,170			
						Late	16	94	2,340	43	2,493			
						Uncl	331	0	286	3	620			
		Unclassified				Early	1,812	15	0	0	1,827	2,277; 6.0	UNCL	4,805; 12.0
						Mid	6	0	0	0	6			
						Late	0	0	0	0	0			
						Uncl	443	0	0	0	443			
Total					**30,622***	**# ha**	**12,660**	**4,531**	**19,546**	**2,380**	**39,117**			
						%	**32.4%**	**11.6%**	**50.0%**	**6.1%**	**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 (Cumberland Hills 540)

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	WCHO (100.0%)	Softwood	rS eH wP	Infrequent	10,308; 60.0	Early	31	130	195	24	380	5,562; 39.0	EARLY	3,183; 23.0
						Mid	172	206	353	82	813			
						Late	766	270	1,812	208	3,056			
						Uncl	1,313	0	0	0	1,313			
		Mixedwood				Early	99	171	335	85	690	4,514; 32.0	MID	3,811; 27.0
						Mid	279	363	1,381	304	2,327			
						Late	170	29	580	70	849			
						Uncl	647	0	0	0	647			
		Hardwood	sM yB Be	Infrequent	6,872; 40.0	Early	125	248	1,299	112	1,784	3,377; 24.0	LATE	4,567; 32.0
						Mid	29	41	568	33	671			
						Late	1	21	587	53	662			
						Uncl	169	0	90	0	259			
		Unclassified				Early	328	0	0	0	328	656; 5.0	UNCL	2,547; 18.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	328	0	0	0	328			
Total					**17,180***	**# ha**	**4,457**	**1,479**	**7,200**	**971**	**14,107**			
						%	**31.6**	**10.5**	**51.0**	**6.9**	**100.0**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cumberland Hills 540)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Hummocks	ICHO (65.0%) IMHO (23.0%) IFHO (12.0%)	Softwood	bS	Frequent	14,472; 100.0	Early	35	62	77	8	182	5,958; 48.0	EARLY	1,797; 15.0
						Mid	57	161	389	71	678			
						Late	217	662	2,941	267	4,087			
						Uncl	1,010	0	0	0	1,010			
		Mixedwood				Early	8	73	224	15	320	3,561; 29.0	MID	3,241; 26.0
						Mid	101	232	1,419	169	1,921			
						Late	30	27	756	50	863			
						Uncl	457	0	0	0	457			
		Hardwood				Early	68	145	748	40	1,001	2,269; 18.0	LATE	5,483; 45.0
						Mid	46	33	535	26	640			
						Late	0	12	517	4	533			
						Uncl	47	0	49	0	96			
		Unclassified				Early	295	0	0	0	295	503; 4.0	UNCL	1,770; 14.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	208	0	0	0	208			
Total					**14,472***	**# ha**	**2,579**	**1,407**	**7,655**	**650**	**12,291**			
						%	**21.0%**	**11.4%**	**62.3%**	**5.3%**	**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 (Cumberland Hills 540)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Red Spruce Hummocks	WMHO (90.0%) WFHO (10.0%)	Softwood	rS	Frequent	5,102; 100.0	Early	15	10	14	1	40	1,375; 30.0	EARLY	1,264; 28.0
						Mid	19	38	57	17	131			
						Late	58	126	649	74	907			
						Uncl	297	0	0	0	297			
		Mixedwood				Early	4	18	46	16	84	1,296; 28.0	MID	1,318; 29.0
						Mid	9	114	624	83	830			
						Late	0	12	153	18	183			
						Uncl	201	0	0	0	201			
		Hardwood				Early	16	198	826	62	1,102	1,706; 37.0	LATE	1,219; 27.0
						Mid	5	28	307	18	358			
						Late	0	1	129	0	130			
						Uncl	42	0	75	0	117			
		Unclassified				Early	39	0	0	0	39	173; 4.0	UNCL	750; 16.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	134	0	0	0	134			
Total					**5,102***	**# ha**	**839**	**545**	**2,880**	**289**	**4,553**			
						%	**18.4%**	**12.0%**	**63.3%**	**6.3%**	**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 (Cumberland Hills 540)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Wetlands	IMSM (98.0%) WTLD (2.0%)	Softwood	bS	Frequent	421; 40.0	Early	2	2	6	0	10	624; 77.0	EARLY	89; 11.0
						Mid	24	44	20	3	91			
						Late	38	202	195	26	461			
						Uncl	64	0	0	0	64			
		Mixedwood				Early	0	4	11	0	15	98; 12.0	MID	144; 18.0
						Mid	0	10	30	2	42			
						Late	0	4	7	0	11			
						Uncl	30	0	0	0	30			
		Hardwood	aE sM wA	Gap	307; 29.0	Early	0	9	32	1	42	54; 7.0	LATE	471; 58.0
						Mid	0	6	5	0	11			
						Late	0	0	0	0	0			
						Uncl	2	0	0	0	2			
		Unclassified				Early	23	0	0	0	23	31; 4.0	UNCL	103; 13.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	8	0	0	0	8			
Total					**1,046***	**# ha**	**191**	**281**	**306**	**32**	**810**			
						%	**23.6%**	**34.7%**	**37.8%**	**4.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cumberland Hills 540)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Hemlock Pine Hummocks and Hills	WCDS (100.0%)	Softwood	rS eH wP	Infrequent	896; 100.0	Early	0	11	15	3	29	260; 31.0	EARLY	66; 8.0
						Mid	0	6	40	22	68			
						Late	0	1	123	2	126			
						Uncl	36	0	0	0	36			
		Mixedwood				Early	17	0	9	3	29	240; 28.0	MID	165; 19.0
						Mid	4	1	66	17	88			
						Late	0	0	59	8	67			
						Uncl	54	0	0	0	54			
		Hardwood				Early	0	1	6	1	8	316; 37.0	LATE	474; 56.0
						Mid	0	2	4	0	6			
						Late	0	1	280	0	281			
						Uncl	14	0	6	0	20			
		Unclassified				Early	0	0	0	0	0	30; 4.0	UNCL	141; 17.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	30	0	0	0	30			
Total					**896***	**# ha**	**155**	**23**	**608**	**56**	**842**			
						%	**18.4%**	**2.7%**	**72.2%**	**6.7%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cumberland Hills 540)

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	IMSM (37.0%) WCHO (18.0%) ICHO (13.0%) WCKK (8.0%) WTLD (6.0%) ICSM (5.0%) IMHO (4.0%) WCDS (2.0%) WMKK (1.0%)	Softwood	bS rS eH wP rS eH	Frequent Infrequent Infrequent	2,520	Early	12	36	69	9	126	1,197; 56.0	EARLY	482; 23.0
						Mid	16	40	128	29	213			
						Late	48	159	348	67	622			
						Uncl	237	0	0	0	237			
		Mixedwood				Early	7	20	73	27	127	545; 25.0	MID	562; 26.0
						Mid	9	42	164	62	277			
						Late	2	27	51	7	87			
						Uncl	54	0	0	0	54			
		Hardwood	sM yB Be aE sM wA	Gap	1,110	Early	31	29	145	17	222	356; 17.0	LATE	762; 36.0
						Mid	1	5	45	21	72			
						Late	0	0	53	0	53			
						Uncl	7	0	2	0	9			
		Unclassified				Early	8	0	0	0	8	44; 2.0	UNCL	336; 16.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	36	0	0	0	36			
Total					**4,654***	**# ha**	**468**	**358**	**1,078**	**239**	**2,143**			
						%	**21.8%**	**16.7%**	**50.3%**	**11.2%**	**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 (Cumberland Hills 540)

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	bS	Frequent	273; 40.0	Early	0	6	7	0	13	229; 57.0	EARLY	51; 13.0
						Mid	0	6	21	0	27			
						Late	4	23	113	9	149			
						Uncl	39	0	0	0	39			
		Mixedwood				Early	1	2	1	4	8	104; 26.0	MID	89; 22.0
						Mid	6	8	27	8	49			
						Late	1	0	31	2	34			
						Uncl	12	0	0	0	12			
		Hardwood	aE sM wA	Gap	205; 30.0	Early	8	9	5	8	30	65; 16.0	LATE	200; 50.0
						Mid	1	1	10	1	13			
						Late	0	0	17	0	17			
						Uncl	6	0	0	0	6			
		Unclassified				Early	0	0	0	0	0	5; 1.0	UNCL	63; 16.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	5	0	0	0	5			
Total					**682***	**# ha**	**83**	**55**	**232**	**32**	**402**			
						%	**20.6%**	**13.7%**	**57.7%**	**8.0%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cumberland Hills 540)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats	IFSM (71.0%) ICSM (29.0%)	Softwood	bS rS eH wP	Frequent Frequent	449	Early	0	0	5	0	5	350; 67.0	EARLY	48; 9.0
						Mid	0	4	34	2	40			
						Late	14	10	158	39	221			
						Uncl	86	0	0	0	86			
		Mixedwood				Early	1	0	3	0	4	57; 11.0	MID	112; 21.0
						Mid	1	1	16	10	28			
						Late	0	16	9	0	25			
						Uncl	0	0	0	0	0			
		Hardwood				Early	3	10	25	0	38	114; 22.0	LATE	275; 53.0
						Mid	6	6	30	3	45			
						Late	0	0	30	0	30			
						Uncl	2	0	0	0	2			
		Unclassified				Early	2	0	0	0	2	3; 1.0	UNCL	89; 17.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
Total					**605***	**# ha**	**116**	**47**	**310**	**54**	**527**			
						%	**22.0%**	**8.9%**	**58.8%**	**10.2%**	**100.0%**			

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Appendix 10: Table 2: Composition of Forest Communities (in Cumberland 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 Hills	WCKK WMKK WFKK XXWA	Gap Gap Gap	sM yB Be sM yB Be sM yB Be	S	SrSbSDom	10,104	27.4%	L	Well-drained: Early - tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid - rS, bF, stair-step moss - rM, hay-scented fern, wood sorrel Late - sM, yB, New York fern - sM, wA, - Christmas fern - sM yB, hay scented fern - rS eH, starflower - eH, rS, wild lily-of-the- valley, yB, rS, wood fern
				S	SwSDom	772	2.1%	E	
				S	SspbFDom	767	2.1%	L	
				S	SpiDom	634	1.7%	L	
				S	SbFDom	524	1.4%	E	
				S	SMHePiSp	164	0.4%	L	
				M	MIHwSH	6,128	16.6%	M	
				M	MIHwHS	4,800	13.0%	M	
				M	HTHw	1,804	4.9%	L	
				H	HIHw	7,228	19.6%	M	
				H	HTHw	2,834	7.7%	L	
				H	HITHw	1,082	2.9%	M/L	
Total						**36,841**	**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 Cumberland 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	WCHO	Infrequent	rS eH wP	S	SrSbSDom	4,466	33.2%	L	**Well-drained:** Early - tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid - rS, bF, stair-step moss - rM, hay-scented fern, wood sorrel Late - sM, yB New York fern - sM, wA, Christmas fern - sM yB, hay scented fern - rS eH, starflower - eH, rS, wild lily-of- the-valley yB, rS, wood fern
				S	SspbFDom	330	2.5%	L	
				S	SbFDom	265	2.0%	E	
				S	SwSDom	220	1.6%	E	
				S	SMHePiSp	156	1.2%	L	
				S	SpiDom	126	0.9%	L	
				M	MIHwSH	2,368	17.6%	M	
				M	MIHwHS	1,527	11.3%	M	
				M	MTHw	619	4.6%	L	
				H	HIHw	2,288	17.0%	M	
				H	HTHw	793	5.9%	L	
				H	HITHw	296	2.2%	M/L	
Total						**13,454**	**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 Cumberland Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stag	Successional Types
Spruce Pine Hummocks	ICHO IMHO IFHO	Frequent	bS	S	SrSbSDom	5,112	43.4%	L	**Well-drained:** Early: tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid: rS, bF, stair-step moss - rM, hay-scented fern, wood sorrel Late: sM, yB, New York fern - sM, wA, Christmas fern - sM yB, hay scented fern - rS eH, starflower - eH, rS, wild lily-of-the-valley - yB, rS, wood fern Well to imperfect drained: bS, cinnamon fern, sphagnum bS, false holly, wild raisin rP, bS sphagnum rM, bf - sensitive fern eL, bS -sedge (jP and wP) **Poorly drained** - scrubby wetlands of shrubs and stunted trees.
				S	SspbFDom	245	2.1%	L	
				S	SpiDom	213	1.8%	L	
				S	SMHePiSp	183	1.6%	L	
				S	SbFDom	157	1.3%	E	
				S	SwSDom	48	0.4%	E	
				M	MIHwSH	1,737	14.7%	M	
				M	MIHwHS	1,156	9.8%	M	
				M	MTHw	668	5.7%	L	
				H	HIHw	1,503	12.7%	M	
				H	HTHw	606	5.1%	L	
				H	HITHw	160	1.4%	M/L	
Total						**11,788**	**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 Cumberland 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
Red Spruce Hummocks	WMHO WFHO	Frequent	rS	S	SrSbSDom	1,218	27.8%	L	**Well-drained:** Early - tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid - rS, bF, stair-step moss - rM, hay-scented fern, wood sorrel Late - sM, yB New York fern - sM, wA, Christmas fern - sM yB, hay scented fern - rS eH, starflower - eH, rS, wild lily-of-the-valley, yB, rS, wood fern
				S	SpiDom	72	1.6%	L	
				S	SspbFDom	27	0.6%	L	
				S	SwSDom	17	0.4%	E	
				S	SbFDom	14	0.3%	E	
				S	SMHePiSp	27	0.6%	L	
				M	MIHwSH	628	14.4%	M	
				M	MIHwHS	613	14.0%	M	
				M	MTHw	55	1.3%	L	
				H	HIHw	1,454	33.2%	M	
				H	HTHw	207	4.7%	L	
				H	HITHw	45	1.0%	M/L	
Total						**4,377**	**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 Cumberland 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
Spruce Hemlock Pine Hummocks and Hills	WCDS	Infrequent	rS eH wP	S	SrSbSDom	182	22.3%	L	**Well-drained:** Early: -tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid: rS, bF, stair-step moss - rM, hay-scented fern, wood sorrel Late: -sM, yB New York fern - sM, wA, Christmas fern - sM yB, hay scented fern - rS eH, starflower - eH, rS, wild lily-of-the-valley, yB, rS, wood fern
				S	SbFDom	48	5.9%	E	
				S	SspbFDom	24	3.0%	L	
				S	SwSDom	5	0.6%	E	
				M	MTHw	205	25.1%	L	
				M	MIHwSH	21	2.6%	M	
				M	MIHwHS	14	1.7%	M	
				H	HTHw	301	36.9%	L	
				H	HIHw	8	1.0%	M	
				H	HITHw	7	0.8%	M	
Total						**815**	**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 Cumberland 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
Spruce Pine Flats	IFSM ICSM	Frequent	bS rS eH wP	S	SrSbSDom	336	64.4%	L	**Well to imperfect drained** bS, cinnamon fern, sphagnum bS, false holly, wild raisin rP, bS sphagnum rM, bf - sensitive fern eL, bS -sedge (jP and wP) **Well-drained** Early - tA, honeysuckle, wood aster - rM, tA, bunchberry - rM, wB, sarsaparilla Mid - rS, bF, stair-step moss Late - rS eH, starflower - eH, rS, wild lily-of-the-valley yB, rS, wood fern **Poorly drained** scrubby wetlands of shrubs and stunted trees.
				S	SspbFDom	9	1.7%	L	
				S	SbFDom	6	1.1%	E	
				M	MIHwSH	28	5.3%	M	
				M	MTHw	25	4.8%	L	
				M	MIHwHS	4	0.9%	M	
				H	HIHw	61	11.8%	M	
				H	HTHw	32	6.1%	L	
				H	HITHw	21	4.0%	M/L	
Total						**522**	**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 Cumberland 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	IMSM WCHO ICHO WCKK WTLD XXWA ICSM IMHO WCDS WMKK	Frequent Infrequent Frequent Gap Open seral Frequent Frequent Infrequent Gap	bS rS eH wP bS sM yB Be rS eH wP bS rS eH wP sM yB Be	S	SrSbSDom	940	44.8%	L	Corridors cut through different element types -see other elements for successional types
				S	SspbFDom	87	4.2%	L	
				S	SbFDom	58	2.8%	E	
				S	SwSDom	53	2.5%	E	
				S	SpiDom	48	2.3%	L	
				S	SMHePiSp	11	0.5%	L	
				M	MIHwSH	297	14.1%	M	
				M	MIHwHS	160	7.6%	M	
				M	MTHw	88	4.2%	L	
				H	HIHw	266	12.7%	M	
				H	HTHw	64	3.0%	L	
				H	HITHw	26	1.3%	M/L	
Total						**2,098**	**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 Cumberland 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	IMSM WTLD	bS	Frequent Open seral	S	SrSbSDom	607	78.3%	L	(IMSM) **well-drained** Early alders/shrubs Mid black cherry, white spruce Late wA, sM - ostrich fern **Well to imperfect drained** - bS, cinnamon fern-sphagnum/ bS, false holly, wild raisin / rP, bS sphagnum / rM, bf - sensitive fern / eL, bS - sedge (jP and wP) **Poorly drained** Scrubby wetlands of shrubs and stunted trees.
				S	SpiDom	9	1.2%	L	
				S	SMHePiSp	5	0.6%	L	
				S	SspbFDom	2	0.3%	L	
				S	SwSDom	1	0.1%	E	
				M	MIHwSH	69	8.9%	M	
				M	MIHwHS	28	3.6%	M	
				H	HIHw	54	7.0%	M	
Total						**775**	**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 Cumberland 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	Frequent	bS	S	SrSbSDom	179	45.1%	L	**Well-drained**: Early alders/shrubs Mid black cherry, white spruce Late wA, sM - ostrich fern **Well to imperfectly drained** - bS, cinnamon fern-sphagnum / bS, false holly, wild raisin / rP, bS sphagnum / rM, bf - sensitive fern / eL, bS - sedge (jP and wP) **Poorly drained** scrubby wetlands of shrubs and stunted trees.
				S	SpiDom	18	4.5%	L S	
				S	SspbFDom	15	3.8%	L S	
				S	SwSDom	7	1.8%	E S	
				S	SMHePiSp	5	1.3%	L S	
				S	SbFDom	5	1.3%	E	
				M	MIHwSH	50	12.6%	M	
				M	MTHw	37	9.3%	L	
				M	MIHwHS	16	4.0%	M	
				H	HIHw	33	8.3%	M	
				H	HTHw	24	6.0%	L	
				H	HITHw	8	2.0%	M/L	
Total						**397**	**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	34,764	39.0%	36,757	8.0%
bS	17,125	19.0%	71,985	15.0%
rS eH wP	16,242	18.0%	18,108	4.0%
rS eH	14,186	16.0%	14,186	3.0%
rS	5,125	6.0%	133,552	28.0%
aE sM wA	1,029	1.0%	3,356	1.0%
Total	**88,471**	**99.0%***	**277,944**	**59.0%****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

Ecological Emphasis Class	Conservation Factor	Description
Reserve	**1**	• Reserved lands which meet biodiversity conservation goals through preservation of natural conditions and processes. Resource management activities are not usually permitted except where required to perpetuate desired natural conditions. This class is assigned based on the types of laws and policies governing the management (for example: Wilderness, Parks, Conservation Easement, Old Forest Policy).
Extensive	**0.75**	• Lands managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and processes. • Forestry practices employ ecosystem-based prescriptions which consider natural disturbance regimes, successional trends, structure, and composition. Natural regeneration is favoured to provide the next forest. Practices may include protection from fire and insects. • Management complies with the Forest Code of Practice and excludes the use of herbicides, exotic tree species, off-site native species, genetically modified organisms, and 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 Mixedwood Hills	45,464	464	30,510	2,633	5,047	6,810	25,707 to 29,112	57 to 64
Tolerant Mixedwood Hummocks	17,158	161	10,589	876	2,590	2,942	9,057 to 10,528	53 to 61
Spruce Pine Hummocks	14,458	378	10,321	146	1,278	2,335	8,739 to 9,907	60 to 69
Red Spruce Hummocks	5,096	75	3,914	71	328	708	3,205 to 3,559	63 to 70
Wetlands	1,046	15	891	0	14	126	715 to 778	68 to 74
Spruce Hemlock Pine Hummocks and Hills	893	17	682	3	35	156	569 to 647	64 to 72
Valley Corridors	4,407	170	2,856	94	917	370	2,428 to 2,613	55 to 59
Floodplain	677	36	331	10	222	78	306 to 345	45 to 51
Spruce Pine Flats	604	0	454	11	46	93	366 to 413	61 to 68
Total	**89,803**	**1,316**	**60,548**	**3,844**	**10,477**	**13,617**	**51,093 to 57,902**	**57 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
ICHO	10,022	192	7,666	91	500	1,573	6,358 to 7,144	63 to 71
ICSM	385	0	226	17	90	52	187 to 213	49 to 55
IFHO	1,742	12	841	5	761	123	675 to 736	39 to 42
IFSM	450	0	378	0	9	63	299 to 331	67 to 74
IMHO	3,476	220	2,399	61	78	718	2,214 to 2,573	64 to 74
IMSM	3,428	148	2,201	29	713	337	1,890 to 2,059	55 to 60
WCDS	1,007	25	777	4	36	166	650 to 733	65 to 73
WCHO	18,049	163	11,115	909	2,834	3,028	9,484 to 10,997	53 to 61
WCKK	35,466	227	24,105	2,248	3,037	5,849	20,330 to 23,255	57 to 66
WFHO	516	0	420	7	42	47	329 to 352	64 to 68
WFKK	103	0	27	10	56	10	25 to 30	25 to 29
WMHO	4,607	77	3,513	64	287	666	2,895 to 3,227	63 to 70
WMKK	10,342	245	6,687	403	2,016	991	5,609 to 6,104	54 to 59
WTLD	299	0	263	0	30	6	199 to 202	66 to 67
Total	**89,893**	**1,309**	**60,618**	**3,848**	**10,489**	**13,625**	**51,141 to 57,954**	**57 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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