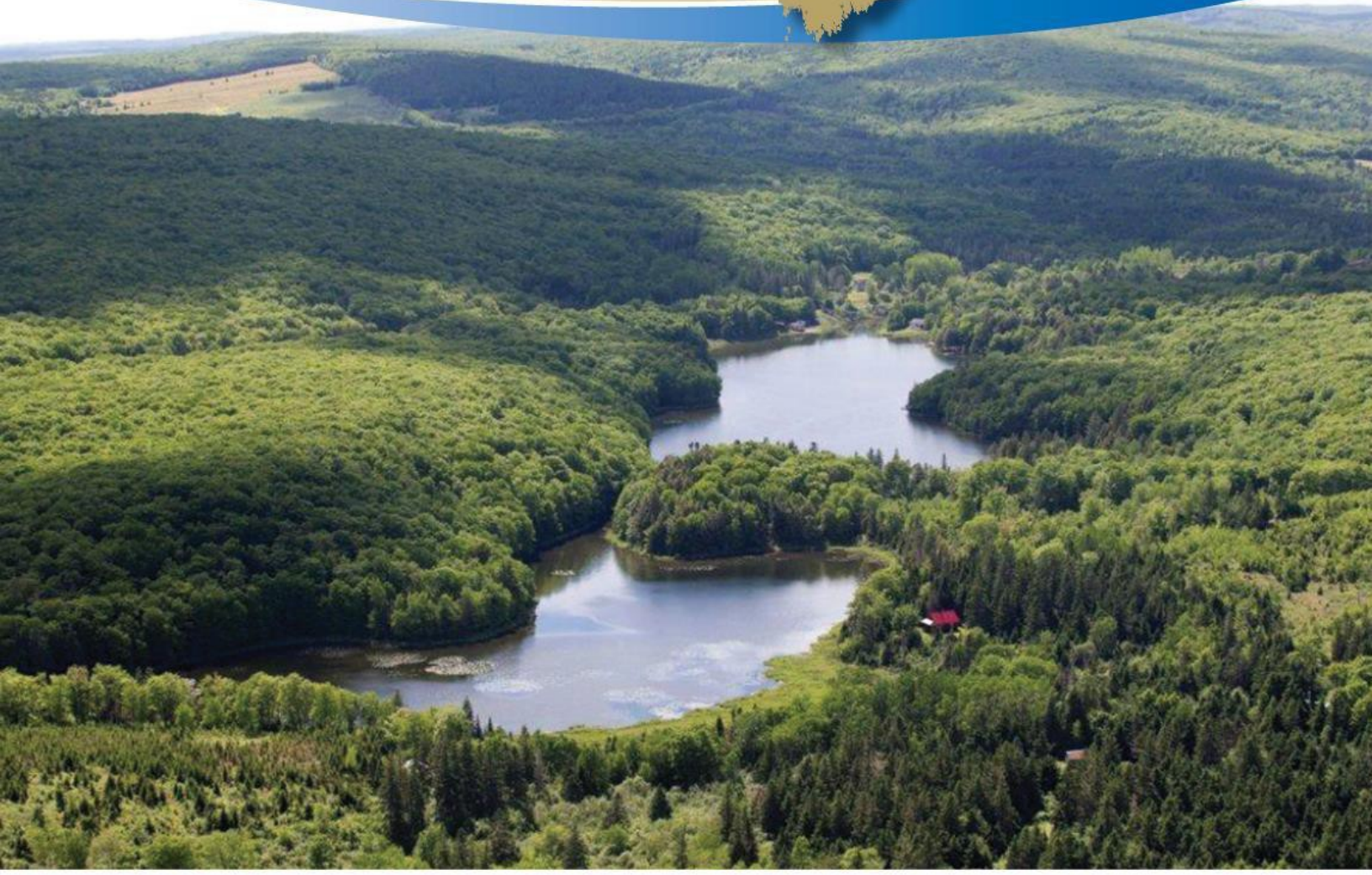
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS COBEQUID HILLS ECODISTRICT 340

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-340

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 340: Cobequid Hills

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

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Cobequid 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 (1994) – stand volume, species composition
- Crown Lands Forest Model landbase classification (2006) – provides forest inventory update for harvesting and silviculture from satellite photography (2005), silviculture treatment records (2006) and forest age increment (2006)
- Roads and Utility network – Service Nova Scotia and Municipal Relations (2006)
- Significant Habitat and Species Database (2007)
- Atlantic Canada Data Conservation Centre (2013)

Conventions

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

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

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

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

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Understanding the Landscape as an Ecological System

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

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

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

Elements Within Landscapes (Map 2)

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

Tolerant Hardwood Hills is the matrix element, representing more than 65% of the ecodistrict. This element naturally supports long-lived hardwood species that grow well in shade, such as sugar maple, yellow birch, and beech.

The two largest patch elements are close in size, each representing about 12% of the ecodistrict. **Tolerant Mixedwood Hummocks** is very fragmented, with the largest areas occurring in Economy Lake and Lynn Mountain. **Red and Black Spruce Hummocks** is distributed throughout the ecodistrict. The two other patch elements are **Tolerant Mixed Slopes** at a little over 7% of the area and the tiny **Wetlands** element. **Valley Corridors** is a linear element associated with the about 20 major watercourses in the ecodistrict.

Comparisons with the current conditions determined that some of the ecological structure has been altered within the ecodistrict. Tolerant Hardwood Hills is still the dominant element. Past harvesting, insect and diseases and human settlement has altered the overall structure. Hardwood communities have been reduced from 77% to 44%. Early and mid-seral species of red maple, white spruce, balsam fir, and white birch comprise some 30% of the ecodistrict. Late seral species of red and black spruce, sugar maple, yellow birch, and hemlock comprise 53% of the area.

Areas that have changed in land use or been converted are most notable around Scotsburn, Fitzpatricks Mountain, Green Hill, Folly Lake, and the Salt Springs area.

River corridors promote connectivity.

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, moose, deer, black bear, raptors, and furbearers.

There is a natural percolation or movement throughout the ecodistrict, but more specific locations of the flow phenomena are shown in Map 2. The more prominent flow areas are the transportation and utility corridors as well as the Snowmobilers Association of Nova Scotia (SANS) trails that also provide linkages to other ecodistricts.

As an example of the flow–element interactions, deer move away from the Cobequid Hills in times of deep snow and down to use the lower valley along the Parrsboro Shore as a wintering area. The shore line, which has more softwood and mixedwood areas, has also been altered by human intervention, such as harvesting, agriculture, and settlement. These areas not only provide shelter but browse in the changed structure of the forest to more early and young development classes.

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)

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

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

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

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

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

The Cobequid Hills is now dominated by a somewhat changed structure that does not represent the inherent natural conditions that once characterized this landscape. Human land use, transportation

systems, trails, and utility corridors have fragmented some of the element types, reducing the connective functions.

An additional concern inherent in all 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 natural disturbance regime (NDR) guidelines for landscape composition and recognizing natural linkage opportunities.

Connectivity and management issues include:

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

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

Landscape flows are identified with major linkages to adjacent areas or ecodistricts (Map 2). The hydrological system provides the most obvious physical connection among the Parrsboro Shore 910, Cumberland Hills 310, Northumberland Lowlands 530, Cobequid Slopes 350, and Central Uplands 380 ecodistricts.

The main corridors follow the main river valleys of several rivers and brooks including the Fox, Farrells, East and West Branch, Moose, Harrington, Bass, East, Economy, Murphy Brook, Portapique, Great Village, Folly, Chiganois, Debert, North, Salmon, Six Mile Brook, Four Mile Brook, and West.

These river systems occur throughout the seven watershed areas of the Salmon River, Economy, Pictou, Parrsboro, River Hebert, Wallace, and River John. Deer move out of the higher elevations in winter down through the southern sections of the ecodistrict and into their wintering areas along the shores of the Bay of Fundy from Parrsboro, Economy, Debert, and Central North River.

People provide many linkages into adjoining ecodistricts through their many activities of recreation, transportation, fishing, hunting, forest management, utilities development, and settlements.

Future land management activities should recognize significant linkages to those neighbouring ecodistricts and apply management practices to enhance and sustain connectivity.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

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

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Tolerant Hardwood Hills	IH6, IH7, MW4, MW5	14.0	TH7, TH8	17.0	**TH1, TH2,** TH3, TH4, TH5	53.0
Tolerant Mixedwood Hummocks	IH6, MW4, MW5	9.0	MW2, SH5, SH6, SH8	17.0	MW1, MW3, SH1 **TH1, TH2, TH3**	64.0
Tolerant Mixedwood Slopes	IH6, MW4, MW5	9.0	MW2, SH5, SH8	14.0	**MW1, MW3,** SH1	70.0
Red and Black Spruce Hummocks	MW4, MW5, IH6	13.0	MW2, SH5, SH6, SH8	22.0	**SH3,** SP7	44.0
Wetlands	FP3, WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8,					

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

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

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

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

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

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

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

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

A summary of these land use intensities provides an overall EEI of 60 to 68 for the ecodistrict (Appendix 12a).

The extensive forest management class is most common, accounting for 123,234 hectares, or 65% of the total area. Following, in order of size, are the unclassified class at 30,572 hectares (16%), conversion to non-forest area at 13,951 hectares (7%), intensive forest management at 11,233 hectares (6%), and reserve class at 10,287 hectares (5%).

The reserve class is divided into two categories: legal reserves and policy reserves.

The legal reserves are those areas that have legal status under the IUCN (International Union for the Conservation of Nature) codes of I, II, or III such as wilderness areas, protected beaches, and designated provincial parks.

The policy reserves are those that set aside areas under various provincial policies such as the old forests or the Eastern Habitat Joint Venture Lands. Representation within Cobequid Hills is relatively low because of the 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 or ecoregion.

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

Road Index (Appendices 6, 7; Map 5)

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

In discussing road ecology, Forman (2004) describes five distinctive landscape types in North America: city-suburb, agricultural, forestry, arid-grassland, and natural landscape. Each landscape type has a characteristic pattern of road networks with distinctive ecological effects and planning

considerations (Forman & Hersperger 1996). These were adapted in Nova Scotia to classify five Road Index Benchmark Ranges associated with particular land use settings:

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

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

Low road density areas are important features for biodiversity conservation. Planning should consider block scheduling options, life expectancy, class requirements, decommissioning strategies, and overall landscape function, in order to develop efficient access systems designed to minimize environmental impacts.

Currently, Cobequid Hills has an overall RI value of 7.5 (Appendix 7, Table 3). This average falls within the Forest Resource Index range of 7 to 15 and may be described as moderately low. This Category represents 44%, or 82,873 hectares, of the ecodistrict (Appendix 7, Table 2).

Only 19%, or 37,037 hectares, of the ecodistrict has a Remote RI of 0 to 6 (Appendix 7, Table 2).

As expected, the highest road densities occur around the settlements, town and main transportation systems. Only 1% of the area of this ecodistrict is in the Urban category. Mixed Rural accounts for 27% of the ecodistrict and Agriculture Suburban for 9%.

Opportunities for road and trail access in a design phase include:

- Conserve the relatively low road densities within the matrix (RI of 8) through strategic scheduling of new access and decommissioning where possible. Private woodland owners may be able to decommission select roads and share access.
- Access systems must be scheduled for regular maintenance or decommissioning, particularly where connectivity or additional reserves are to be established.
- Recreational trails should utilize old abandoned trails or logging roads before additional trails are established.
- Seek to improve the distribution and connectivity among the few low road density areas, especially near Lynn Mountain, Black Brook, and Earltown, where this may improve connectivity among natural areas and linkages to neighbouring ecodistricts (Map 5).

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

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

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

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

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

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

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

Species at Risk

The term "species at risk" is generally used to describe those species that are, to some extent, protected under provincial or federal endangered species legislation. Usually these species are protected where they occur on provincial, federal, and private lands. In Nova Scotia, the two main pieces of endangered species legislation are the Nova Scotia Endangered Species Act (NSESA) and the federal Species at Risk Act (SARA). Species can be classified as "endangered," "threatened," "vulnerable/special concern," or as "extinct" or "extirpated." In most cases for species at risk, recovery planning and special management are in place, as well as legal protection (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 Cobequid Hills Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species: six endangered, three threatened, and three vulnerable. In addition to the listed species, the National General Status process also identifies 11 orange-listed species, 41 yellow-listed species, 20 green-listed species, and seven undetermined species for a total of 79 other species of conservation concern in this ecodistrict.

Designated species at risk found within the Cobequid Hills Ecodistrict include Atlantic salmon, black ash, monarch butterfly, wood turtle, moose (mainland), little brown myotis, northern long-eared myotis, prototype quillwort, and several bird species (olive-sided flycatcher, eastern wood-pewee, bobolink, rusty blackbird, barn swallow, wood thrush, and Canada warbler).

Other species of conservation concern known for the Cobequid Hills Ecodistrict include cliff swallow, spotted sandpiper, and eastern bluebird (birds); round-lobed hepatica, smooth sweet cicely, and northern bedstraw (dicots); lance-leaf grape-fern and fragrant wood fern (ferns and their allies); arctic fritillary and mustard white (insects); blistered tarpaper lichen (lichens); long-tailed shrew (mammals); eastern lampmussel and tidewater mucket (mollusks); short-awed foxtail and showy lady’s-slipper (monocots).

Birds

As of 2013, seven species of birds found to be present in the ecodistrict are designated at risk. Six of these are listed under the NSESA: Canada warbler, barn swallow, and rusty blackbird as endangered; olive-sided flycatcher as threatened; and bobolink and eastern wood-pewee as vulnerable. Nationally, three species are listed under SARA: olive-sided flycatcher and Canada warbler as threatened; and rusty blackbird as special concern.

COSEWIC has designated all seven species – olive-sided flycatcher, bobolink, barn swallow, wood thrush, and Canada warbler – as threatened and the eastern wood-pewee and rusty blackbird 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 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 clearing 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.
The rusty blackbird and wood thrush declines are attributed to habitat changes including those occurring in the wintering grounds.

Barn swallows have declined across North America since the 1980s. They nest at artificial sites such as barns, under bridges, culverts near farmlands, marshes, lakes, and rural areas. The loss of important artificial nesting substrates and changes to farming practices may be implicated with population declines.

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

Dicots

The only species at risk documented for the Cobequid Hills is black ash. *In 2013, Black Ash was listed under the NSESA as threatened.* There are an estimated 1,000 individual black ash trees and only 12 mature trees in the province. There is only documentation of one sapling known in this ecodistrict, found near Mount Thom.

Ferns and Their Allies

Prototype quillwort is listed under the NSESA as vulnerable and of special concern by SARA and COSEWIC.

Prototype quillwort is an aquatic perennial that typically grows in dense mats rooted to the bottom of cold, nutrient poor, spring-fed lakes. This species is known to occur in 13 lakes in northeastern North America, with nine of them being in Nova Scotia. A wide range of potential limiting factors could impact the population, including changes in water quality, boating, and shoreline development.

Prototype quillwort can be found in three lakes within the Cobequid Hills Ecodistrict.

Fish

Historically, Atlantic salmon have utilized many of the rivers systems found in this ecodistrict, including Economy, Portapique, Great Village, Folly, Chiganois, and Debert, 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 Species at Risk Act.

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. They are grouped with the milkweed butterflies of the family Danaidae, which also includes the viceroy. The monarch is the most common of this group, occurring throughout the U.S. and Southern Canada and it is also one of the few butterflies that are migratory.

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

Mammals

Moose on the mainland of Nova Scotia have been listed as endangered under the Nova Scotia Endangered Species Act (2003). Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy. The Cobequid Hills Ecodistrict 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 they are reported to occur throughout it in low numbers.

Moose are commonly associated with forested landscape habitats that have frequently been altered by a disturbance regime, such as fire, wind, disease, and timber harvesting.

The habitat requirements of moose are largely dependent on successional forest stages. Early successional hardwood trees and shrubs provide important browse while mature conifer cover is available for shelter, thermal cover, and protection in winter and summer. Secluded wetland areas with 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 aim 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, maintenance of reasonable age class distribution, and maintenance of a 20 metre buffer zone along watercourses.

In 2013, the little brown myotis and northern long-eared myotis were listed under the NSESA as endangered. The population of both bat species has experienced an alarming decline due to a disease known as white-nose syndrome caused by the fungus *Pseudogymnoascus destructans*. The disease has killed nearly seven million bats in eastern North America in the past eight years and estimates of a 90% decline in Nova Scotia over three years.

Currently there is no known cure for the disease that affects all bats that hibernate in caves and abandoned mines during the winter. There are three abandoned mines in the ecodistrict that are documented hibernation sites.

Reptiles

Wood turtles are designated by COSEWIC as threatened and under the federal SARA and NSESA. Based on species occurrence information, Cobequid Hills is not likely to support a large number of wood turtles.

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

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

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

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

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

340 Cobequid Hills Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Hills (Matrix)	WCKK WMKK WFKK WFHO IFKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Tolerant Mixedwood Hummocks (Patch)	WCHO WMHO	Gap	red Spruce (rS), eastern Hemlock (eH), yB
Red and Black Spruce Hummocks (Patch)	ICHO ICSM IFHO	Frequent	rS, black Spruce (bS)
Tolerant Mixedwood Slopes (Patch)	WCDS WMDS	Gap	rS, eH, white Pine (wP), yB, sM
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, red Maple (rM), tamarack (tL)
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

Six of the thirteen ecosections (IFHO, IFKK, WFHO, WMDS, WMHO, and WTLD) found in Cobequid Hills Ecodistrict 340 each comprise less than 2% of the ecodistrict.

The red spruce-hemlock-sugar maple-yellow birch-beech forest community within the WMHO ecosection has the highest land use pressures within the ecoregion, with 66% converted to human settlement, farming, and other development activities.

No ecosection is more than 70% converted. Old growth stands have been identified on 9,383 hectares, or 30%, of the Crown lands within this ecodistrict are under the Old Forest Policy. Opportunities for management to address fine filter conservation issues include:

- Recognizing uncommon forest species for which genetic viability may be threatened as indicated by DNR's endangered species rating system.
- Applying management opportunities related to conservation of significant habitats.
- Increasing representivity of uncommon community conditions (e.g. old age, large live and dead trees and species associations) and uncommon old forest communities.
- Implementing restorative measures in community types such as elm, sugar maple, and ash stands along the river corridors or the jack pine, black spruce, and white pine where conversion to other species or uses is 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 Integrated Resource Management (IRM) classification to include old forest, Eastern Habitat Joint Venture Sites, non-designated provincial park reserves, and non-designated sites of ecological significance.

The lands under policy reserve status within the Cobequid Hills is old forest (9,383 ha) under the Old Forest Policy, 2.7 hectares of designated provincial parks and park reserves, and 1.4 hectares of operational non-designated parks and park reserves. Legal reserves account for 7,064 hectares of wilderness areas.

Provincial Crown lands represent about 17% of the entire ecodistrict. Opportunities to improve representation may be required from 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 should include:

- Additional wetlands and connectivity among wetland complexes, including river corridors.

- Additional ecosection representation and their climax communities found in WMKK, IFHO, WMHO, and WMDS.

ELA Summary

Element Interpretation (All appendices and maps)

Sometimes described as a cigar-shaped block, Cobequid Hills extends approximately 150 kilometres in a northwest to southeast orientation between the towns of Pictou and Parrsboro. These hills separate two lowland ecodistricts, the Minas Lowlands Ecodistrict 620 to the south and the Northumberland Lowlands Ecodistrict 530 to the north.

The geological history of the Cobequid Hills is complex with underlying fault blocks consisting of resistant pre-Carboniferous metamorphic sediments, volcanic deposits, and granites dominating the landscape. The lower elevations comprise more easily eroded bedrock such as sandstones, shale and limited deposits of limestone. Many fault lines are expressed throughout the Cobequids, with the most prominent, the Cobequid Fault, extending along the south slope from Truro to Cape Chignecto.

The highest points on the mainland are found in the Cobequid Hills at Nuttby Mountain and Dalhousie Mountain, which rise to 335 metres above sea level. Within the Nova Scotia Upland Ecoregion (300), the Cobequid Hills Ecodistrict is the driest with a below average annual precipitation for the province of about 1,200 millimetres per year.

However, the hills receive the greatest snowfall on the mainland with over 300 centimetres of snow in an average year. Freshwater lakes and streams account for only 0.5% of the ecodistrict. Many of the lakes are small and shallow, but Folly Lake, which resulted from glacial ice resting in the valley of an old river and choking both ends with gravel deposits from the melting ice, has depths of over 100 metres. Cobequid Hills provides a watershed for streams running north or south which leave the mountains in deep, steep-walled ravines and gorges in a series of falls or cascades.

The soils are primarily coarse, gravelly to stony well-drained sandy loams derived from igneous and metamorphic rocks. In many areas, the soils are shallow to bedrock, especially on the crests and upper slopes of the hilly topography. The well-drained sandy loam soils are found on nearly 85% of the Cobequids and support zonal forests, with pure stands of tolerant hardwoods extending from the crests to lower slopes of hills and large hummocks. In between these hills, extensive flats of imperfectly drained coarse-textured soils on the level to hummocky terrain are found where forests of red spruce and black spruce dominate.

Another characteristic of the ecodistrict is the steep-sided ravines with well-drained coarse to medium-textured soils where forests of shade-tolerant species including hemlock, white pine, white ash, and ironwood can be found. The growth potential of the hardwood forests is seriously limited on the upper elevations where damage caused by snow and ice breakage reduces height and stem quality.

However, on the sheltered lower slopes, hardwood potential is improved as the exposure to winds is diminished. Many stands of white spruce can be found in the ecodistrict on the abandoned farmland of the early settlers who must have found the environment a serious impediment to crop production.

The Cobequid Hills Ecodistrict supports one of the largest intact Acadian Forests of shade-tolerant hardwoods on the mainland with stands extending from the crests to lower slopes of hills and large hummocks. On the crests and upper slopes the growth potential of these hardwood forests is seriously limited by exposure to winds, snow, and ice breakage which reduces height and stem quality. However, on the sheltered, rich, lower slopes, hardwood growth potential improves. Scattered throughout these hardwood forests are small stands of balsam fir that became established following area disturbances. In between these hills, extensive flats of imperfectly drained coarse-textured soils on the level to hummocky terrain are found where forests of red spruce and black spruce dominate.

Another characteristic of the ecodistrict are the steep-sided ravines with well-drained coarse to medium-textured soils where forests of shade-tolerant species including hemlock, red spruce, white pine, white ash, sugar maple, yellow birch, and ironwood can be found. Many stands of white spruce can be found in the ecodistrict on the abandoned farmland of the early settlers who must have found the environment a harsh constraint to crop production. Some of these fields are now used for blueberry production.

Most of these old field white spruce stands were once tolerant hardwood forests. Where rock outcrops and/or soils are shallow to bedrock, stands of red spruce and hemlock can be found.

In Cobequid Hills, stand-level natural disturbances occur rarely or infrequently in the dominant tolerant hardwood forest. Typically small gaps or individual tree mortality will occur from winds and winter storm damage, insects, and natural senescence. Many of these stands will develop into old growth with these small gap disturbances providing openings in the canopy for a younger component and allowing the development of uneven-aged stands.

Storms in this ecodistrict may be the most significant of the disturbance agents. However, little evidence can be found to support any theory that large stand-initiating events occur on the dominant hardwood ecosystems of the ecodistrict.

Only where softwood forests occur on the moist soils of upland flats and hummocky terrain, for example, Moose River, Economy Lake, and Farm Lake/Belmont Mountain areas, would larger area sizes be possible due to blowdown. In February 2003 ice damage to hardwood crowns was documented up to 30% on approximately 100,000 hectares in Cumberland and north Colchester counties. Evidence of blowdown and uprooting is evident in much of the hardwood forest by the abundance of pit and mound relief.

Based on 40 years of fire records between 1959 and 1999, the occurrence of lightning-caused fires in Cobequid Hills is one of the lowest in Nova Scotia. Environment Canada weather office maps indicate that this ecodistrict and most of Nova Scotia receive 0.25-0.5 cloud to ground lightning

strikes per square kilometre per year. The moisture holding capacity of the soils during the summer is one of the lowest in the province as reflected by a significant soil moisture deficit.

Insects and diseases have been known to cause extensive damage to the forests of Cobequid Hills. The 1980 spruce budworm epidemic caused stand-level mortality in red spruce forests, most notably in the western portion. This was followed a few years later by the bark beetle, which attacked stands stressed earlier by the budworm.

The hardwood forests have also experienced significant mortality with individual species succumbing to pathogens. The birch dieback was widespread in eastern Canada in 1932 to 1955 and the Nova Scotia Department of Lands and Forests reported in 1952 that 15 to 40% of the yellow birch on the mainland was dead. The exact cause of the dieback has never been determined but indications point to a series of climatic events (drought and freeze/thaw) that eventually caused enough stress, followed by secondary agents such as fungi, to cause tree mortality. The beech canker, introduced to the province in the 1890s, has reduced the once dominant beech to a lower canopy species.

Other insects and diseases that cause individual tree mortality in hardwood species include the maple borer and cinder conk in yellow birch. Wounds in trees caused by ice storms and subsequent breakage provide avenues for a variety of fungi to enter and weaken trees for subsequent breakage and blowdown.

Tolerant Hardwood Hills
(Matrix) (WCKK, WMKK, WFKK, WFHO and IFKK ecosections) (123,589 ha)

This matrix element is approximately 123,500 hectares and extends over the entire ecodistrict.

The covertype, which was predominately hardwood, is now 32% softwood, 20% mixedwood, 44% hardwood, and 4% unclassified.

Early seral stage species in the establishment class dominate the softwood covertypes. The early and mid-seral species in the establishment development class dominate the mixedwood stands.

Sugar maple and yellow birch along with red and black spruce are the major species in the hardwood stands. Fifty-three percent of this ecodistrict currently comprises late seral sugar maple, yellow birch, and red and black spruce.

Flows

People (ATV use, snowmobiles, hunting, cottage country, harvesting, aggregate, exploration, sugarbush); water (filtering, catchment, filter, headwaters, recharge, fish habitat); moose (travel, summer habitat); deer (travel, summer habitat, browse, deer wintering areas on the south slopes); black bear (travel, food, denning); raptors (nesting, hunting); furbearers (general travel, food, fisher – denning, hunting).

Composition

Cobequid Hills Ecodistrict 340 (based on statistics up to 2006)

Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	26%	8%	66% (60 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	14%	17%	53%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	32%	44%	20%	4%

Desired Condition

The desired condition for this matrix is late seral hardwood stands of sugar maple, yellow birch, and beech, with inclusions of mixedwood stands of red spruce, sugar maple, yellow birch, and beech. Most of the stands would be in the late seral stage appropriate for the gap disturbance regime.

Issues

- Change of covertype from hardwood to softwood and mixedwood.
- High percentage of early and mid-seral (30%) species.
- Only 53% of the element has late seral communities.
- High conversion rates and relatively low EEI in the matrix.
- Although the Crown ownership is only 17% of this ecodistrict, 33%, or 4,559 hectares, of those lands have been set aside for representation of this element under the Old Forest Policy.

Tolerant Mixedwood Hummocks

(Patch) (WCHO and WMHO ecosections) (22,091 ha)

This patch type is historically contained a mixture of hardwood and softwood stands located on the well-drained, gravelly sandy loam hill of the Cobequid Association. The element is a series of small, medium, and fairly large patches distributed over the entire ecodistrict.

Most of the inherent species are still present but the community associations have been slightly changed. The hardwood covertype of sugar maple, yellow birch, accounts for approximately 50% of the total area. The softwood covertype is 32% and mixedwoods account for 15% of the element. Three percent is unclassified.

The development classes are fairly well-balanced for this gap-disturbed ecodistrict. Most of early and mid-successional stages are in the softwood and mixedwood covertypes with balsam fir, white spruce, white birch, aspen, and red maple dominating. Seventy-two percent of the forests are in the mature and multi-aged development class.

Flows

People (harvesting, silviculture, agriculture, recreation);water (filtering, catchment, headwaters, recharge, fish habitat); moose (habitat, food, travel); deer (travel, food); black bear (travel, denning, habitat, food); raptors (nesting, hunting); furbearers (travel, food, denning, hunting).

Composition

Cobequid Hills Ecodistrict 340 (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
	18%	10%	72% (65 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	9%	17%	64%	10%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	32%	50%	15%	3%

Desired Condition

To maintain a long-lived tolerant community of red spruce, hemlock, sugar maple, and yellow birch with at least 60 to 70% of this forest community in the mature and multi-aged development class.

Issues

- Fragmentation of this patch type continues throughout the element.
- Amount of forested area presently in the softwood covertype is 23%.
- Increased conversion to non-forest.
- A total of 3,255 hectares or 32% of the Crown lands have been set aside under the Old Forest Policy. The area exceeds the 8% requirement but the majority of this area is located in the three wilderness areas within the ecodistrict.

Red and Black Spruce Hummocks
(Patch) (ICHO, ICSM and IFHO ecosections) (22,378 ha)

This patch element comprises of black and red spruce and is located throughout the entire ecodistrict. It varies in size but there is more area in the 10 to 100 hectare areas than in the smaller or larger size classes. Most of the larger areas occur in Lynn Mountain, Cranberry Lake, and Higgins Mountain to the East Branch of the Chiganois River.

This element is still predominately softwood at 64%, but mixedwood and hardwood makes up 17% and 14% respectively. Late seral species of sugar maple, yellow birch, and red spruce dominate all covertypes. Fifty-six percent of the forest is in the mature and multi-aged development class. A high percentage (21%) of the forest is unclassified. The amount of forest in each of the development classes (Appendix 10) is fairly well balanced for the frequent disturbance

regime. Early successional species such as white spruce and balsam fir comprise 13% of the current forested area.

The EEI is 61 to 72 which would indicate a relatively low land use pressure for this patch element.

The RI is 6, which places this patch in the Remote Class, the lowest index rating (0 to 6).

Flows

People (harvesting, silviculture, agriculture, recreation); water (filtering, catchment, headwaters, recharge, fish habitat); moose (calving site, thermal cover); deer (wintering areas, thermal cover); black bear (travel, denning, habitat, thermal, food); raptors (nesting, hunting); furbearers (general travel, food, denning, hunting).

Composition

Cobequid Hills Ecodistrict 340 (based on statisticsup to 2006)
Composition of Red and Black Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	30%	14%	56% (45 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	13%	22%	44%	21%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	64%	14%	17%	5%

Desired Condition

A softwood-dominated patch type with a mixture of developmental classes and seral stages that are consistent with frequent stand-initiating disturbances.

Issues

- Increased harvesting in the form of clearcutting.
- 21% of the area is unclassified in its seral stage.
- 26% of the softwood covertype is in the mid-seral stage.
- There are no present gaps under the Old Forest Policy. The Crown has reserved approximately 1,600 hectares, or 22%, of their land holdings under the Old Forest Policy.

Tolerant Mixedwood Slopes
(Patch) (WCDS and WMDS ecosections) (13,380 ha)

This is a very fragmented patch type that occurs throughout the entire ecodistrict, following the rivers and major tributaries. The larger areas are found in the Wentworth Valley and the Warwick Mountain area. This patch type was once 100% mixedwood covertype of red spruce, hemlock,

sugar maple, yellow birch, and beech. Currently Tolerant Mixedwood Slopes is 27% mixedwood, 25% softwood, and 47% hardwood, with 1 % unclassified.

The patch has a gap disturbance regime, with wind the main disturbance agent. Seventy percent of the forest is in the late seral stage and consists of sugar maple, yellow birch, red spruce, and scattered hemlock. Approximately84% of the forest is in the mature and multi-aged development classes. This element type has a fairly high EEI range of 67 to 71, attributed mainly to a low area (548 ha) being converted to non-forest use. The percentage of land in the reserve class is similar to the other elements.

Flows

People (harvesting, silviculture, agriculture, recreation); water (filtering, catchment, headwaters, recharge, habitat); moose (habitat, food, travel); deer (travel, food); black bear (travel, denning, habitat, food); raptors (nesting, hunting); furbearers (travel, food, denning, hunting).

Composition

Cobequid Hills Ecodistrict 340 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Slopes

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	11%	5%	84% (79 Mat + 5 OF)	5%
Seral Stage	Early	Mid	Late	Unclassified
	9%	14%	70%	7%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	25%	47%	27%	1%

Desired Condition

A mixedwood community of red spruce, hemlock, sugar maple, and yellow birch with at least 60 to 70% of the forest community in the mature development class.

Issues

- Change of 100% mixedwood in the inherent community to 47% hardwood, 27% mixedwood, and 25% softwood.
- The climax community of rS, sM, yB and eH is well represented with 32%, or 3,250 hectares, of the Crown land set aside under the Old Growth Policy.

Wetlands
(Patch) (WTLD ecosection) (47 ha)

Wetlands account for 47 hectares, or less than 0.1%, of the ecodistrict.

The small, isolated parcels occur around the Moose Bog, Cranberry Lake, Gundalow Plains, Trout Lake, Shatter Lake, Black Lake, Nuttby South, and Juniper Swamp areas.

This patch type has a very high importance in water collection, filtering, and groundwater recharge.

The wetlands are only partially treed with black spruce, with imperfect to poor drainage and ericaceous vegetation over most of the area.

Flows

People (hunting, recreation); water (filtering, catchment, headwaters, recharge, habitat); moose (feeding, calving, thermal, refugia); black bear (feeding, thermal, refuge); raptors (hunting); furbearers (hunting, habitat, denning).

Composition

Cobequid Hills Ecodistrict 340 (based on statisticsup to 2006)
Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	0%	6%	94% (78 Mat + 16 OF)	16%
Seral Stage	Early	Mid	Late	Unclassified
	<1%	28%	72%	0%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	28%	67%	5%	0%

Desired Condition

A series of wetlands or wetland complexes connected and interconnected to hydrological systems.

Issues

- Wetlands represent less than 0.1% of the ecodistrict and so it is extremely important to maintain these wetlands and look at the possibility of creating new wetlands.
- Destruction of these important ecosystems by ATVs.
- There is good representation for this community type under the Old Forest Policy.

Valley Corridors
(Corridor) (Various ecosections) (7,210 ha)

These are very strong linear corridors that dissect the ecodistrict in several locations: Fox River, Farrells River, West Branch Moose River, East Branch Moose River, Harrington River, Bass River (of Five Islands), East River, Economy River, Murphy Brook, Silica Lake/Bass River, Portapique River, Great Village River, Folly River, Chiganois River, Debert River, North River, Salmon River, Six Mile Brook, Four Mile Brook, and West River.

Historically these corridors are associated with late successional spruce, hemlock, sugar maple, yellow birch, and beech with an infrequent to gap disturbance regime. Mature late successional species still dominate in all covertypes but softwood now accounts for 50% of the element, followed by hardwood at 24%, and mixedwood at 23%.

Seventy-four percent of the forest is in the mature and multi-aged development class.

The EEI is one of the lowest of the ecodistrict at 58 to 63, mainly because of the high conversion (9%) to non-forest uses.

Flows

People (travel, fishing, recreation, ATV use, snowmobiles, transportation, hiking on Salmon River Trail, trapping, aggregate in Folly Lake and Portapique, waterfalls, Kenomee Trail in Economy River, Chignecto Trail, Silica Lake, pole rail, Murphy Brook, fossils, Great Village River, mine workings, skiing, old mill sites); water (major drainage, groundwater, recharge, erosion, trout, salmon, eel); moose (travel, Fox River, Portapique River, Bass River, Great Village River, Murphy Brook, Black Brook, habitat, thermal cover); deer (deer wintering areas, travel, food); black bear (travel, food, denning); raptors (food, hunting, nesting); furbearers (travel, habitat, food).

Composition

Cobequid Hills Ecodistrict 340 (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
	18%	8%	74% (60 Mat + 14 OF)	14%
Seral Stage	Early	Mid	Late	Unclassified
	16%	21%	51%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	50%	24%	23%	3%

Desired Condition

A series of connected slopes and intervales across the ecodistrict that are in a natural forest condition.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Cobequid 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:

- Wetlands account for only 0.1% of the ecodistrict.
- Disturbance of wetland ecosystems by ATVs.
- Change of covertypes in the ecodistrict.
- Increased harvesting in the ecodistrict.
- High percentage of some element types that is unclassified.
- High percentage of some softwood covertypes that are in mid-seral stage.
- There are no present gaps in representation of any of the community types in regards to the Old Forest Policy. All communities have in excess of 8% of the Crown land area set aside under the Old Forest Policy.
- There are three wilderness areas within this ecodistrict that account for 7,064 hectares under legal reserves.

Appendix 1: Flow - Element Interactions

Elements	People	Water	Moose	Deer	Black Bear	Raptors	Furbearers (Fisher, Otter, Beaver)
Matrix Tolerant Hardwood Hills	ATV's, snowmobiles, hunting, cottage country, harvesting, aggregate, exploration, sugarbush	filtering, catchment, headwaters, recharge, fish habitat	travel, summer habitat	travel, summer habitat, browse, deer wintering areas (south slopes)	travel, food, denning	nesting, hunting	general travel, food, fisher – denning, hunting
Patches Red and Black Spruce Hummocks	harvesting, silviculture, agriculture, recreation	filtering, catchment, headwaters, recharge, fish habitat	calving site, thermal cover	deer wintering areas, thermal cover	travel, denning, habitat, thermal, food	hunting, nesting	general travel, food, denning, hunting
Tolerant Mixedwood Hummocks	harvesting, siliviculture, agriculture, recreation	filtering, catchment, headwaters, recharge, habitat	habitat, food, travel	travel, food	travel, denning, habitat, food	hunting, nesting	travel, food, denning, hunting
Wetlands	hunting, recreation	filtering, catchment, headwaters, recharge, habitat	feeding, calving, thermal refugia		feeding, thermal refugia	hunting	habitat, hunting, denning
Tolerant Mixedwood Slopes	recreation, limited travel, harvesting	filtering, catchment, habitat	travel	travel, deer wintering areas, thermal	travel, cover	hunting, perching trees	habitat, hunting, denning
Corridor Valley Corridors	travel, fishing, recreation, ATV's, snowmobiles, transportation, hiking (Salmon River trail), trapping, aggregate (Folly Lake, Portapique), waterfalls, Kenomee Trail (Economy River), Chiganois Trail, Silica Lake - pole rail, Murphy Brook - fossils, Great Village River - mine workings, skiing, old mill sites	major drainage, groundwater recharge, erosion, trout, salmon, eel	Travel - Fox River, Portapique River, Bass River, Great Village River, Murphy Brook, Black Brook, habitat, thermal cover	deer wintering areas, travel, food	travel, food, denning	food, hunting, nesting	travel, habitat, food

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Matrix	Very High	Major hardwood region of the mainland found mostly in the WCKK ecosection	landscape level – well defined rivers valleys across the watersheds	predominately gap with some infrequent stand-initiating	Inherent - sM, yB, Be and rS, sM, yB, Be Present- rS, bS, wS, bF and rS, sM eH, yB	softwood or mixedwood community	road systems around the 104 at Westville, Stellarton (converted lands and highway) and Westchester Mountain. The #4 around Folly lake - gravel pit and other conversions and the highway	Special Management Zones along major valley features - covertype change and amount of mature late seral hardwood.	- define effective riparian Special Management Zones - increase climax and maturity in key areasof matrix - communication of this key function to private and municipal planners. Collaboration with varied ownerships and stakeholder agencies (Agriculture, Environment, etc.) Best management practices to conserve soil/site - reduce the conversion of tolerant hardwood sites to softwood plantations.
Tolerant Mixedwood Hummocks	Patch	Moderate	Bass River area Predominately associated with the well-drained course-textured hummocky ecosections (WCHO)	Good representation of all patch sizes across the ecodistrict	gap	Inherent - rS, eH, sM, yB, Be Present sM, yb and rS, bS	Matrix- rS, bS, wS, bF or rS, sM, eH, yB.	Fragmentation - poor connectivity in some locations	increased conversion	improve connectivity with long-lived tolerant species (connect low road density areas) - improve Special Management Zones - maintain wildlife habitat (e.g. goshawk - Bass River area)

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Red and Black Spruce Hummocks	Patch	High	Cranberry Lake, East and West Branch Moose River, Economy Lake, Higgins Mountain, East Branch Chiganois	varied patch sizes	frequent	bS, rS	matrix - mixedwood hummocks	- increased harvesting - large amount of the forest in early, mid, and unclassified (56%)	fragmentation - increased harvesting	manage for late seral species by early intervention of silviculture - increase patch size - maintain softwood cover for wildlife habitat (e.g. moose winter cover)
Tolerant Mixedwood Slopes	Patch	High	along most of valley corridors - larger patches located in Wentworth to Warwick Mountain	along continuous corridors widely distributed and generally connected	Gap	rS, eH, sM, yB, Be	sM, yB, Be	some conversions	good distribution of development classes and seral stages (positive issue)	maintain continuity - maintain wildlife habitat (e.g. talus slopes), moose - winter cover
Wetlands	Patch	High	Moose Bog, Cranberry Lake, Gundalow Plains, Shatter Lake, Juniper Swamp	very small patches - only 0.5% of ecodistrict	Open Seral	bS, rS	bS, rS	- small area - connectivity	poor connection to hydrological system	- maintain the integrity of the few wetlands present - educate public on the importance - keep off-highway vehicle trails away from wetlands
Valley Corridors	Corridor	high	Debert, Chiganois, Folly, North River, etc.	long continuous moderate sized rivers	infrequent to gap	mixture of community types	sM, yB, rS	conversions	connectivity	maintain and/or restore connectivity

Appendix 2b: Connective Management Strategies

Structure Type	Attributes	Conditions of Concern	Management Strategies
Matrix	percolation, large patch, interior habitat	fragmentation, excessive edge	1. Promote contiguous forest structure using strategies 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 340)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
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
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Wood Thrush	*Hylocichla mustelina*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS	-			
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
FERNS AND THEIR ALLIES				
Prototype Quillwort	*Isoetes prototypus*	Vulnerable	Special Concern	Special Concern
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
MAMMALS	-			
Moose	*Alces americanus*	Endangered	N/A	N/A
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Northern Long-eared Myotis	*Myotis septentrionalis*	Endangered	N/A	Endangered
REPTILES	-			
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 340)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
BIRDS	--------		
Northern Goshawk	*Accipiter gentilis*	Secure (Green)	S3S4
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
American Bittern	*Botaurus lentiginosus*	Sensitive (Yellow)	S3S4B
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Killdeer	*Charadrius vociferus*	Sensitive (Yellow)	S3S4B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Cape May Warbler	*Dendroica tigrina*	Sensitive (Yellow)	S3?B
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Sensitive (Yellow)	S3S4B
Wilson's Snipe	*Gallinago delicata*	Sensitive (Yellow)	S3S4B
Northern Mockingbird	*Mimus polyglottos*	Secure (Green)	S3B
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3S4
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3B
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
Pine Grosbeak	*Pinicola enucleator*	May Be At Risk (Orange)	S3?B,S5N
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3
Vesper Sparrow	*Pooecetes gramineus*	May Be At Risk (Orange)	S2S3B
Eastern Bluebird	*Sialia sialis*	Sensitive (Yellow)	S3B
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	S3S4B
DICOTS			
Nantucket Serviceberry	*Amelanchier nantucketensis*	May Be At Risk (Orange)	S1
Running Serviceberry	*Amelanchier stolonifera*	Secure (Green)	S3?
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Marsh Bellflower	*Campanula aparinoides*	Sensitive (Yellow)	S3
Rock Whitlow-Grass	*Draba arabisans*	Sensitive (Yellow)	S2
Northern Bedstraw	*Galium boreale*	May Be At Risk (Orange)	S2
Bicknell's Crane's-bill	*Geranium bicknellii*	Secure (Green)	S3
Round-lobed Hepatica	*Hepatica nobilis var. obtusa*	May Be At Risk (Orange)	S1S2
Kalm's Hawkweed	*Hieracium kalmii*	Undetermined	S2?
Panicled Hawkweed	*Hieracium paniculatum*	Secure (Green)	S3
Disguised St John's-wort	*Hypericum dissimulatum*	Sensitive (Yellow)	S2S3
Smooth Sweet Cicely	*Osmorhiza longistylis*	May Be At Risk (Orange)	S2
Blood Milkwort	*Polygala sanguinea*	Sensitive (Yellow)	S2S3
Halberd-leaved Tearthumb	*Polygonum arifolium*	Sensitive (Yellow)	S2
Lesser Pyrola	*Pyrola minor*	Sensitive (Yellow)	S2
Satiny Willow	*Salix pellita*	Undetermined	S2S3
Meadow Willow	*Salix petiolaris*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 340)

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***
Long-leaved Starwort	*Stellaria longifolia*	Sensitive (Yellow)	S3
Fringed Blue Aster	*Symphyotrichum ciliolatum*	Sensitive (Yellow)	S2S3
Heart-leaved Foamflower	*Tiarella cordifolia*	Sensitive (Yellow)	S2
Squashberry	*Viburnum edule*	Sensitive (Yellow)	S3
Northern Bog Violet	*Viola nephrophylla*	Sensitive (Yellow)	S2
FERNS AND THEIR ALLIES			
Cut-leaved Moonwort	*Botrychium dissectum*	Secure (Green)	S3
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive (Yellow)	S2S3
Least Moonwort	*Botrychium simplex*	Sensitive (Yellow)	S2S3
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Fragrant Wood Fern	*Dryopteris fragrans var. remotiuscula*	Sensitive (Yellow)	S2
Appalachian Fir-Clubmoss	*Huperzia appalachiana*	Undetermined	S1S3
Northern Firmoss	*Huperzia selago*	Undetermined	S1S3
Acadian Quillwort	*Isoetes acadiensis*	Sensitive (Yellow)	S3
Northern Adder's-tongue	*Ophioglossum pusillum*	Sensitive (Yellow)	S2S3
Appalachian Polypody	*Polypodium appalachianum*	Undetermined	S3?
Smooth Cliff Fern	*Woodsia glabella*	Sensitive (Yellow)	S2
INSECTS			
Arctic Fritillary	*Boloria chariclea*	Sensitive (Yellow)	S2
Baltimore Checkerspot	*Euphydryas phaeton*	Secure (Green)	S3
Harvester	*Feniseca tarquinius*	Secure (Green)	S3S4
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
LICHENS			
Blistered Tarpaper Lichen	*Collema nigrescens*	Sensitive (Yellow)	S2S3
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
Long-tailed Shrew	*Sorex dispar*	Sensitive (Yellow)	S1

Appendix 3: Special Occurrences (Ecodistrict 340)

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***
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
Atlantic Sedge	*Carex atlantica ssp. capillacea*	Undetermined	S2
Scabrous Black Sedge	*Carex atratiformis*	Sensitive (Yellow)	S2
Hop Sedge	*Carex lupulina*	Secure (Green)	S3
Rosy Sedge	*Carex rosea*	Secure (Green)	S3
Long-bracted Frog Orchid	*Coeloglossum viride var. virescens*	May Be At Risk (Orange)	S2S3
Early Coralroot	*Corallorhiza trifida*	Secure (Green)	S3
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Ovate Spikerush	*Eleocharis ovata*	Sensitive (Yellow)	S2?
Canada Waterweed	*Elodea canadensis*	Secure (Green)	S3?
Wiegand's Wild Rye	*Elymus wiegandii*	May Be At Risk (Orange)	S1
Nodding Fescue	*Festuca subverticillata*	May Be At Risk (Orange)	S1

*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 (see http://www.wildspecies.ca/wildspecies2010).

Appendix 3: Special Occurrences (Ecodistrict 340)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Green Hill Provincial Park	Park	Provincial Database	NS Provincial Parks Act
Raised Bog - Moose Bog, Economy Lake	Ecosystem	Local	NS Environment Act
Purple Trillium	Species	Local	
Moose Calving Area	Occurrence	Local	NS Endangered Species Act
Canada Yew	Species	Local	
Aggregate/Glaciofluvial- Folly, Belmont Mountain, Mount Thom, West Lake, Heathbell	Quarries	Surficial Geology	
Deer Wintering Areas	Habitat	NS Significant Species and Habitats	
Abandoned Mine Workings - Lear Shaft, New Lairg, Five Islands	Habitat	NS Significant Species and Habitats	NS Endangered Species Act
Viewscapes	Feature	Local	
Waterfalls	Feature	Local	
Wind Turbine - Millsville, Rodney, Higgins Mountain		Local	

Appendix 3: Special Occurrences (Ecodistrict 340)
Table 1d – Heritage Features

Feature	Type	Information Source
Hermit Gully Lake	Heritage	Local
Historical Cemeteries - Higgins Mountain, Sutherland Lake, Westchester Mountain	Heritage	Local
Past Mining	Historical	Abandoned Mines Database

Appendix 3: Special Occurrences

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

Ecosections that form 2% or less of the ecodistrict and/or ecoregion area or are more than 75% converted are highlighted. The table provides a sense of how unique or uncommon an ecosection and its associated climax communities are within the ecodistrict and across the ecoregion. The EEC Index value conveys an indication of relative land use pressure on 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	20,643	10.9	17,366	2.7	60 to 72	3.0	34,388	3.5	95,246	10.0	59 to 70	4.0
ICSM	bS	4,013	2.1	17,366	0.1	66 to 71	5.0	8,264	0.8	95,246	10.0	55 to 60	16.4
IFHO	bS	153	0.1	17,366	0.1	44 to 56	16.0	31,017	3.2	95,246	10.0	52 to 61	12.8
IFKK	rS eH sM yB Be	537	0.3	55,394	0.3	34 to 52	12.0	33,586	3.5	61,830	6.4	51 to 61	12.1
WCDS	rS eH sM yB Be	13,997	7.4	55,394	0.3	67 to 71	4.0	20,864	2.1	61,830	6.4	67 to 71	3.8
WCHO	rS eH sM yB Be	24,654	13.0	55,394	0.3	66 to 71	6.0	69,561	7.2	61,830	6.4	59 to 66	8.6
WCKK	sM yB Be	117,996	62.3	96,964	0.5	59 to 67	8.0	184,987	19.1	394,227	40.6	56 to 66	7.7
WFHO	rS eH sM yB Be	906	0.5	55,394	0.3	42 to 58	11.0	19,089	2.0	61,830	6.4	51 to 59	14.0
WFKK	rS eH sM yB Be	2,977	1.6	55,394	0.3	34 to 43	32.0	75,801	7.8	61,830	6.4	51 to 59	12.3
WMDS	rS eH sM yB Be	81	0.0	55,394	0.3	49 to 54	10.0	51,684	5.3	61,830	6.4	64 to 68	4.0
WMHO	rS eH sM yB Be	122	0.1	55,394	0.3	20 to 22	66.0	81,376	8.4	61,830	6.4	56 to 66	5.4
WMKK	sM yB Be	3,210	1.7	96,964	0.5	51 to 56	24.0	167,845	17.3	394,227	40.6	59 to 66	6.5
WTLD	wetlands	47	0.0	0	0.0	74	0.0%	6,067	0.6	0	0.0	62 to 65	6.7

*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	117,996	15.0	3,522	0	2,499	0	6,020	5.0	0	0.0	6,020	5.0
WCHO	rS eH sM yB Be	24,653	27.0	2,015	0	303	0	2,318	9.0	0	0.0	2,318	9.0
ICHO	bS	20,643	27.0	615	0	392	0	1,007	5.0	0	0.0	1,007	5.0
WCDS	rS eH sM yB Be	13,997	9.0	686	0	20	0	706	5.0	0	0.0	706	5.0
ICSM	bS	4,013	18.0	226	0	0	0	226	6.0	0	0.0	226	6.0
WMKK	sM yB Be	3,210	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WFKK	rS eH sM yB Be	2,977	7.0	0	0	11	0	11	0.0	0	0.0	11	0.0
XXWA		963	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WFHO	rS eH sM yB Be	906	8.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFKK	rS eH sM yB Be	537	20.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFHO	bS	153	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMHO	rS eH sM yB Be	122	1.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMDS	rS eH sM yB Be	80	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	47	75.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**190,297**	**17.0%**	7,064	0	3,225	0	10,288		0		0	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act - Designation	Area by Ownership		Policy - Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	7,064	0	Old Forest	9,383	0
			Designated Provincial Parks and Park Reserves	3	0
			Operational Non Designated Parks and Reserves	1	0

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

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

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

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

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

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	2,245
Utility Corridors	3	152
Gravel Roads and active railways	6	972
Paved streets and roads collectors	10	127
Highways	15	12

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	37,037	19
Forest Resource	7 to 15	82,876	44
Mixed Rural	16 to 24	51,233	27
Agriculture Suburban	25 to 39	17,193	9
Urban	40 to 100	1,947	1
Total		**190,286**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	7,210	20
Tolerant Hardwood Hills	123,581	7
Tolerant Mixedwood Slopes	13,380	9
Tolerant Mixedwood Hummocks	23,091	6
Red and Black Spruce Hummocks	22,378	6
Wetlands	47	14
Total	**189,687**	**7.5**

*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

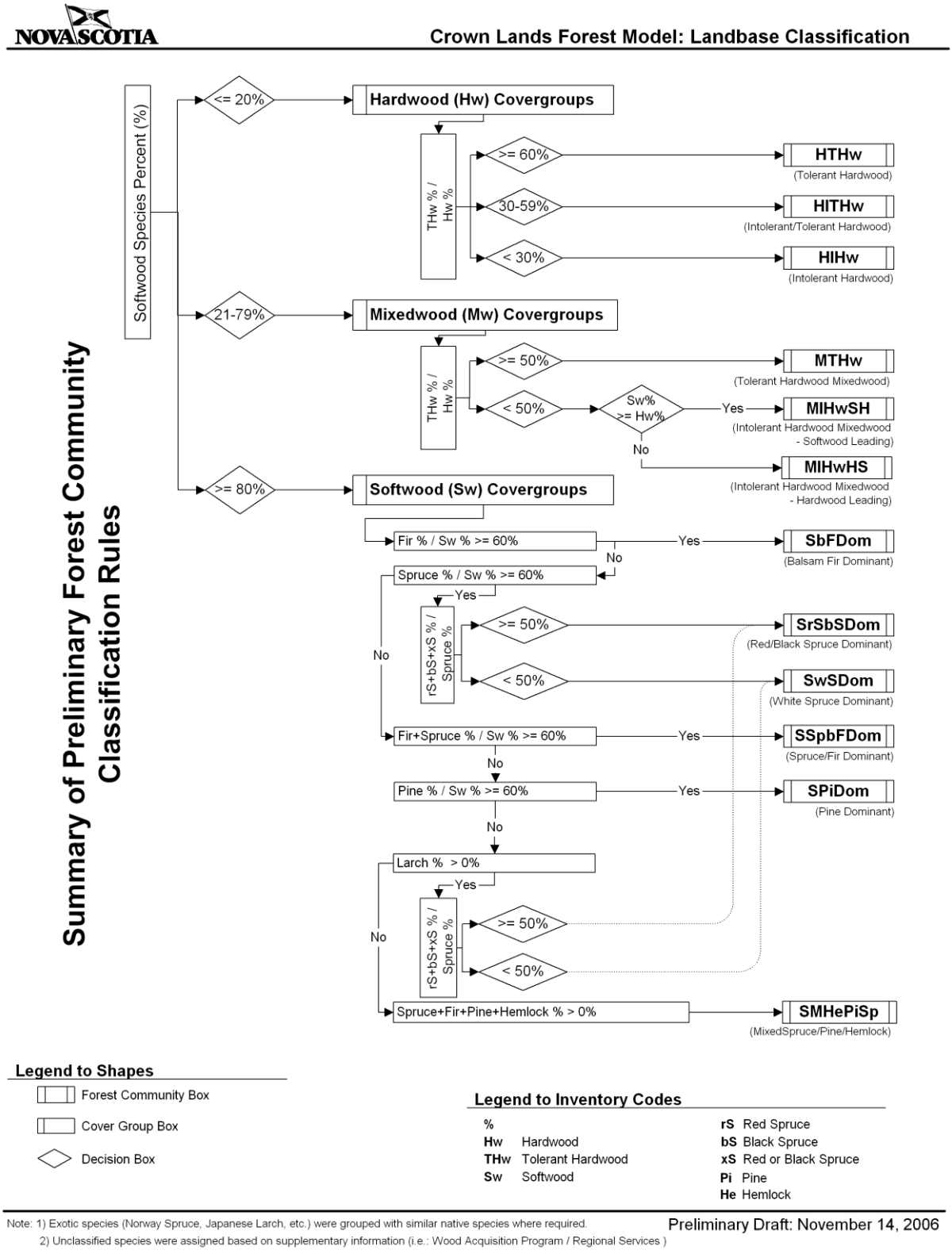
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and 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																																							
Code	Name	100	210	220	310	320	330	340	350	360	370	380	410	420	430	440	450	510	520	530	540	550	560	610	620	630	710	720	730	740	750	760	770	780	810	820	830	840	910	920
AS	ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BA	black ash	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BC	black cherry	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
BE	beech	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
BF	balsam fir	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	1	1
BP	balsam poplar	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	3	1
BS	black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EC	eastern cedar	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
EH	eastern hemlock	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
	exotic species	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
GB	grey birch	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
IH	intolerant hardwood	3	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	2	4	3	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
JP	jack pine	2	3	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	3	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
LA	largetooth aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
OH	other hardwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
OS	other softwood	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
PC	pin cherry	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RM	red maple	3	2	4	2	2	2	2	2	4	2	5	2	2	2	2	2	2	2	2	2	5	3	2	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2	2
RO	oak	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
RP	red pine	3	3	3	3	3	3	3	3	3	4	3	3	3	4	3	3	3	3	4	4	4	4	4	4	4	3	4	3	3	3	4	4	3	4	4	3	3	3	3
RS	red spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
SM	sugar maple	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
ST	striped maple	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
TA	aspen	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
TH	tolerant hardwood	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TL	eastern larch	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
UC	unclassified	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
WA	white ash	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
WB	white birch	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WE	white elm	2	2	4	2	4	2	2	2	2	2	2	2	2	2	2	2	4	4	4	2	2	2	4	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
WP	white pine	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
WS	white spruce	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red&black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
YB	yellow birch	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Cobequid Hills 340)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills (Matrix)	WCKK (94%) WMKK (3%) WFKK (2%) WFHO (1%) IFKK (<1%)	Softwood	rS bS	Infrequent	11,969; 9.7	Early	2,128	2,067	4,648	1,001	9,844	35,225; 32.0	EARLY	15,788; 14.0
						Mid	1,260	995	3,314	844	6,413			
						Late	2,300	818	6,501	923	10,542			
						Uncl	8,420	0	0	0	8,420			
		Mixedwood	rS eH sM yB Be	Gap	16,400; 13.3	Early	617	660	982	251	2,510	23,330; 20.0	MID	18,339; 17.0
						Mid	1,017	968	4,778	1,403	8,166			
						Late	525	470	6,533	1,385	8,913			
						Uncl	3,736	0	1	0	3,737			
		Hardwood	sM yB Be	Gap	95,166; 77.0	Early	231	450	941	78	1,700	48,596; 44.0	LATE	59,090; 53.0
						Mid	541	1,109	1,953	151	3,754			
						Late	825	1,896	36,017	893	39,631			
						Uncl	2,973	2	532	0	3,507			
		Unclassified				Early	1,592	19	120	0	1,731	4,275; 4.0	UNCL	18,209; 16.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2,544	0	0	0	2,544			
Total					**123,589***	**# ha**	**28,709**	**9,454**	**66,320**	**6,929**	**111,412**			
						%	**25.8%**	**8.5%**	**59.5%**	**6.2%**	**100%**			

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 (Cobequid Hills 340)

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 (Patch)	WCHO (99.0%) WMHO (1.0%)	Softwood	bS rS	Frequent	31; <0.2	Early	327	387	559	114	1,387	6,734; 32.0	EARLY	2,047; 9.0
						Mid	546	368	938	321	2,172			
						Late	257	257	1,502	364	2,379			
						Uncl	795	0	0	0	795			
		Mixedwood	rS eH sM yB Be	Gap	23,019; 99.7	Early	69	51	113	44	278	3,273; 15.0	MID	3,517; 17.0
						Mid	224	261	434	143	1,062			
						Late	41	162	1,077	206	1,486			
						Uncl	447	0	0	0	447			
		Hardwood	sM yB Be	Gap	34; <0.2	Early	50	31	134	11	226	10,770; 50.0	LATE	13,718; 64.0
						Mid	37	135	109	2	283			
						Late	164	512	8,925	253	9,853			
						Uncl	307	0	101	0	407			
		Unclassified				Early	152	2	2	0	156	574; 3.0	UNCL	2,068; 10.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	418	0	0	0	418			
Total					**23,091***	**# ha**	**3,834**	**2,166**	**13,894**	**1,458**	**21,351**			
						%	**18.0%**	**10.1%**	**65.1%**	**6.8%**	**100%**			

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 (Cobequid Hills 340)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Red and Black Spruce Hummocks (Patch)	ICHO (85.0%) ICSM (14.0%) IFHO (<1.0%)	Softwood	bS rS	Frequent	22,272; 99.0	Early	273	425	814	205	1,717	12,677; 64.0	EARLY	2,505; 13.0
						Mid	368	717	1,598	590	3,273			
						Late	466	1,028	2,922	832	5,248			
						Uncl	2,440	0	0	0	2,440			
		Mixedwood	rS eH sM yB Be	Gap	40; <1.0	Early	98	82	80	24	284	3,445; 17.0	MID	4,384; 22.0
						Mid	57	139	535	220	951			
						Late	36	75	800	245	1,156			
						Uncl	1,053	0	0	0	1,053			
		Hardwood	sM yB Be	Gap	62; <1.0	Early	18	25	62	7	112	2,846; 14.0	LATE	8,777; 44.0
						Mid	30	45	81	4	160			
						Late	13	183	2,128	50	2,374			
						Uncl	195	0	6	0	201			
		Unclassified				Early	388	3	1	0	392	913; 5.0	UNCL	4,215; 21.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	521	0	0	0	521			
Total					**22,378***	**# ha**	**5,956**	**2,722**	**9,027**	**2,177**	**19,882**			
						%	**30.0%**	**13.7%**	**45.4%**	**10.9%**	**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 (Cobequid Hills 340)

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 (Patch)	WTLD (100.0%)	Softwood	bS rS	Open	1; 3.0	Early	0	0	0	0	0	5; 28.0	EARLY	0; <1.0
						Mid	0	1	1	2	4			
						Late	0	0	1	0	1			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	0	0	0	0	1; 5.0	MID	5; 28.0
						Mid	0	0	0	1	1			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	0	0	0	12; 67.0	LATE	13; 72.0
						Mid	0	0	0	0	0			
						Late	0	0	12	0	12			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.0	UNCL	0; 0.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**47***	**# ha**	**0**	**1**	**14**	**3**	**18**			
						%	**0.0%**	**5.6%**	**77.8%**	**16.7%**	**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 (Cobequid Hills 340)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Slopes (Patch)	WCDS (99.0%) WMDS (<1.0%)	Softwood				Early	92	95	456	82	725	3,191; 25.0	EARLY	1,129; 9.0
						Mid	89	42	443	35	609			
						Late	108	15	1,316	93	1,532			
						Uncl	325	0	0	0	325			
		Mixedwood	rS eH sM yB Be	Gap	13,320; 99.0	Early	26	29	87	21	163	3,457; 27.0	MID	1,804; 14.0
						Mid	117	126	532	127	902			
						Late	25	48	1,871	192	2,136			
						Uncl	256	0	0	0	256			
		Hardwood	sM yB Be	Gap	38; <1.0	Early	18	10	132	14	174	5,966; 47.0	LATE	8,946; 70.0
						Mid	21	74	176	22	293			
						Late	33	172	5,024	50	5,279			
						Uncl	127	0	92	0	219			
		Unclassified				Early	65	0	1	0	66	163; 1.0	UNCL	897; 7.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	97	0	0	0	97			
Total					**13,380***	**# ha**	**1,399**	**611**	**10,130**	**636**	**12,776**			
						%	**11.0%**	**4.8%**	**79.3%**	**5.0%**	**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 (Cobequid Hills 340)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Valley Corridors	WCKK (28.0%) WCHO (23.0%) ICHO (22.0%) ICSM (12%) WCDS (10%) WMHO (<1%) WMKK (<1%) WFKK (<1%)	Softwood	bS rS	Frequent	2,637; 37.0	Early	89	87	371	103	650	2,769; 50.0	EARLY	909; 16.0
						Mid	78	94	434	105	712			
						Late	55	100	724	177	1,057			
						Uncl	350	0	0	0	350			
		Mixedwood	rS eH sM yB Be	Gap	2,580; 36.0	Early	17	28	80	21	146	1,280; 23.0	MID	1,184; 21.0
						Mid	15	35	218	101	368			
						Late	19	19	401	155	594			
						Uncl	172	0	0	0	172			
		Hardwood	sM yB Be	Gap	1,620; 23.0	Early	6	9	34	23	72	1,340; 24.0	LATE	2,796; 51.0
						Mid	1	57	36	10	104			
						Late	6	32	1,032	75	1,146			
						Uncl	16	0	1	0	18			
		Unclassified				Early	40	0	0	0	40	178; 3.0	UNCL	678; 12.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	138	0	0	0	138			
Total					**7,210***	**# ha**	1,002	461	3,331	770	5,567			
						%	18.0%	8.3%	59.8%	13.8%	100.0%			

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

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

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WCKK WMKK WFKK WFHO IFKK	Gap Gap Infrequent Infrequent Infrequent	sM yB Be rS eH sM yB Be sM yB Be rS eH sM yB Be rS eH sM yB Be rS eH sM yB Be rS eH sM yB Be	S	SrSbSDom	15,622	14.6%	L	**Well-drained:** **Early:** rM, hay scented fern, wood sorrel **Mid:** maple,yB, new York fern -rM, hay scented fern, wood sorrel **Late:** sM,wA,xmas fern-sM yB, hay scented fern **Moist**: **Early:** bF, rM, wood sorrel **Mid:** rS bF, stairstep moss **Late:** rS eH starflower - eH rS, wild lily-of-the-valley - yB rS wood fern
				S	SwSDom	8,700	8.1%	E	
				S	SbFDom	6,690	6.2%	E	
				S	SspbFDom	3,447	3.2%	E/M	
				S	SMHePiSp	476	0.4%	L	
				S	SpiDom	290	0.3%	L	
				M	MTHw	16,174	15.1%	L	
				M	MIHwSH	4,474	4.2%	M	
				M	MIHwHS	2,682	2.5%	M	
				H	HTHw	43,472	40.6%	L	
				H	HIHw	2,946	2.7%	M	
				H	IH TH	2,177	2.0%	M/L	
Total						**107,150**	**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 Cobequid 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 WMHO	Gap Gap	rS eH sM yB Be rS eH sM yB Be	S	SrSbSDom	3,669	17.7%	L	**Well-drained** **Early:** old field, conifer forest - rM, wB, sarsaparilla **Mid:** maple, yB, New York fern - rM, hay scented fern **Late:** sM, wA, Christmas fern - sM, yB, hay-scented fern **Moist: Early:** bF, rM, wood sorrel **Mid:** rS, bF, stairstepmoss **Late:** rS eH starflower – eH rS, wild lily-of-the-valley - yB rS wood fern **Wet:** bS, cinnamon fern, sphagnum - bS, false holly, wild raisin - rS, cinnamon fern, sphagnum - rM, bF sensitive fern
				S	SwSDom	750	3.6%	E	
				S	SbFDom	1,382	6.7%	E	
				S	SspbFDom	809	3.9%	E/M	
				S	SMHePiSp	113	0.5%	L	
				S	SpiDom	12	0.1%	L	
				M	MTHw	2,394	11.5%	L	
				M	MIHwSH	650	3.1%	M	
				M	IH (HL)	230	1.1%	M	
				H	HTHw	10,301	49.6%	L	
				H	HIHw	309	1.5%	M	
				H	HITHw	159	0.8%	M/L	
Total						**20,778**	**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 Cobequid 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 and Black Spruce Hummocks	ICHO ICSM IFHO	Frequent Frequent Frequent	bS rS bS rS bS rS	S	SrSbSDom	8,108	42.8%	L	**Moist**: **Early:** bF, rM, wood sorrel **Mid:** rS bF, stairstep moss **Late:** rS eH starflower – eH rS, wild lily-of-the-valley - yB rS wood fern **Wet:** bS, cinnamon fern, sphagnum - bS, false holly, wild raisin - rM, bF sensitive fern Note: ICSM - wet successional types only
				S	SwSDom	610	3.2%	E	
				S	SbFDom	2,457	13.0%	E	
				S	SspbFDom-	1,383	7.3%	E/M	
				S	SMHePiSp	91	0.5%	L	
				S	SpiDom	28	0.1%	L	
				M	MTHw	2,350	12.4%	L	
				M	MIHwSH	759	4.0%	M	
				M	MIHwHS	335	1.8%	M	
				H	HTHw	2,566	13.5%	L	
				H	HIHw	190	1.0%	M	
				H	HITHw	89	0.5%	M/L	
Total						**18,966**	**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 Cobequid 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	WTLD	Open seral	wetlands	S	SrSbSDom	4	25.0%	L	**Wet:** bS, cinnamon fern, sphagnum
				H	HTHw	12	75.0%	L	
Total						**16**	**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 Cobequid Hills Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Slopes (Patch)	WCDS WMDS	Gap Gap	rS eH sM yB Be rS eH sM yB Be	S	SrSbSDom	1,856	14.7%	L	**Well-drained and Moist** **Early:** bF, rM wood sorrel - rM, wB sarsaparilla **Mid:** rS, bF, schreber's moss -rS, bF, stairstep moss **Late:** rS, eH, starflower - eH, rS, wild lily-of-the-valley -yB, rS, wood fern
				S	SwSDom	573	4.5%	E	
				S	SbFDom	415	3.3%	E	
				S	SspbFDom	262	2.1%	E/M	
				S	SMHePiSp	74	0.6%	L	
				S	SpiDom	12	0.1%	L	
				M	HTHw	2,715	21.5%	L	
				M	MIHwSH	451	3.6%	M	
				M	MIHwHS	290.5	2.3%	M	
				H	HTHw	5,497	43.6%	L	
				H	HIHw	246	2.0%	M	
				H	HITHw	222	1.8%	M/L	
Total						**12,614**	**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 Cobequid 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	WCKK WCHO ICHO ICSM WCDS WMHO WMKK WFKK	Gap Gap Frequent Frequent Gap Gap Gap Infrequent	sM yB Be rS eH sM yB Be rS eH sM yB Be bS rS bS rS rS eH sM yB Be rS eH sM yB Be sM yB Be rS eH sM yB Be rS eH sM yB Be	S	SrSbSDom	1,428	26.5%	L	Various successional types pending ecosection
				S	SwSDom	337	6.3%	E	
				S	SbFDom	589	10.9%	E	
				S	SspbFDom	386	7.2%	E/M	
				S	SMHePiSp	24	0.4%	L	
				S	SpiDom	3.7	0.1%	L	
				M	MTHw	928	17.2%	L	
				M	MIHwSH	286	5.3%	M	
				M	MIHwHS	66	1.2%	M	
				H	HTHw	1,181	21.9%	L	
				H	HIHw	118	2.2%	M	
				H	HITHw	40	0.7%	M/L	
Total						**5,387**	**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	96,964	51.0%	394,228	40.0%
rS eH sM yB Be	55,394	29.0%	61,830	6.0%
rS	19,563	10.0%	98,853	10.0%
bS	17,366	9.0%	95,246	10.0%
Total	**189,287**	99.0%*	**650,157**	69.0%**

*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 stand conversion.
Intensive	**0.25**	• Lands managed intensively to optimize resource production from sites maintained in a native state (e.g. forested). Despite intensive practices these lands are an important component of landscape structure and composition. • Management may eliminate or reduce the duration of some development processes, particularly mature old forest stages, and may result in non-natural succession. Practices may produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels. Forests are protected from fire, insects, and competing vegetation. • Management adheres to environmental regulations and policies such as the Wildlife Habitat and Watercourse Protection Regulations, and Forest Code of Practice.
Converted	**0**	• Land converted to an unnatural state for human use, or areas where practices have significantly degraded site productivity (e.g. agriculture, urban development roads, Christmas trees, seed orchards, forest soil compaction).

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Hills	123,534	5,968	76,485	8,767	10,699	21,645	70,935 to 81,758	57 to 66
Tolerant Mixedwood Hummocks	23,083	2,260	16,568	688	1,262	2,306	15,434 to 16,588	67 to 72
Red and Black Spruce Hummocks	22,373	1,058	14,912	800	807	4,796	13,641 to 16,040	61 to 72
Tolerant Mixedwood Slopes	13,369	641	10,482	635	548	1,064	8,927 to 9,459	67 to 71
Wetlands	47	0	47	0	0	0	36	76
Valley Corridors	6,837	358	4,740	343	635	761	4,189 to 4,570	61 to 67
Total	**189,243**	**10,285**	**123,234**	**11,233**	**13,951**	**30,572**	**113,164 to 128,450**	**60 to 68**

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	20,643	1,007	13,465	756	649	4,767	12,486 to 14,870	60 to 72
ICSM	4,012	226	3,079	101	217	388	2,658 to 2,852	66 to 71
IFHO	153	0	71	21	25	37	68 to 86	44 to 56
IFKK	538	0	133	150	62	193	185 to 282	34 to 52
WCDS	13,997	706	11,030	619	579	1,064	9,399 to 9,931	67 to 71
WCHO	24,654	2,318	17,518	816	1,584	2,418	16,265 to 17,474	66 to 71
WCKK	117,996	6,020	74,514	8,017	8,930	20,515	69,039 to 79,296	59 to 67
WFHO	906	0	357	159	96	293	381 to 528	42 to 58
WFKK	2,977	11	971	504	942	549	1,003 to 1,277	34 to 43
WMDS	80	0	42	22	8	8	39 to 43	49 to 54
WMHO	122	0	27	9	80	6	24 to 27	20 to 22
WMKK	3,209	0	2,036	69	759	346	1,630 to 1,803	51 to 56
WTLD	47	0	47	0	0	0	35	75
Total	**189,333**	**10,290**	**123,288**	**11,241**	**13,930**	**30,583**	**113,212 to 128,503**	**60 to 68**

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 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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