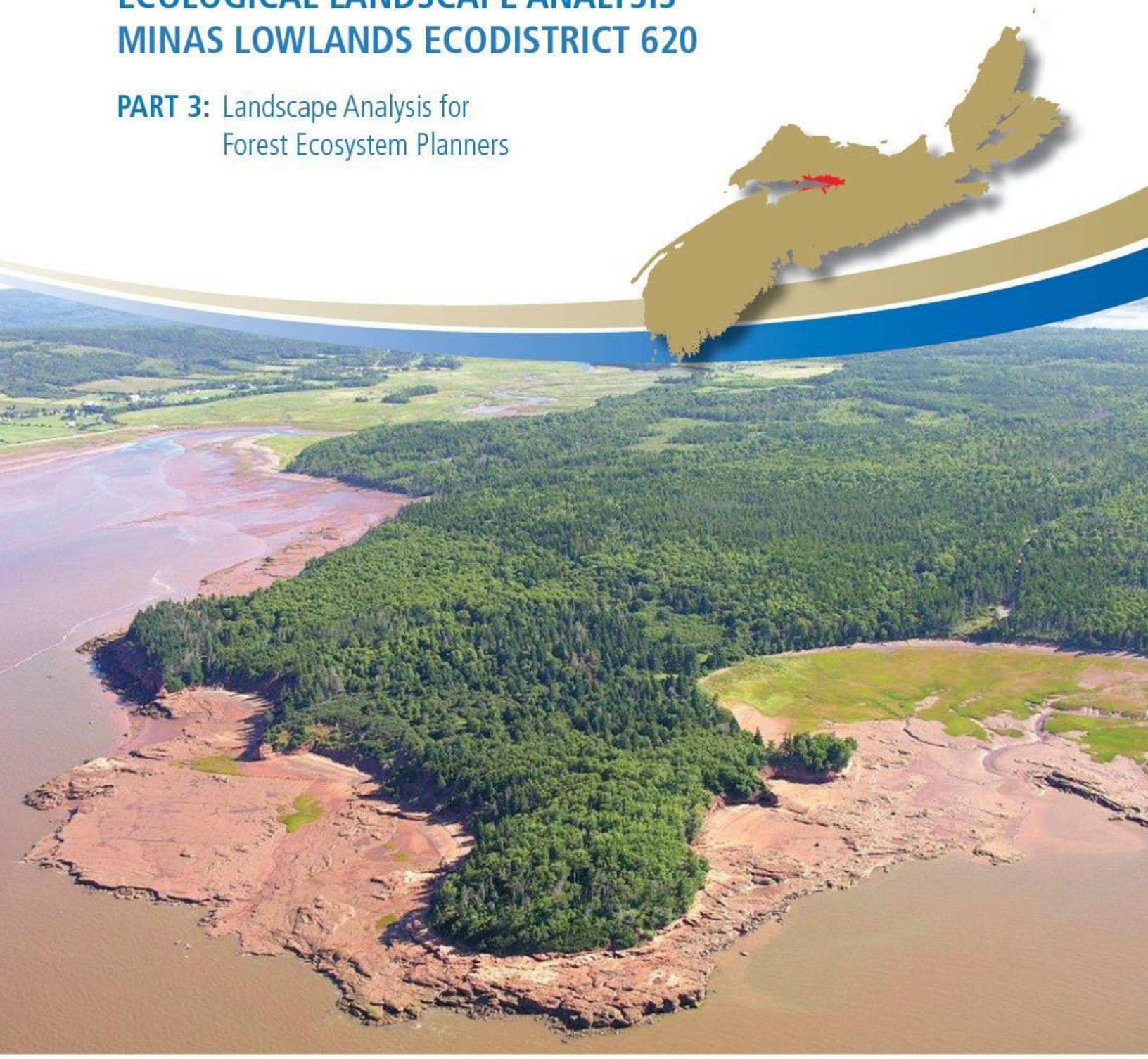
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS MINAS LOWLANDS ECODISTRICT 620

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-620

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 620: Minas Lowlands

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

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

Information sources and statistics (benchmark dates) include:

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

Conventions

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

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Part 3: Landscape Analysis of Minas Lowlands – *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 nine distinctive elements in the Minas Lowlands Ecodistrict – two co-matrix, six patches, and a corridor. A matrix is the dominant element. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts (see connectivity section for full discussion of matrix, patch, and corridor concepts).

Red and Black Spruce Hummocks is one of the co-matrix elements, representing 34% of the ecodistrict. **Spruce Pine Hummocks** is the other co-matrix, accounting for 32% of the area and together representing nearly two-thirds of the ecodistrict. The dominant species in both ecodistricts is spruce – mainly black and red – with some pine and balsam fir.

Two patch elements – **Marshes and Grasslands** and **Salt Marsh** – are associated with the tidal action in Cobequid Bay and are mainly found at the mouths of major rivers that empty into the bay.

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

Valley Corridors is a linear corridor element associated with the major river systems in the ecodistrict. Over half of these corridors have been converted to other uses, such as farming and settlement.

Flow – Element Interactions (Appendix 1; Map 2)

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

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 along the shores of Cobequid Bay at the eastern end of the Minas Basin and the Bay of Fundy.

An example of the flow element interactions is the number of bald eagles that use the corridors, especially along the Salmon, Shubenacadie, Great Village, Portapique, Bass, and Economy rivers, for nesting, perching, and hunting.

Much of the forest along these important systems has been altered to early to mid seral softwood and mixedwood. Only 16% of the forest is in the late seral stage.

One objective may be to reduce the early and mid seral species and promote more red and black spruce, hemlock, white pine, sugar maple, yellow birch, and white ash by employing forest management strategies that include pre-commercial and commercial thinning and the creation of larger stand sizes.

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

River corridors promote connectivity.

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

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

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

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

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

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

The Minas Lowlands is now dominated by a much changed structure that does not represent the inherent natural conditions that once characterized this landscape. Human land use, farming, transportation systems, and utility corridors have fragmented most of the element types, reducing

the connective function of the corridors for some species and also increasing the barrier effect of transportation corridors that species that must move across (Map 5).

An additional concern inherent in ecological planning is the maintenance of connectivity among conservation areas (including wilderness, old growth, provincial parks, and ecological reserves) that are often not ecologically related. At the landscape scale of planning, connectivity among these areas is supported by the dominant forest structure. Connectivity will be sustained by applying the natural disturbance regime guidelines for landscape composition (Table 7) and recognizing natural linkage opportunities.

Opportunities for connective management strategies include:

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

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

Some of the landscape flows – such as people, deer, muskrats, trout, and bass – are identified with major linkages to adjacent areas or ecodistricts (Map 2).

The hydrological system provides the most obvious physical connection between Minas Lowlands and surroundings areas. The major river corridors are the Bass, Portapique, Great Village, Debert, Chiganois, Salmon, and Shubenacadie rivers. The dynamics of these water linkages have downstream effects from the wetlands that capture, filter, and store water to their connection to the overall hydrological system.

Most of these river corridors and estuaries are important nesting areas for bald eagles and anadromous fish, such as Atlantic salmon. A number of these major river systems contain rare plants, such as the yellow Canada lily and blue cohosh.

Deer flow in and out of this lowland area, migrating in harsh winter conditions from the Pictou Antigonish Highlands and Cumberland Hills ecodistricts to the northern edge of the lowland area where there are reduced snow levels.

People, by their transportation systems, provide linkages among the neighbouring ecodistricts of Cobequid Slopes, Central Uplands, and Central Lowlands and also through their many activities (such as recreation, transportation, fishing, forest management, utilities, development, and settlements). The major linkages occur at the Great Village and Debert areas, Truro, Old Barns, Brookside, Valley, Onslow, and Hilden.

Transportation linkages from the Minas Lowlands, Cobequid Slopes, and Central Uplands ecodistricts bring national and international tourists to the Bay of Fundy. Attractions include high tides, tidal bore rafting, coastal beaches, parks, and nature-based outdoor recreational opportunities.

Future management activities should recognize significant links to neighbouring ecodistricts and manage these forests to enhance and sustain connectivity.

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

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

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

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

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

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

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

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

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

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Minas Lowlands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Spruce Pine Hummocks (includes floodplain ecosite)	IH1, IH4, IH6, OW1, OW2, OW4, SP1, SP2, SP10 (FP5, FP6)	14.0	MW4, SP3, SP4, SP6, SP8 (FP3)	19.0	**SP5**, SP7 (**FP1**)	48.0
Red and Black Spruce Hummocks	IH1, IH4, IH6, MW5, OF1, OF2, OF4, OF5	31.0	MW4, SH5, SH6, SP4, SP6, SP8	25.0	SH3, **SH4, SP5,** SP7	24.0
Red and Black Spruce Flats	IH1, IH4, IH6, MW5, SP10	23.0	MW4, SH5, SH6, SP4, SP6, SP8	29.0	SH3, **SH4, SP5,** SP7	20.0
Spruce Hemlock Pine Hummocks and Hills	IH3, IH5, IH6, MW5, OF1, OF2 OF4, OF5	33.0	MW4, SH5, SH6, SH8	24.0	SH1, SH2, **SH3, SH4**	27.0
Tolerant Mixedwood Hills	IH3, IH5, IH6, OF1, OF2, OF4, OF5	40.0	MW2, MW4	14.0	**MW1, MW3**	22.0
Salt Marsh	Grasslands of *Spartina spp.*					
Marshes and Grasslands	Cultivated Fields and Freshwater Wetlands (cattails, willows, alders, WC, WD)					
Wetlands	WC1, WC2, WC3, WC4, WC5, WC6, WC7, WD1, WD2, WD3, WD5, WD6, WD7, WD8					

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

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

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

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

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

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

- Reserve, such as parks or wilderness areas

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

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

A summary of these land use intensities provides an overall EEI of 33 to 39 for the ecodistrict (Appendices 12a and 12b). This would suggest that overall intensity of land use for the Minas Lowland Ecodistrict is currently at a significantly changed state affecting both the structure and function to support habitat (for all species) and for biodiversity conservation.

The 43,692 hectares contained within the Minas Lowlands Ecodistrict is inherently capable of supporting approximately 31,549 hectares of forest, with remaining lands being non-forest ecosystems such as lakes, wetlands, and barrens.

A GIS-based classification of current land use employing the four ecosystem emphasis classes, indicates that only 36% of the lands inherently capable of supporting forest land, fall within the extensive EEC (Map 3). Lands in this category are managed for multiple values using ecosystem-based techniques that conserve biodiversity and encourage natural ecosystem conditions and processes.

An additional 6% of these lands fall in the intensive EEC and are intensively managed to optimize resource production from sites maintained in a native state (e.g. forested). Despite intensive practices these lands are an important component of landscape structure and composition. Management may eliminate or reduce the duration of some development processes, particularly mature old forest stages, and may result in non-natural succession, produce unnatural conditions such as exotic species, old field spruce, and monoculture plantations, or reduce structure and composition below ecologically desirable levels.

Forests are protected from fire, insects, and competing vegetation. Management adheres to environmental regulations and policies such as the Wildlife Habitat and Watercourse Protection Regulations, Forest Code of Practice, and Department of Environment Wetlands Directive.

The remaining lands are split between the reserve class (1%) and the converted class (45%).

Approximately 11% of the lands are unclassified.

The reserve class is divided into two categories: legal reserves and policy reserves. Legal reserves are wilderness areas, protected beaches, and designated provincial parks. Policy reserves are those set aside under various provincial policies, such as the Old Forest Policy or Eastern Habitat Joint Venture lands.

Representation of reserves within Minas Lowlands is low because of the percentage of lands converted to other uses. There is opportunity to add additional lands to the reserve classes under the Old Forest Policy by selecting community types that presently have insufficient representation or community types that are rare within the ecodistrict and/or ecoregion.

The converted lands are those areas that have been altered by human settlement, farming, urban development, and transportation and utility corridors. These converted lands are predominately located around the major river corridors, villages, and towns. These lands are given a 0 ecological emphasis index class in their present state but some locations, especially along the river corridors, show opportunity for restorative measures to the predicted climax stands of spruce, elm, sugar maple, and white ash.

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

Road Index (Appendices 6, 7; Map 5)

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

In discussing road ecology, Forman (2004) describes five distinctive landscape types in North America: city-suburb, agricultural, forestry, arid-grassland, and natural landscape. Each landscape type has a characteristic pattern of road networks with distinctive ecological effects and planning considerations (Forman & Hersperger 1996). These were adapted in Nova Scotia to classify five Road Index Benchmark Ranges associated with particular land use settings:

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

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

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

Currently, Minas Lowlands has an overall RI value of 24 (Appendix 7, Table 3). This average falls at the high end of the between the Mixed Rural category range of 16 to 24. Only 2% of the ecodistrict has a Remote RI of 0 to 6 (Appendix 7, Table 2). Nearly two-thirds of the ecodistrict area has road indices in the Mixed Rural and Agriculture Suburban categories.

As expected, the highest road densities occur around river valleys, settlements, and main transportation systems. RI values of 40 in the Valley Corridors element place them in the Urban category and are highest within the entire ecoregion (Appendix 7 and Map 5).

These high RI values affect the ecodistrict in numerous areas because of river corridors and human settlement that contribute to habitat fragmentation.

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

- Conservation of some of the relatively few low road densities within the co-matrix elements through strategic scheduling of new access and decommissioning where possible. Private woodland owners may be able to decommission select roads and share access.
- Accessing systems must be scheduled for regular maintenance or decommissioning, particularly where connectivity or additional reserves are to be established.
- Recreational trails should utilize old abandoned trails or logging roads before additional trails are established.
- Seeking to improve the distribution and connectivity among the few low road density areas. This may improve connectivity between natural areas and linkages to neighbouring ecodistricts.

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.

Old Forest

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

As of 2013 in the Minas Lowlands Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species: four endangered, four threatened, and three vulnerable.

In addition to the listed species, the National General Status process also identifies 18 orange-listed species, 41 yellow-listed species, 33 green-listed species, and 5 undetermined species, for a total of 98 other species of conservation concern in this ecodistrict.

Designated species at risk found within the Minas Lowlands Ecodistrict include Atlantic salmon, black ash, eastern white cedar, monarch butterfly, wood turtle, snapping turtle, moose, and several bird species (red knot, piping plover, common night hawk, olive-sided flycatcher, bobolink, barn swallow, bank swallow, and Canada warbler).

Other species of conservation concern known for the Minas Lowlands Ecodistrict include semipalmated sandpiper and eastern bluebird (birds); marsh bellflower, blue cohosh, and cuckoo flower (dicots); northern maidenhair fern and meadow horsetail (ferns and their allies); arctic fritillary and taiga bluet (insects); short-awned foxtail, hayden's sedge, and woolly sedge (monocots).

Birds

As of 2013, eight species of birds found to be present in the ecodistrict are designated at risk. Seven of these are listed under the NSESA: red knot (*rufa* ssp), piping plover (*melodus* spp), barn swallow, and Canada warbler as endangered; common nighthawk and olive-sided flycatcher as threatened; bobolink as vulnerable.

Nationally, four species are listed under SARA: piping plover (*melodus* spp) as endangered; common nighthawk, olive-sided flycatcher, and Canada warbler as threatened.

COSEWIC has designated all eight species: red knot (*rufa* ssp) and piping plover (*melodus* ssp) as endangered; common nighthawk, olive-sided flycatcher, bobolink, barn swallow, bank swallow, and Canada warbler as threatened.

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

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

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

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

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

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

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

The red knot is a shorebird that breeds in Arctic Canada, winters in South America, and migrates thousands of kilometres between the breeding grounds and wintering areas. This

subspecies has shown a 70% decline in abundance over the past 15 years. The red knot stops over in Nova Scotia during migration to feed on horseshoe crab eggs, which is a critical food source. The primary cause of decline is attributed to the depletion of this food source. There have been historical occurrence reports of red knot in one location along the shore of the Minas Basin in this ecodistrict.

The piping plover is a small migratory shorebird that feeds on marine worms, fly larvae, beetles, crustaceans, mollusks, and other small marine invertebrates. Habitat preferences include sandy or pebbly beaches with access to intertidal areas and mudflats for feeding. Minas Lowlands has limited preferred habitat and therefore occurrences of piping plover are very low, with only one historical record documented. There are approximately 40 breeding pairs along the shores of Nova Scotia. Low numbers are attributed to human disturbances, shoreline development, predation by birds and mammals, and habitat loss from natural beach succession.

Dicots

Only one species at risk is documented for the Minas Lowlands Ecodistrict: black ash. In 2013, black ash was listed under the NSESA as threatened. There are an estimated 1,000 individuals and only 12 mature trees in the province. In Minas Lowlands, one black ash tree is documented near South Maitland.

Gymnosperms

Only one species at risk is documented for Minas Lowlands: eastern white cedar. In 2006, eastern white cedar was listed under NSESA as vulnerable; only 32 stands are identified provincially. The population is fragmented and comprises small stands that appear genetically separate from each other. This species is typically found in riparian areas, woodland forests, and old pastures, preferring nutrient rich, cool, moist habitats. In Minas Lowlands, one site is documented near the eastern boundary.

Fish

Major rivers in Minas Lowlands include the Shubenacadie, Salmon, Chiganois, Folly, Debert, Bass, and Portapique. Historically, Atlantic salmon have utilized these rivers for spawning and may make some use of the available habitat they present. 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 designation. 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, meadow, abandoned farmland, and roadsides that have a presence of milkweed. Monarchs will only lay their eggs on the leaves of milkweed, which is the primary food for the developing caterpillars. The monarch may occasionally be observed in the Minas Lowlands Ecodistrict as they may in other areas of the province.

Mammals

Moose on the mainland of Nova Scotia have been designated 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. Moose are transient in this ecodistrict , moving through the area on occasion.

Moose are commonly associated with forested landscape habitats that have been altered or disturbed by an event such as fire, wind, disease, or 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 are valuable for shelter, thermal cover, and protection in winter and summer. Secluded wetland areas with an abundance of emergent vegetation are used for feeding and cooling during the summer. The availability of suitable habitat for endangered mainland moose is important in maintaining its future presence.

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

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

Reptiles

Wood turtle is designated by COSEWIC as threatened and listed under the federal SARA and NSESA as the same. Based on species occurrence information, Minas Lowlands is not likely to support a large number of wood turtle. Wood turtles are uncommon province-wide, with the majority of observation occurring at a few main concentration areas, presently none of which are located within this ecodistrict.

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

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.

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

620 Minas Lowlands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Red and Black Spruce Hummocks (Co-Matrix)	WMHO WMSM	Frequent	red Spruce (rS), black Spruce (bS)
Spruce Pine Hummocks (Co-Matrix)	IFSM IMHO IMSM	Frequent	bS, white Pine (wP)
Spruce Hemlock Pine Hummocks and Hills (Patch)	ICHO ICSM WCHO	Frequent	rS, eastern Hemlock (eH), wP
Marshes and Grasslands (Patch)	DKLD	Open Seral (Frequent)	N/A
Red and Black Spruce Flats	IFHO	Frequent	rS, bS
Tolerant Mixedwood Hills (Patch)	IFKK WMDS WMKK	Infrequent	rS, eH, wP, yellow Birch (yB), sugar Maple (sM)
Salt Marsh (Patch)	XXSM	Open Seral (Frequent)	*Spartina spp.* (cordgrass)
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, red Maple (rM)
Valley Corridors (Corridor)	Various	Various	Various

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

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

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

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

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

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

Five of the 17 ecosections – WMDS, WTLD, WMSM, IFKK, and ICSM – found in Minas Lowlands Ecodistrict 620 each comprise less than 2% of the ecodistrict (Map 7 and Appendix 3, Table 2).

Two of these ecosections – IFKK and WMDS located within the Tolerant Hardwood Hills element – have the highest land use pressures, with 51% converted to human settlement, farming, and other development activities. These same ecosections have much lower land use pressures at the ecoregional level at 21% and 11%, respectively (Appendix 3, Table 2).

No ecosection is more than 70% (other than Dykeland) converted at the ecodistrict level. The WMSM ecosection is 75% converted at the ecoregional level. Old growth stands have been identified on 177 hectares (Appendix 5) of the Crown lands under Old Forest Policy. A total of 9% of the provincial Crown lands have been identified as old forest, but a number of community types have inadequate representation because of little or no Crown lands exist within those species**.**

Pure stands of red spruce or communities with red spruce-hemlock-white pine-sugar maple-yellow birch-beech and also sugar maple-yellow birch-beech are almost non-existent within the ecodistrict. Therefore, representation of these community types will be required from other ecodistricts within the ecoregion.

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

- Conservation of uncommon forest species for which genetic viability may be threatened as indicated by DNR's Endangered Species Rating System.
- Conservation of significant habits and recognition of uncommon community conditions (e.g. old age, large live and dead trees, and species associations) and increased representivity of uncommon old forest communities.
- Implementation of restorative measures in community types, such as elm, sugar maple and ash stands along the river corridors or 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 IRM classification to include old forest, Eastern Habitat Joint Venture Sites, non-designated provincial park reserves, and non-designated sites of ecological significance.

Legal reserves account for 285 hectares in the ecodistrict (Appendix 5).

An additional 200 hectares are defined as policy reserves, including old forest sites set aside under the provincial Old Forest Policy, along with designated provincial parks and park reserves, operational non-designated parks and park reserves, and areas under the Nature Conservancy of Canada.

Since provincial Crown lands only represent about 4% of the ecodistrict, opportunities to improve representation will have to be directed to private lands in the form of programs of Eastern Habitat Joint Venture, Nature Conservancy of Canada, and Nova Scotia Nature Trust.

Priority sites and strategies to improve representation should include:

- Conservation of uncommon or rare climax community types, such as red spruce, sugar maple, yellow birch, and beech, which are less than 3% in the ecodistrict and less than 1% in the ecoregion. Red Spruce is less than 1% in the WMSM ecosection within the ecodistrict and under heavy land use pressures. Red spruce, hemlock, white pine, sugar maple, yellow birch, and beech form less than 1% in both ecodistrict and ecoregion (WMDS).
- Conservation of additional old forest area in all climax community types with the exception of elm-sugar maple-white ash, black spruce-white pine, and red spruce-hemlock and white pine.
- Improved connectivity among wetlands and river corridors.

ELA Summary

Element Interpretation (All appendices and maps)

This ecodistrict comprises the lowland area surrounding Cobequid Bay. Along the southern shore of the bay the ecodistrict is fairly narrow until it approaches Truro, where it widens and extends inland following the valleys of the Salmon and North rivers to the slopes of the Cobequid Hills.

Several other major rivers pass through the ecodistrict, including the Shubenacadie, Chiganois, Folly, Debert, and Bass. The highest elevation seldom exceeds 40 metres above sea level.

The climate, influenced by Cobequid Bay, is such that on the better soils conditions permit the growing of many of the crops associated with the Annapolis Valley, such as corn and strawberries.

The ecodistrict is underlain by the Triassic era red siltstones and sandstones. On the north shore of Cobequid Bay, most of the ecodistrict has been covered by glacial deposits of sand and gravel

which have formed deep beds. Evidence of this is found in the extensive aggregate quarries outside of Truro along the North River. Along the bay the soft sandstones have been gradually eroding and extensive tidal flats on both sides of the bay are evidence of a once larger land mass.

Similar to the Annapolis Valley Ecodistrict, Minas Lowlands has very little in the way of lakes, with most of the freshwater resource (2% of the ecodistrict) occurring in streams and rivers and a few small ponds. Since European settlement, the construction of dykes has been used to claim farmland from the tidal salt marshes that surround the bay.

The forests of this ecodistrict predominantly comprise softwood species, with few stands of tolerant hardwood. Usually only on well-drained hills will sugar maple, yellow birch, and beech be found. Elsewhere, tolerant hardwoods will be found growing in mixedwood associations with red spruce, hemlock, and white pine, particularly on the steep slopes of the streams and rivers flowing to the bay.

Where the soils are imperfectly to poorly drained, the forests are dominated by black spruce and scattered white pine. On the well-drained sandy loams, red spruce and hemlock will be found. A few areas of the ecodistrict have deep, coarse sandy soils where red pine and white pine occur that have originated after fire. Elm, black ash, and occasionally sugar maple and beech may be found on the alluvial soils along the river systems.

Fire and hurricane have been the predominant natural disturbance agents in the ecodistrict. Occasional stand-level mortality will occur due to insect and disease epidemics such as the spruce budworm and tussock moth. The damage caused by Hurricane Juan in 2003 was extensive in this ecodistrict and provides an example of the susceptibility of wind damage to forests on moist soils.

Red and Black Spruce Hummocks

(Co-Matrix) (WMHO and WMSM ecosections) (14,843 ha)

This co-matrix is found fairly uniformly across the ecodistrict in small to large patches. The present forest is predominately red and black spruce but there are higher percentages of early and mid seral stages with such species as balsam fir, white spruce, and intolerant hardwoods (Appendix 10, Table 1). Fifty-six percent of the forest is found in the early and mid seral stages with only 24% in the late seral stage.

The Ecological Emphasis Classification indicates that the index for WMHO and WMSM is 29 to 34 and 31 to 38, respectively, indicating high land use pressures and conversion to other uses (Appendix 12b). The red spruce within the WMSM is under heavier pressures across the ecoregion with EEC of 17 to 18 and conversion of nearly 75%.

Flows

People (exploration, forestry, recreation, transportation, utilities, residences, OHVs); deer (year-round habitat); eagles (nesting, perching, Shubenacadie River - over wintering); trout (habitat); bass (river estuaries - Bass, Portapique, Shubenacadie, and Economy).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)

Composition of Red and Black Spruce Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	11%	57% (46 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	31%	25%	24%	20%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	68%	6%	21%	5%

Desired Condition

Spruce and hemlock-dominated softwood stands in a variety of patch sizes and development classes as well as a minimum of 40% of the forest in the mature class.

Issues

- less than 1% of this element is in the reserve class
- representation under the Old Forest Policy indicates WMHO (red spruce and hemlock) is only 4% and WMSM (red spruce) is 0%
- 20% of the forest in this co-matrix is unclassified (Appendix 4)
- conversion exceeds 47% for both ecosections in element (Appendix 3, Table 2)
- early and mid seral stages exceed 50% of the present forest (Appendix 10)
- less than 2% of the area is under the administration and control of the Crown (Appendix 4)

Spruce Pine Hummocks

(Co-Matrix) (IFSM, IMHO and IMSM ecosections) (13,618 ha)

This co-matrix is found predominately on the north side of the Bay of Fundy in larger patches than the Spruce Pine Hummocks and Ridges. Almost 79% of the area within this element is found within the black spruce-white pine community.

The element is still 81% softwood. Thirty-four percent of the forest is in the early and mid seral stages. All three ecosections have a higher conversion rate within the ecodistrict (30% to 51%) than the ecoregion, which ranges from 20% to 36% (Appendix 3, Table 2).

Forty-eight percent of the forest is in the mature seral stage. The development classes are fairly well balanced. Although the EEC Index is low throughout the entire ecodistrict, this element has one of the highest EEC of 41 to 49 (Appendix 12a). Both co-matrix have the same road index of 22.

Flows

People (exploration, forestry, recreation, transportation, utilities, residences, and OHVs); deer (winter refugia); eagles (nesting, perching, Shubenacadie River - over wintering); trout

(habitat); bass (river estuaries - Bass, Portapique, Shubenacadie, and Economy).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)

Composition of Spruce Pine Hummocks

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	25%	20%	55% (40 Mat + 15 OF)	15%
Seral Stage	Early	Mid	Late	Unclassified
	14%	19%	48%	19%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	81%	3%	15%	1%

Desired Condition

A spruce and white pine-dominated community with a variety of development classes. A minimum of 40% of the forest should be in the mature class. Inclusions of hardwoods and mixedwoods within the spruce/pine dominated forest would increase fertility, add diversity, and reduce the risk to fire.

Issues

- less than 3% of this element is in the reserve class
- 19% of the forest is unclassified
- conversion rates range from 30% to 51%
- only 5% of black spruce-white pine community is found on provincial Crown lands
- high road index of 22
- only 2% of the black spruce-white pine community is set aside for representation

Spruce Hemlock Pine Hummocks and Hills

(Patch) (ICHO, ICSM and WCHO ecosections) (3,653 ha)

This is the largest patch element in Minas Lowlands, representing 9% of the ecodistrict.

Historically, the forest composition has been about 76% softwood with spruce, pine, and hemlock dominating. The remaining 24% was a hardwood forest of sugar maple, elm, and white ash. This patch type is fairly fragmented in medium to large areas occurring mostly north of the Bay of Fundy.

The present forest composition is dominated by softwoods and mixedwoods that are in early to mid seral stages. Only 5% of the present forest is in a hardwood covertype. The development classes are fairly well balanced for the natural disturbance regime (NDR).

Flows

People (exploration, transportation, recreation, residences, hunting, utilities); deer (year-round habitat).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)
Composition of Spruce Hemlock Pine Hummocks and Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	37%	11%	52% (41 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	33%	24%	27%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	70%	5%	19%	6%

Desired Condition

A spruce and pine-dominated softwood patch type in a variety of patch sizes and development stages as well as a minimum of 40% of the forest in the mature class. Inclusions of long-lived tolerant hardwoods, such as sugar maple and ash, would add diversity to this element type.

Issues

- less than 1% of the red spruce, hemlock, and white pine found within the WCHO ecodistrict is under reserve status
- ICHO and ICSM have no representation within this ecodistrict
- almost 50% of the patch type has been converted to other uses (Appendix 3, Table 2)
- unclassified lands account for 16% of the total area (Appendix 10)
- less than 5% of the area is under the administration and control of the Crown
- early and mid seral stages account for 57% of the forested area
- only 27% of the forest in the late seral stage

Marshes and Grasslands
(Patch) (DKLD ecosection) (1,844 ha)

Dykelands are the agricultural lands developed from rich salt marshes found predominately on the north side of the Bay of Fundy. Prior to dyking, these salt marshes occurred at the mouths of tidal rivers and in other low-lying coastal areas. The salt marsh plants trap the nutrient-rich sediments from the tidal waters on large areas which are ideal for development of agricultural lands.

The Acadians were the first to design and construct many of the present day dyke systems around the Bay of Fundy. These dykelands became farms of the Acadian settlers that provided for their needs as well as giving them a surplus for export along the eastern seaboard. After the Acadians

were expelled in 1755, the New England Planters, Yorkshire farmers, and the United Empire Loyalists claimed new areas of salt marshes used primarily for pasture and hay production.

Until the 1920s, these dykelands played an important role in Nova Scotia agriculture. Between 1920 and 1948 there was little or no effort in maintaining and rebuilding the dykes. By 1948, many of these dykes had deteriorated to the point where large tracts of dykeland reverted back to salt marsh. In 1949, the Maritime Marshland Rehabilitation Act was introduced to prevent any further loss of the dykelands.

Dykelands still play an important agricultural role, as shown by the number of different crops, such as hay, corn, cereal, and sod, around Lower and Central Onslow, Truro, and Old Barns.

These same dykelands are important habitat for a number of wildlife species, such as meadow voles, shrews, marsh hawks, kestrels, deer, fox, coyotes, and shorebirds.

The marshy areas of the dykelands provide habitat for species associated with wetlands, such as black duck, bittern, muskrat, fish, and beaver. These areas are also traditional migration routes of a wide range of bird species.

The dykes also provide recreational activity including walking, bird watching, hunting, and trapping. Despite the importance of dykelands, these lands face increased pressure to be developed for other human uses such as urban expansion and landfill sites.

Flows

People (agriculture, transportation); water (catchment, wildlife habitat area, filtering); deer (travel, general percolation); furbearers (muskrats, mink, beaver); eagle (food, habitat).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)

Composition of Marshes and Grasslands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	17%	27%	56% (49 Mat + 7 OF)	7%
Seral Stage	Early	Mid	Late	Unclassified
	25%	23%	44%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	86%	3%	10%	1%

Desired Condition

A series of undisturbed freshwater and saltwater marshes and grasslands with inclusions of bogs and peat lands.

Issues

- high costs of maintenance and rebuilding the dykelands
- increased pressures to use other areas (dykelands) for human settlement, urban development, and infill sites
- low EEI of 17 to 18 (Appendix 12a)

Red and Black Spruce Flats
(Patch) (IFHO ecosection) (1,683 ha)

This patch element occurs in four general locations: Economy and Five Islands area, Upper Bass River, Millbrook, and the west side of the Shubenacadie River, north of the Gosse Bridge. These areas are generally characterized by imperfectly drained fine to medium-textured soils and relatively high stocking of trees. Red and black spruce are still the most common species, but there is a higher percentage of balsam fir, white spruce, red maple, white birch, and aspen.

The development classes are fairly well balanced but there is a slightly higher percentage of the forest in the establishment class.

The softwood covertype has decreased from the inherent 70% to 52% and the intolerant hardwoods in the hardwood covertypes account for 9% of the total forested area (Appendix 10).

Only 20% of the present forest is in the late seral stage, 52% in the early to mid seral and 28% of the forest is unclassified. A total of 283 hectares, or 17% of the element, has been converted to other uses (Appendix 12a). The Ecological Emphasis Index is 49 to 60.

Flows

People (forestry, recreation, farming, OHV, summer residence); deer (year-round habitat); eagles (perching and hunting); trout (habitat - Bass River area).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)
Composition of Red and Black Spruce Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	36%	12%	52% (35 Mat + 17 OF)	17%
Seral Stage	Early	Mid	Late	Unclassified
	23%	29%	20%	28%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	51%	9%	34%	6%

Desired Condition

A softwood-dominated patch element of black spruce with inclusions of a mixedwood

community of red spruce, yellow birch, and sugar maple and a variety of development classes associated with the frequent disturbance.

Issues

- no reserve areas have been identified for this community type and ecosection (IFHO)
- low percentage of Crown ownership
- 28% of the area is unclassified (Appendix 10)
- high percentage of the forest in the early and mid seral stage (Appendix 10)
- only 20% of the forest are in the late seral stage
- EEI of 49 to 60 (Appendix 12a)

Tolerant Mixedwood Hills
(Patch) (IFKK, WMDS and WMKK ecosections) (1,256 ha)

This patch type was historically a mixture of spruce, sugar maple, yellow birch, hemlock, and white pine located on well-drained knolls or ravines. On the upper slopes and crests of the knolls there are pure stands of sugar maple, yellow birch, and beech. This patch type occurs in six locations: Lower Economy, Kings Rest, Great Village, along the Chiganois River south of Staples Brook, Millbrook, and Murrays Siding.

The present forest composition is in a slightly unbalanced state with a slight over abundance in the establishment development class (Appendix 10). This patch type is now only 25% mixedwood and 49% in the softwood covertype. Fifty-three percent of the forest is in the early and mid seral stages with balsam fir, red maple, white spruce, tamarack, and birch dominating. Only 22% of the forest is in the late seral stage.

Flows

People (farming, forestry, recreation, residential, transportation, summer cottages); deer (habitat, feeding); eagles (perching, hunting); muskrats (habitat); trout (habitat - feeder streams).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)
Composition of Tolerant Mixedwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	32%	12%	56% (52 Mat + 4 OF)	4%
Seral Stage	Early	Mid	Late	Unclassified
	40%	14%	22%	24%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	49%	23%	25%	3%

Desired Condition

A mixedwood community of spruce, sugar maple, yellow birch, hemlock, and white pine with at least 60% of the forest in the mature, multi-aged and old growth development class.

Issues

- small patch type with no areas identified for reserve status (Appendix 4)
- infrequent and gap disturbance with only 22% of the present forest in the late seral stage
- fifty-four percent of the forest in the mature and multi-aged development classes
- conversion to other uses (farming, settlement, and transportation corridors)
- low EEI of 31 to 39
- fifty-three percent of the forest is in the early and mid seral stages

Salt Marsh

(Patch) (XXSM ecosection) (1,015 ha)

Salt marshes are areas of coastal wetlands that are periodically flooded by the sea and are a very fertile part of Cobequid Bay. Along the Bay of Fundy, these marshes can be found in localized small patches in Lower Debert, Lower Onslow, Old Barns, and Clifton. The salt marshes are dominated by grasses and are in an intertidal zone where there is moderate to low wave action and they are protected by the highest waves and storms.

The Minas Basin and Cobequid Bay have extensive areas of intertidal mud flats owing to the high tidal range, coastal erosion, and sediments brought in from some of the major rivers, such as the Salmon, Shubenacadie, Kennetcook, Avon, and Cornwallis.

These salt marshes import and export nutrients and help provide habitat for fish. The salt marshes of the Bay of Fundy contain higher mineral content than others found along the South Shore or in Halifax County.

These Bay of Fundy marshes can be divided into two zones: one that is frequently flooded twice daily by the tides and the other which usually borders a river or stream. Both types are high in cordgrass. These zones are called high and low marsh areas.

High marsh areas have more species diversity. These high marsh areas have also experienced considerable alterations by dyking over the past 300 to 400 years in order to secure more agricultural land. The low marsh areas have a wider range of habitat that supports more diversity of wildlife species. This combination equals very important ecological areas noteworthy for conservation and restoration.

The estuaries and salt marshes that are found around the Bay of Fundy provide significant ecological functions, services, and also habitat for a number of species both terrestrial and marine.

Flows

People (recreation, hunting, farming-reclaimed); deer (habitat, summer foraging); eagles (perching, hunting especially edges); muskrats (habitat); trout (habitat); bass (habitat - Portapique and Economy).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006) **Composition of Salt Marsh**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	17%	6%	77% (57 Mat + 20 OF)	20%
Seral Stage	Early	Mid	Late	Unclassified
	54%	28%	8%	10%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	56%	12%	30%	2%

Desired Condition

A series of undisturbed freshwater and saltwater marshes and grasslands with inclusions of bogs and peat lands.

Issues

- low to medium EEI of 56
- conversion to other uses (farming, settlement, and transportation corridors)

Wetlands
(Patch) (WTLD ecosection) (219 ha)

These wetland patch elements occur in small, fairly isolated areas throughout the ecodistrict, in three general areas: Portapique, Lower Debert, and Maitland. Smaller wetlands and wetland complexes occur throughout the Minas Lowlands Ecodistrict.

These wetlands have a high importance in water collection, filtering, and groundwater recharge.

Wetlands are characterized by imperfect to poor drainage, stunted black spruce and larch bogs, and ericaceous vegetation.

Flows

People (hunting and trapping); deer (habitat for foraging around the edges); eagles (perching and hunting especially edges); muskrats (habitat for ducks).

Composition

Minas Lowlands Ecodistrict 620 (based on statistics up to 2006)

Composition of Wetlands

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	1%	8%	91% (71 Mat + 20 OF)	20%
Seral Stage	Early	Mid	Late	Unclassified
	38%	38%	23%	1%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	55%	11%	34%	0%

Desired Condition

Wetlands and wetland complexes that are all interconnected to the hydrological system.

Issues

- less than 1% land in a wetland state (Appendix 12a)
- no representation for the wetland patch type
- connectivity (Appendix 2)
- wetland loss, fragmentation

Valley Corridors

(Corridor) (Various ecosections) (5,113 ha)

The Valley Corridors element comprises the numerous river corridors that dissect the Minas Lowlands in several locations across the entire ecodistrict.

These corridors generally contain late seral softwoods, mixedwoods, and hardwoods of red and black spruce, white pine, sugar maple, yellow birch, beech, white ash, and elm. The higher slopes and knolls are gap-disturbed compared to the flats and bottoms which tend to be frequently disturbed by severe winds.

Overall, the development classes are fairly well balanced with 67% of the forest in the mature and multi-aged and 26% in the establishment class (Appendix 10). Most of the lower reaches of these river systems have been significantly altered by human settlement, dykelands, agriculture, urban development, intersecting roads, utility lines, recreational trails, and other linear features.

Over 50% of the forest land within these corridor systems has been converted to other uses. The reserve area is less than 1% and the EEI is 24 to 26 (Appendix 12a).

Flows

People (Salmon River - fishing, kayaking, OHV, hiking, aggregate, trails; Shubenacadie River – rafting; Chiganois River - fishing, trails, aggregate; Debert River - fishing, trails aggregate; Great

Village River - salmon fishing, aggregate; Portapique River - smelt fishing, aggregate; Bass River - bass fishing, aggregate; North River - trout fishing, aggregate); deer (habitat all rivers); eagles (nesting and perching except the Chiganois, Debert, and North rivers); muskrats (habitat all rivers); trout (habitat all rivers); bass (habitat in the Shubenacadie, Portapique, Bass, and Economy rivers); moose (habitat around the Shubenacadie, Chiganois, Debert, Great Village, and Portapique rivers).

Composition

Minas Lowlands Ecodistrict 620 (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
	26%	7%	67% (58 Mat + 9 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	35%	27%	16%	22%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	71%	9%	18%	2%

Desired Condition

Well-connected slopes and intervales in a natural forest condition.

Issues

- insignificant amount of area identified as reserve under either policy or legal status
- early and mid seral stages account for 52% of the present forest (Appendix 10)
- only 16% of the present forest is in the late seral stage (Appendix 10)
- high conversion rates (>50%) (Appendix 12b)
- transition away from hardwood covertypes to an ecodistrict that is now dominated by mixedwood and softwood

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Minas Lowlands 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:

- Minas Lowlands is located in a relatively rural area that is heavily forested but has a high intensity of land use as indicated by the EEI of 33 to 39, an average of 40% to 43% conversion to other uses, and an average Road Index value of 24.
- Less than 2% of the ecodistrict has been set aside as reserve status and a number of the elements have less than 1% representation.

- ICHO and ICSM ecosections have no representation.
- A high percentage of the forest is unclassified.
- A high percentage of the forest is in the early and mid seral stage.
- Only 4% of the ecodistrict is under the administration and control of the Crown.

Appendix 1: Flow - Element Interactions

Element	People	Deer	Eagles	Muskrats	Trout	Bass	Moose
Red and Black Spruce Hummocks	Exploration, forestry recreation, transportation, utilities, residences, OHV's	Habitat year round	Nesting, perching (Shubenacadie River) overwintering	_____	Habitat	River estuaries (Bass, Portapique, Shubenacadie and Economy)	_____
Spruce Pine Hummocks	Exploration, forestry recreation, transportation, utilities, residences, OHV's	Winter refugia	Nesting, perching (Shubenacadie River) overwintering	_____	Habitat	River estuaries (Bass, Portapique, Shubenacadie and Economy)	_____
Valley Corridors 1) Salmon 2) Shubenacadie 3) Chiganois 4) Debert 5) Great Village 6) Portapique 7) Bass River 8) Economy 9) North River	- Fishing, kayaking, OHV, hiking, aggregate, trails - rafting -fishing, trail, aggregate - fishing, trail, aggregate - salmon fishing, aggregate - smelt fishing, aggregate - Bass fishing, aggregate - Bass, salmon, trout, aggregate -Trout fishing, aggregate	Habitat (all)	Nesting, Perching Nesting, Perching Nesting, Perching Nesting, Perching Nesting, Perching Nesting, Perching Nesting, Perching	Habitat (All)	Habitat (All)	Habitat Habitat Habitat Habitat Habitat Habitat	Habitat Habitat Habitat Habitat Habitat

Appendix 1: Flow - Element Interactions

Element	People	Deer	Eagles	Muskrats	Trout	Bass	Moose
Spruce Hemlock Pine Hummocks and Hills	exploration, transportation, recreation, residences, off-highway vehicles, hunting, utilities	Year round habitat	_____	_____	N/A	N/A	_____
Red and Black Spruce Flats	forestry, recreation, farming, OHV, summer residences	Habitat year round	Perch, hunt	_____	Habitat - Bass River area	N/A	_____
Salt Marsh	Recreation, hunting, farming - reclaimed	Habitat - summer foraging	Perching and hunting especially edges	Habitat	Habitat	Yes - Bass, Portapique and Economy	_____
Wetlands	Hunting, trapping	Habitat for foraging around the edges	Perching and hunting especially edges	Habitat also ducks	N/A	N/A	_____
Tolerant Mixedwood Hills	Farming, recreation, forestry, residential, transportation, summer cottages	Habitat, Feeding	Some perching and hunting	habitat	habitat, feeder streams	_____	_____
Red and Black Spruce Hummocks	Exploration, forestry recreation, transportation, utilities, residences, OHVs	Habitat year round	Nesting, perching (Shubenacadie River) overwintering	_____	Habitat	River estuaries (Bass, Portapique, Shubenacadie and Economy)	_____

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	Co-Matrix	High	Most prominent in the central and eastern sections	landscape	Frequent	- rS eH - bS - rS	Spruce Pine Hummocks - bS wP - rS eH - bS	reduced old forest features and species diversity	large percentage of the forest in early and mid seral stages - diversity - ownership	Manage to frequent NDR short to medium rotation with representation in all seral stages.
Spruce Pine Hummocks	Co-Matrix	High	Prominent along the northern sections of the ecodistrict - West Montrose, Five Houses, Onslow Mountain, Belmont, and Valley	landscape pattern large patches broad distribution	Frequent	bS wP - rS eH bS	rS eH bS rS	- connectivity - urbanization - road system	ownership - few lakes Special Management Zones along major river valleys	manage to frequent NDR - promote effective Special Management Zones - increase climax species in key areas of the matrix
Spruce Hemlock Pine Hummocks and Hills	Patch	Very High	large patch types located along river systems - Bass River, Portapique, Great Village, Debert, and Chiganois	broad distribution over the northern sections	Frequent	Late vegetation type: rS eH wP - along the river systems we find the aE sM wA	rS eH - bS - rS - bS wP	high conversions both in the ecodistrict and ecoregion (40 to 57%) - early and mid seral species is high (>50%) - early development exceeds 35% of the total forest	Special Management Zones within patch type - age class distribution - seral stages - ownership	very little crown - communication to establish and define Special Management Zones - restoration where possible - additional representation - decrease conversio n

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 Flats	Patch	Medium	Five Islands Upper Bass River Millbrook	Localized small patches in three locations	Frequent	bS tL bF rM	rS eH - bS - rS	High conversion - early and mid seral percentages are high	conversion	Manage to frequent NDR short to medium rotation with representation in all seral stages
Tolerant Mixedwood Hills	Patch	Medium	Great Village, Upper Economy, Bass River, Chiganois, Murray Siding	Small isolated patches	Infrequent and gap	rS sM yB Be - rS eH wP sM yB Be	rS eH - bS - rS - bS wP	road systems - conversion (10 to 50%) - connectivity lack of mature late seral	ownership restoration opportunities are limited	reduce early seral species - no representation
Marshes and Grasslands	Patch	Medium	Salmon River area - near MacElmons Pond Provincial Park, Great Village	small patch	Open	_____	_____	_____	_____	_____
Wetlands	Patch	Very High	Portapique, Lower Economy	Isolated patches	Open seral	Sphagnum Bogs stunted trees	poorly drained ericaceous vegetation	connectivity	wetland loss - degradation road fragmentation	decrease losses to agriculture and urbanization
Salt Marsh	Patch	High	Coastal areas - Lower Debert, Lower Onslow, Old Barns, Clifton	localized small patch	frequent	invasive cordgrass	ocean and fresh water	infilling	infilling	_____

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
Valley Corridors	Corridors	High	Debert, Chiganois, Portapique, Bass, Great Village, North and Great Village Rivers	Long continuous rivers that start in the Cobequid Hills and dissect the Lowlands before emptying into the Minas Basin	Frequent and Gap	all	all	human settlement / development	non-continuous forest cover because of settlement, agriculture, forestry	improve continuity

Appendix 2b: Connective Management Strategies

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

Appendix 3: Special Occurrences (Ecodistrict 620)
Table 1a: Species at Risk (species protected by endangered species legislation on all lands)

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Red Knot rufa ssp	*Calidris canutus rufa*	Endangered	N/A	Endangered
Piping Plover melodus ssp	*Charadrius melodus melodus*	Endangered	Endangered	Endangered
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Bank Swallow	*Riparia riparia*	N/A	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
DICOTS				
Black Ash	*Fraxinus nigra*	Threatened	N/A	N/A
FISH				
Atlantic Salmon - Inner Bay of Fundy	*Salmo salar*	N/A	Endangered	Endangered
GYMNOSPERMS				
Eastern White Cedar	*Thuja occidentalis*	Vulnerable	N/A	N/A
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MOLLUSKS				
Atlantic Mud-piddock	*Barnea truncata*	N/A	N/A	Threatened
REPTILES				
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 620)

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	-		
Spotted Sandpiper Least	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Sandpiper Semipalmated	*Calidris minutilla*	Secure (Green)	S1B,S5M
Sandpiper Northern	*Calidris pusilla*	Sensitive (Yellow)	S3M
Cardinal	*Cardinalis cardinalis*	Secure (Green)	S3S4
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Semipalmated Plover	*Charadrius semipalmatus*	Secure (Green)	S1S2B,S5M
Killdeer	*Charadrius vociferus*	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
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Hudsonian Godwit	*Limosa haemastica*	Sensitive (Yellow)	S3M
Hudsonian Whimbrel	*Numenius phaeopus hudsonicus*	Sensitive (Yellow)	S3M
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3S4
Red-necked Phalarope	*Phalaropus lobatus*	Sensitive (Yellow)	S2S3M
American Golden-Plover	*Pluvialis dominica*	Sensitive (Yellow)	S3M
Virginia Rail	*Rallus limicola*	Undetermined	S2B
Eastern Bluebird	*Sialia sialis*	Sensitive (Yellow)	S3B
Greater Yellowlegs	*Tringa melanoleuca*	Sensitive (Yellow)	S3B,S5M
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	S2S3B
Solitary Sandpiper	*Tringa solitaria*	Secure (Green)	S1?B,S4S5M
Eastern Kingbird	*Tyrannus tyrannus*	Sensitive (Yellow)	S3S4B
DICOTS			
Hooked Agrimony	*Agrimonia gryposepala*	Secure (Green)	S3
Virginia Anemone	*Anemone virginiana*	May Be At Risk (Orange)	S2
Drummond's Rockcress	*Arabis drummondii*	Sensitive (Yellow)	S2
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3
Marsh Bellflower	*Campanula aparinoides*	Sensitive (Yellow)	S3
Large Toothwort	*Cardamine maximum*	May Be At Risk (Orange)	S1
Cuckoo Flower	*Cardamine pratensis var. pratensis*	May Be At Risk (Orange)	S1
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2

Appendix 3: Special Occurrences (Ecodistrict 620)

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***
Canada Tick-trefoil	*Desmodium canadense*	May Be At Risk (Orange)	S1
Common Bedstraw	*Galium aparine*	Exotic	S1
Northern Bedstraw	*Galium boreale*	May Be At Risk (Orange)	S2
Robinson's Hawkweed	*Hieracium robinsonii*	Sensitive (Yellow)	S2
Canada Wood Nettle	*Laportea canadensis*	Sensitive (Yellow)	S3
Balsam Groundsel	*Packera paupercula*	Secure (Green)	S3
Small's Knotweed	*Polygonum buxiforme*	Undetermined	S2S3
Climbing False Buckwheat	*Polygonum scandens*	Sensitive (Yellow)	S3
Mistassini Primrose	*Primula mistassinica*	Sensitive (Yellow)	S2
Pink Pyrola	*Pyrola asarifolia*	Secure (Green)	S3
Bloodroot	*Sanguinaria canadensis*	Secure (Green)	S3S4
Long-leaved Starwort	*Stellaria longifolia*	Sensitive (Yellow)	S3
Roland's Sea-Blite	*Suaeda rolandii Tiarella*	May Be At Risk (Orange)	S1?
Heart-leaved Foamflower	*cordifolia Triosteum*	Sensitive (Yellow)	S2
Orange-fruited Tinker's Weed	*aurantiacum Vaccinium*	Sensitive (Yellow)	S2
Dwarf Bilberry	*caespitosum Verbena*	Sensitive (Yellow)	S2
Blue Vervain	*hastata*	Secure (Green)	S3
Golden Alexanders	*Zizia aurea*	May Be At Risk (Orange)	S1
FERNS AND THEIR ALLIES			
Northern Maidenhair Fern	*Adiantum pedatum Cystopteris*	May Be At Risk (Orange)	S1
Bulblet Bladder Fern	*bulbifera Equisetum hyemale*	Secure (Green)	S3S4
Common Scouring-rush	*var. affine Equisetum pratense*	Secure (Green)	S3S4
Meadow Horsetail	*Equisetum scirpoides*	Sensitive (Yellow)	S2
Dwarf Scouring-Rush	*Lycopodium sabinifolium*	Secure (Green)	S3S4
Ground-Fir	*Polypodium appalachianum*	Secure (Green)	S3?
Appalachian Polypody		Undetermined	S3?
INSECTS			
Lance-Tipped Darner	*Aeshna constricta*	Secure (Green)	S3
Milbert's Tortoiseshell	*Aglais milberti*	Secure (Green)	S2
Eastern Red Damsel	*Amphiagrion saucium*	Secure (Green)	S3
Arctic Fritillary	*Boloria chariclea*	Sensitive (Yellow)	S2
Taiga Bluet	*Coenagrion resolutum*	May Be At Risk (Orange)	S1

Appendix 3: Special Occurrences (Ecodistrict 620)

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***
Juvenal's Duskywing	*Erynnis juvenalis*	Secure (Green)	S2S3
Baltimore Checkerspot	*Euphydryas phaeton*	Secure (Green)	S3
Harvester	*Feniseca tarquinius*	Secure (Green)	S3S4
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Compton Tortoiseshell	*Nymphalis l-album*	Secure (Green)	S1S2
Riffle Snaketail	*Ophiogomphus carolus*	Secure (Green)	S3
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Green Comma	*Polygonia faunus*	Secure (Green)	S3
Hoary Comma	*Polygonia gracilis*	Sensitive (Yellow)	S1
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Banded Hairstreak	*Satyrium calanus*	Undetermined	S2
Aphrodite Fritillary	*Speyeria aphrodite*	Secure (Green)	S3S4
Northern Cloudywing	*Thorybes pylades*	Sensitive (Yellow)	S2
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
MONOCOTS			
Short-awned Foxtail	*Alopecurus aequalis*	Sensitive (Yellow)	S2S3
Lesser Brown Sedge	*Carex adusta*	Sensitive (Yellow)	S2S3
Bebb's Sedge	*Carex bebbii*	May Be At Risk (Orange)	S1S2
Bearded Sedge	*Carex comosa*	Sensitive (Yellow)	S2
Bristle-leaved Sedge	*Carex eburnea*	Sensitive (Yellow)	S3
Fernald's Hay Sedge	*Carex foenea*	Secure (Green)	S3?
Hayden's Sedge	*Carex haydenii*	May Be At Risk (Orange)	S1
Pubescent Sedge	*Carex hirtifolia*	Sensitive (Yellow)	S2S3
White-Tinged Sedge	*Carex peckii*	May Be At Risk (Orange)	S2?
Woolly Sedge	*Carex pellita*	May Be At Risk (Orange)	S1
Plantain-Leaved Sedge	*Carex plantaginea*	May Be At Risk (Orange)	S1
Rosy Sedge	*Carex rosea Carex*	Secure (Green)	S3
Tender Sedge	*tenera Corallorhiza*	Sensitive (Yellow)	S1S2
Early Coralroot	*trifida*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 620)

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***
Narrow-leaved Panic Grass	*Dichanthelium linearifolium*	Sensitive (Yellow)	S2?
Dudley's Rush	*Juncus dudleyi*	Sensitive (Yellow)	S2?
Woods-Rush	*Juncus subcaudatus var. planisepalus*	Sensitive (Yellow)	S3
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Canada Rice Grass	*Piptatherum canadense*	Sensitive (Yellow)	S2
Large Purple Fringed Orchid	*Platanthera grandiflora*	Secure (Green)	S3
Shining Ladies'-Tresses	*Spiranthes lucida*	May Be At Risk (Orange)	S2
Narrow False Oats	*Trisetum spicatum*	Secure (Green)	S3S4

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

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

Appendix 3: Special Occurrences (Ecodistrict 620)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Economy River Marsh	Habitat	Eastern habitat Joint Venture	Wildlife Act
Debert Wildlife Management Area	Habitat	Provincial Database	Wildlife Act
Little Dyke Beach	Habitat	Provincial Database	Beaches Protection Act
Anthony Provincial Park	Park	Provincial Database	Provincial Parks Act
MacElmons Pond	Park (operational non-designated)	Provincial Database	
Portapique River Wilderness Area	Habitat	Provincial Database	NS Environment Act
Abandoned Mines (Old Barns, Staples Brook, Birch Hill)		Abandoned Mines Database	
Aggregate		Provincial Database	
Alewife (Gaspereau)	Species	Provincial Database	
American Shad	Species	Provincial Database	
Atlantic Sturgeon	Species	Provincial Database	
Bald Eagle Nest	Species	Provincial Database	
Deer Wintering Area	Habitat	Provincial Database	
Freshwater Lakes- MacElmons Pond	Habitat	Provincial Database	
Gypsum Mine (South Maitland)		Mineral Occurrence Database	
Mineral Occurrence (Clay, Iron)		Mineral Occurrence Database	
Salt Marsh	Habitat	Provincial Database	NS Environment Act
Smallmouth Bass	Species	Provincial Database	
Striped Bass	Species	Provincial Database	
Striped Maple- very large-Economy Point	Species	Local Knowledge	
Titanium Sands		Provincial Reports	
Tomcod	Species	Provincial Database	

Appendix 3: Special Occurrences (Ecodistrict 620)
Table 1d – Heritage Features

Feature	Type	Information Source
Acadian Burial Ground	Heritage	Cultural Database
Chiganois Trail	Heritage	Cultural Database
Debert Airport		
Dykes	Heritage	
Native Burial Site- Debert Community Site	Heritage	Cultural Database
Special Places- Debert	Heritage	Cultural 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	%		
DKLD	dykeland	2,976	6.8	0	0.0	13 to 14	80.9	13,132	3.2	0	0.0	12	83.2
ICHO	bS wP	892	2.0	10,098	23.1	27 to 29	57.0	6,378	1.6	24,911	6.1	42 to 46	36.8
ICSM	bS	85	0.2	6,018	13.8	38 to 43	39.7	13,275	3.3	66,716	16.4	36 to 37	49.2
IFHO	bS	1,771	4.1	6,018	13.8	50 to 60	16.9	63,358	15.6	66,716	16.4	52 to 61	17.4
IFKK	rS sM yB Be	86	0.2	1,261	2.9	25 to 34	51.5	44,100	10.8	1,261	0.3	49 to 57	21.2
IFSM	aE sM wA	972	2.2	3,743	8.6	32 to 36	48.3	20,523	5.0	15,452	3.8	46 to 51	31.1
IMHO	bS wP	10,719	24.5	10,098	23.1	42 to 51	30.0	34,807	8.6	24,911	6.1	47 to 57	20.7
IMSM	aE sM wA	3,154	7.2	3,743	8.6	32 to 36	50.8	16,842	4.1	15,452	3.8	42 to 47	36.2
WCHO	rS eH wP	4,224	9.7	2,957	6.8	30 to 35	46.2	17,090	4.2	36,557	9.0	33 to 37	48.2
WMDS	rS eH wP sM yB Be	101	0.2	101	0.2	50 to 64	10.7	101	0.0	101	0.0	50 to 64	10.7
WMHO	rS eH	14,923	34.2	12,590	28.8	29 to 34	51.4	38,186	9.4	23,290	5.7	30 to 35	48.6
WMKK	rS sM yB Be	1,072	2.5	1,261	2.9	30 to 37	41.1	9,983	2.5	1,261	0.3	50 to 62	15.6
WMSM	rS	226	0.5	226	0.5	31 to 39	47.7	6,488	1.6	63,927	15.7	17 to 18	74.6
WTLD	wetlands	282	0.6	0	0.0	46	34.8	8,359	2.1	0	0.0	63 to 65	13.7

*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)
WMHO	rS eH	14,923	1.6	48	53	9	0	57	0.4	53	0.4	110	0.7
IMHO	bS wP	10,719	4.9	158	0	72	0	230	2.1	0	0.0	230	2.1
WCHO	rS eH wP	4,225	1.8	10	3	0	0	10	0.2	3	0.1	13	0.3
IMSM	aE sM wA	3,154	17.0	0	0	103	0	103	3.3	0	0.0	103	3.3
DKLD	dykeland	2,976	0.5	0	0	4	0	4	0.1	0	0.0	4	0.1
IFHO	bS	1,771	17.6	0	0	0	0	0	0.0	0	0.0	0	0.0
XXMS	salt marsh	1,353	5.7	0	12	0	0	0	0.0	12	0.9	12	0.9
WMKK	rS sM yB Be	1,072	7.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFSM	aE sM wA	972	0.3	2	0	0	7	2	0.2	7	0.7	9	0.9
ICHO	bS wP	892	4.2	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	wetlands	282	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMSM	rS	226	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WMDS	rS eH wP sM yB Be	101	12.0	0	0	0	0	0	0.0	0	0.0	0	0.0
IFKK	rS sM yB Be	86	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
ICSM	bS	85	0.0	0	0	0	0	0	0.0	0	0.0	0	0.0
Total		**42,837**		**217**	**68**	**188**	**7**	**405**		**75**		**480**	

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)
Areas under the Special Places Act	207	53	Old Forest	177	0
Protected Beaches	0	15	Operational Non Designated Parks and Reserves	9	0
Wilderness Areas	10	0	Designated Provincial Parks and Park Reserves	8	0
			Nature Conservancy of Canada	0	7

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

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

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

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

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

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

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	434
Utility corridors	3	76
Gravel Roads and active railways	6	498
Paved streets and roads collectors	10	429
Highways	15	28

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	Range	Hectares	Percent
Remote	0 to 6	676	1.5
Forest Resource	7 to 15	5,933	13.6
Mixed Rural	16 to 24	10,440	23.9
Agriculture Suburban	25 to 39	18,155	41.6
Urban	40 to 100	8,125	18.6
Total		**43,330**	**99.2**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Valley Corridors	5,061	40
Spruce Pine Hummocks	13,602	22
Red and Black Spruce Hummocks	14,783	21
Tolerant Mixedwood Hills	1,247	20
Red and Black Spruce Flats	1,670	11
Marshes and Grasslands	1,834	27
Spruce Hemlock Pine Hummocks and Hills	3,643	27
Salt Marsh	975	22
Wetlands	218	18
Total	**43,033**	**24**

*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

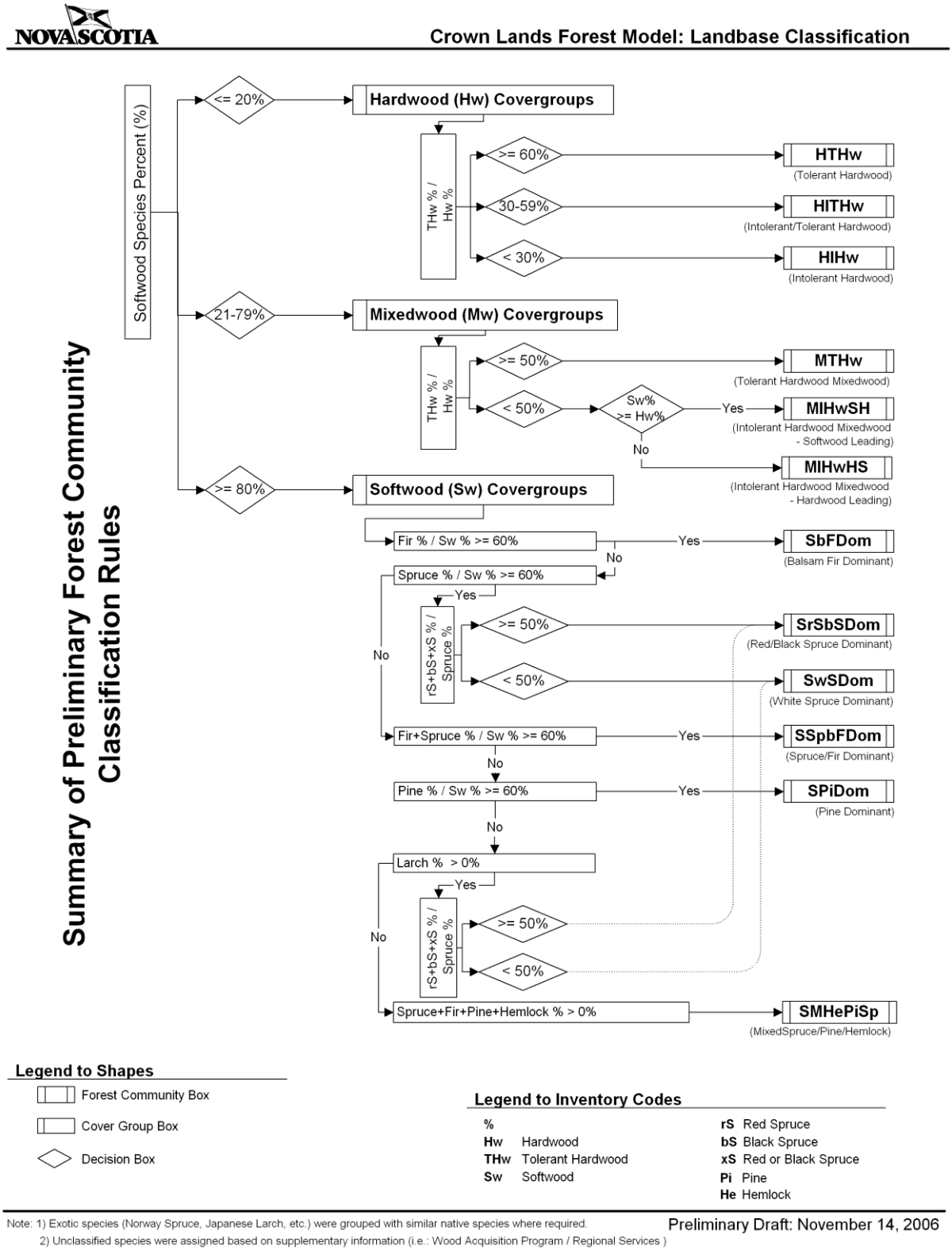
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-lived shade-intolerant "pioneer" species • peak seed production by forbs and 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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
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
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
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
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
BF	balsam fir	5	5	5	5	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	5	1	1
BP	balsam poplar	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	3	3	3	3	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	3	1
BS	black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
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
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
	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
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
IH	intolerant hardwood	3	2	4	2	2	2	2	2	4	2	2	2	2	2	2	2	2	2	2	4	3	2	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2
IW	ironwood	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
JP	jack pine	2	3	2	2	2	2	2	2	2	2	2	2	3	2	2	2	2	3	3	3	3	2	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
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
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
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
RM	red maple	3	2	4	2	2	2	2	2	4	2	5	2	2	2	2	2	2	2	2	5	3	2	2	2	2	2	2	2	2	3	2	3	3	2	2	2	2	2
RO	oak	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
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
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
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
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
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
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
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
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
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
WB	white birch	3	4	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	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
WS	white spruce	4	4	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	5	5	5	4	1	1
XS	red&black spruce	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
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

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 to 23 early, 24 to 37 mid, and 38 to 50 late.

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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 (Co-Matrix)	WMHO (98.0%) WMSM (2.0%)	Softwood	rS eH bS rS	Frequent	14,843; 100.0	Early	129	185	563	152	1,029	4,384; 68.0	EARLY	1,957; 31.0
						Mid	165	169	432	132	898			
						Late	128	223	935	128	1,414			
						Uncl	1,043	0	0	0	1,043			
		Mixedwood				Early	45	39	255	102	441	1,322; 21.0	MID	1,599; 25.0
						Mid	77	50	399	127	653			
						Late	4	6	75	21	106			
						Uncl	124	0	0	0	124			
		Hardwood				Early	37	33	204	60	334	412; 6.0	LATE	1,548; 24.0
						Mid	8	2	36	2	48			
						Late	0	0	30	0	30			
						Uncl	0	0	0	0	0			
		Unclassified				Early	140	3	9	0	152	300; 5.0	UNCL	1,314; 20.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	147	0	0	0	147			
Total					**14,843***	**# ha**	**2,047**	**710**	**2,938**	**724**	**6,419**			
						%	**31.9%**	**11.1%**	**45.8%**	**11.3%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Hummocks (Co-Matrix)	IMHO (78.0%) IMSM (17.0%) IFSM (5.0%)	Softwood	bS wP rS eH bS	Frequent	11,211; 82.0	Early	11	9	51	21	92	920; 81.0	EARLY	163; 14.0
						Mid	10	33	45	27	115			
						Late	31	171	245	59	506			
						Uncl	207	0	0	0	207			
		Mixedwood		Frequent		Early	5	3	12	15	35	170; 15.0	MID	210; 19.0
						Mid	0	8	50	32	90			
						Late	0	0	20	17	37			
						Uncl	8	0	0	0	8			
		Hardwood	aE sM wA	Gap	1805; 13.0	Early	0	6	16	2	24	31; 3.0	LATE	545; 48.0
						Mid	0	0	6	0	6			
						Late	0	0	2	0	2			
						Uncl	0	0	0	0	0			
		Unclassified				Early	12	0	0	0	12	13; 1.0	UNCL	217; 19.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2	0	0	0	2			
Total					**13,618***	**#ha**	**286**	**230**	**447**	**173**	**1,136**			
						%	**25.2%**	**20.2%**	**39.3%**	**15.2%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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 Hills (Patch)	WMKK (85.0%) WMDS (8.0%) IFKK (7.0%)	Softwood				Early	11	44	94	8	158	359; 49.2	EARLY	292; 40.0
						Mid	8	9	18	11	46			
						Late	20	11	46	0	76			
						Uncl	79	0	0	0	79			
		Mixedwood	rS sM yB Be rS eH wP sM yB Be	Infrequent	828; 65.9	Early	0	12	59	6	77	185; 25.3	MID	97; 14.0
						Mid	8	1	35	2	45			
						Late	0	10	49	0	59			
						Uncl	4	0	0	0	4			
		Hardwood	sM yB Be	Gap	428; 34.1	Early	0	4	43	0	47	164; 22.6	LATE	163; 22.3
						Mid	0	0	6	0	6			
						Late	0	0	28	0	28			
						Uncl	84	0	0	0	84			
		Unclassified				Early	10	0	0	0	10	21; 2.9	UNCL	177; 24.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	11	0	0	0	11			
Total					**1,256***	**#ha**	**234**	**90**	**378**	**27**	**729**			
						%	**32.1%**	**12.3%**	**51.9%**	**3.6%**	**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 (Minas Lowlands 620)

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)				
Marshes and Grasslands (Patch)	DKLD (100.0%)	Softwood	N/A	Open Seral		Early	4	3	15	3	25	126; 86.0	EARLY	37; 25.0
						Mid	1	3	19	5	28			
						Late	6	31	25	0	62			
						Uncl	11	0	0	0	11			
		Mixedwood	N/A	Nil		Early	0	0	6	1	7	15; 10.0	MID	34; 23.0
						Mid	1	2	1	2	6			
						Late	0	0	2	1	3			
						Uncl	0	0	0	0	0			
		Hardwood	N/A	Nil		Early	0	0	5	0	5	5; 3.0	LATE	65; 44.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	1; 1.0	UNCL	13; 8.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	2	0	0	0	2			
Total					**1,844***	**#ha**	**25**	**39**	**73**	**12**	**149**			
						%	**16.8%**	**26.2%**	**49.0%**	**8.1%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Hemlock Pine Hummocks and Hills (Patch)	WCHO (78.0%) ICHO (20.0%) ICSM (2.0%)	Softwood	rS eH wP bS wP bS	Frequent	2,765; 76.0	Early	68	46	192	56	362	1,090; 70.0	EARLY	514; 33.0
						Mid	32	35	102	21	190			
						Late	63	54	192	42	351			
						Uncl	188	0	0	0	188			
		Mixedwood				Early	17	8	25	20	70	287; 19.0	MID	367; 24.0
						Mid	76	10	68	19	173			
						Late	0	3	20	9	32			
						Uncl	13	0	0	0	13			
		Hardwood	aE sM wA	Gap	860; 24.0	Early	8	6	14	5	33	69; 5.0	LATE	409; 27.0
						Mid	3	0	1	0	4			
						Late	0	3	23	1	27			
						Uncl	4	0	0	0	4			
		Unclassified				Early	50	0	0	0	50	92; 6.0	UNCL	248; 16.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	42	0	0	0	42			
Total					**3,653***	**#ha**	**564**	**165**	**637**	**173**	**1,539**			
						%	**36.6%**	**10.7%**	**41.4%**	**11.2%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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 Flats (Patch)	IFHO (100.0%)	Softwood	bS	Frequent	1,178; 70.0	Early	6	19	57	17	99	669; 51.0	EARLY	294; 23.0
						Mid	7	55	58	33	153			
						Late	7	26	115	49	197			
						Uncl	218	0	0	0	218			
		Mixedwood	rS sM yB Be	Frequent	505; 30.0	Early	13	13	56	22	104	434; 34.0	MID	380; 29.0
						Mid	58	16	61	67	202			
						Late	0	0	34	16	50			
						Uncl	75	0	0	0	75			
		Hardwood				Early	0	18	47	13	78	112; 9.0	LATE	259; 20.0
						Mid	13	0	9	2	24			
						Late	0	3	7	0	10			
						Uncl	0	0	0	0	0			
		Unclassified				Early	9	0	4	0	13	80; 6.0	UNCL	361; 28.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	67	0	0	0	67			
Total					**1,683***	**#ha**	**473**	**150**	**448**	**219**	**1,290**			
						%	**36.7%**	**11.6%**	**34.7%**	**17.0%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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 (Corridor)	WCHO (27.0%) DKLD (22.0%) IMSM (17.0%) WMHO (6.0%) IFSM (5.0%) ICHO (3.0%) IMHO (2.0%) IFHO (2.0%) WTLD (1.0%)	Softwood	rS eH wP bS wP rS eH	Frequent	1,834; 36.0	Early	20	22	159	16	217	648; 71.0	EARLY	323; 35.0
						Mid	4	16	114	27	161			
						Late	2	8	60	14	84			
						Uncl	186	0	0	0	186			
		Mixedwood	rS sM yB Be	Gap	27; 1.0	Early	3	4	40	8	55	170; 18.0	MID	247; 27.0
						Mid	2	5	50	12	69			
						Late	0	0	41	0	41			
						Uncl	5	0	0	0	5			
		Hardwood	aE sM wA	Gap	1,082; 21.0	Early	3	3	37	2	45	85; 9.0	LATE	147; 16.0
						Mid	1	2	14	1	18			
						Late	0	0	22	0	22			
						Uncl	0	0	0	0	0			
		Unclassified				Early	5	1	0	0	6	15; 2.0	UNCL	200; 22.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	9	0	0	0	9			
Total					**5,113***	**#ha**	**240**	**61**	**537**	**80**	**918**			
						%	**26.1%**	**6.6%**	**58.5%**	**8.7%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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)				
Salt Marsh (Patch)	XXMS	Softwood		Frequent		Early	5	0	18	4	27	44; 56.0	EARLY	42; 54.0
						Mid	1	0	3	1	5			
						Late	0	0	6	0	6			
						Uncl	6	0	0	0	6			
		Mixedwood		Gap		Early	0	2	4	3	9	23; 30.0	MID	22; 28.0
						Mid	0	3	6	5	14			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood		Gap		Early	0	0	5	2	7	10; 12.0	LATE	6; 8.0
						Mid	0	0	3	0	3			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	1; 2.0	UNCL	7; 10.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
Total					**1,015***	**#ha**	**13**	**5**	**45**	**15**	**78**			
						%	**16.7%**	**6.4%**	**57.7%**	**19.2%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Minas Lowlands 620)

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		44; 20.0	Early	0	2	7	0	9	32; 55.0	EARLY	22; 38.0
						Mid	0	0	9	4	13			
						Late	0	2	5	2	9			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	0	2	5	7	20; 34.0	MID	22; 38.0
						Mid	0	0	8	0	8			
						Late	0	0	4	0	4			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	6	0	6	6; 11.0	LATE	13; 23.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.0	UNCL	1; 1.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**219***	**#ha**	**0**	**4**	**41**	**11**	**56**			
						%	**0.0%**	**7.1%**	**73.2%**	**19.6%**	**100.0%**			

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Appendix 10: Table 2: Composition of Forest Communities (in Minas Lowlands 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	WMHO WMSM	Frequent Frequent	rS eH rS	S	SrSbSDom	2,353	38.5%	L	**Well-drained** Early VT: tA, ltA, rM, wB, bF Mid VT: bF, rM, rS, yB Late: rS, eH, wP yB **Imperfectly drained** bS, tL, bF, rM
				S	SspbFDom	440	7.2%	E	
				S	SspbFDom	548	9.0%	M	
				S	SwSDom	918	15.0%	E	
				S	SpiDom-	88	1.4%	L	
				S	SMHePiSp	25	0.45	L	
				M	MIHwHS	732	12.0%	E/M	
				M	MTHw	125	2.0%	L	
				M	MIHwHS	465	7.6%	E/M	
				H	HTHw	36	0.6%	L	
				H	HIHw	371	6.1%	E/M	
				H	HITHw	3	0.0%	M/L	
Total						**6,104**	**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

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Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Hummocks	IFSM IMHO IMSM	Gap Frequent Frequent	aE sM wA bS wP aE sM wA	S	SrSbSDom	730	65.1%	L	**Moist** Early VT: bS wP rP jP wB rM gB Mid: VT bS wP rM LateVT: wP bS **Well-drained** Early VT: tA ltA rM wB bF Mid VT:bF rM rS yB Late VT:rS eH wP yB **Well-drained intervale sites** - aE sM wA
				S	SbFDom	46	4.1%	E	
				S	SspbFDom	43	3.8%	M	
				S	SwSDom	86	7.7%	E	
				S	SpiDom	13	1.2%	L	
				S	Sp Pi eH	1	0.1%	L	
				M	MTHw	22	2.0%	L	
				M	MIHwSH	119	10.6%	E/M	
				M	MIHwHS	30	2.7%	E/M	
				H	HTHw	2	0.2%	L	
				H	HIHw	29	2.6%	E/M	
Total						**1,121**	**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 Minas Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Hills	WMKK WMDS IFKK	Infrequent Gap Infrequent	rS sM yB Be rS eH wP sM yB Be sM yB Be	S	SrSbSDom	141	19.9%	M	**Well-drained** Early VT: rM wB bF Mid VT: bF rS rM yB Late VT: rS eH sM yB Be
				S	SbFDom	43	6.1%	E	
				S	SspbFDom	27	3.8%	M	
				S	SwSDom	145	20.5%	E	
				S	SMHePiSp	2	0.3%	L	
				M	MTHw	66	9.3%	L	
				M	MIHwSH	88	12.4%	E/M	
				M	MIHwHS	31	4.4%	E/M	
				H	HTHw	33	4.7%	L	
				H	HIHw	47	6.7%	E/M	
				H	HITHw	84	11.9%	M/L	
Total						**708**	**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 Minas Lowlands 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
Marshes and Grasslands	DKLD			S	SwSDom	25	17.0%	E	
				S	SrSbSDom	76	51.7%	L	
				S	SbFDom	7	4.8%	E	
				S	SspbFDom	13	8.8%	M	
				S	SpiDom	6	4.1%	L	
				M	MIHwSH	11	7.5%	E/M	
				M	MIHwHS	4	2.7%	E/M	
				H	HIHw	5	3.4%	E/M	
Total						**147**	**100.0%**		

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

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

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Hemlock Pine Hummocks and Hills	WCHO ICHO ICSM	Frequent Frequent Frequent	rS eH wP bS wP bS	S	SrSbSDom	556	38.5%	L	**Well-drained** Early VT: rM wB bF Mid VT:bF rS rM yB Late VT: rS eH wP **Moist** aE sM wA VT's associated with alluvial soils - found along rivers
				S	SbFDom	137	9.5%	E	
				S	SspbFDom	89	6.2%	M	
				S	SwSDom	298	20.6%	E	
				S	SpiDom	9	0.6%	L	
				M	MTHw	30	2.1%	L	
				M	MIHwSH	193	13.3%	E/M	
				M	MIHwHS	64	4.4%	E/M	
				H	HTHw	26	1.8%	L	
				H	HIHw	35	2.4%	E/M	
				H	HITHw	9	0.6%	M/L	
Total						**1,446**	**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 Minas Lowlands 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 Flats	IFHO	Frequent	bS	S	SrSbSDom	438	36.1%	L	**Moist** bS tL bF rM **Well-drained** Early VT: wB gB rM tA bF Mid VT: bF rM rS wP yB Late VT: rS eH wP rM sM yB Be
				S	SwSDom	67	5.5%	E	
				S	SbFDom	77	6.3%	E	
				S	SspbFDom	82	6.8%	M	
				S	SMHePiSp	4	0.3%	L	
				M	MTHw	74	6.1%	L	
				M	MIHwSH	230	18.9%	E/M	
				M	MIHwHS	130	10.7%	E/M	
				H	HTHw	10	0.8%	L	
				H	HIHw	98	8.1%	E/M	
				H	HITHw	4	0.3%	M/L	
Total						**1,214**	**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 Minas Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Valley Corridors	ICHO ICSM IFHO IFSM IMHO IMSM WCHO WMHO WMKK WTLD DKLD	Frequent Frequent Frequent Frequent Gap Frequent Frequent Frequent Frequent Infrequent None	bS wP bS bS aE sM wA bS wP aE sM wA rS eH wP rS eH rS sM yB Be	S	SwSDom	233	25.7%	E	All
				S	SbFDom	64	7.1%	E	
				S	SrSbSDom	238	26.3%	M	
				S	SspbFDom	110	12.1%	E/M	
				S	SMHePiSp	2	0.2%	L	
				S	SpiDom	2	0.2%	L	
				M	MIHwSH	83	9.2%	E/M	
				M	MTHw	54	6.0%	L	
				M	MIHwHS	35	3.9%	E/M	
				H	HIHw	50	5.5%	E/M	
				H	HTHw	26	2.9%	L	
				H	HITHw	9	1.0%	M/L	
Total						**906**	**100.0%**		

*Forest Community Codes:	SrSbSDom-Red Black Spruce Dominan 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 Minas Lowlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	WTLD	Open seral	bS	S	SrSbSDom	16	27.6%	L	**Wetlands of sedges and grasses** bS tL rM
				S	SbFDom	2	3.4%	E	
				S	SspbFDom	8	13.8%	M	
				S	SwSDom	6	10.3%	E	
				M	MIHwSH	11	19.0%	E/M	
				M	MIHwHS	9	15.5%	E/M	
				H	HIHw	6	10.3%	E/M	
Total						**58**	**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 Minas Lowlands 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
Salt Marsh	XXMS	None	bS wP	S	SwSDom	23	31.0%	E	
				S	SrSbSDom	11	14.0%	L	
				S	SbFDom	5	7.2%	E	
				S	SSpbFDom	3	4.3%	M	
				M	MIHwHS	12	15.7%	E/M	
				M	MIHwSH	11	15.1%	E/M	
				H	HIHw	10	12.8%	E/M	
Total						**75**	**100.0%**		

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

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

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
rS eH	12,590	33.6%	23,290	9.3%
bS wP	10,098	27.0%	24,911	9.9%
bS	6,018	16.1%	66,716	26.5%
aE sM wA	3,743	10.0%	15,152	6.0%
rS eH wP	2,957	7.9%	36,557	14.5%
rS sM yB Be	1,261	3.4%	1,261	0.5%
sM yB Be	429	1.1%	19,831	7.9%
rS	226	0.6%	63,927	25.4%
rS eH wP sM yB Be	101	0.3%	101	0.0%
Total	**37,423**	**86.7%***	**251,746**	**62.0%****

*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
Red and Black Spruce Hummocks	14,833	111	4,744	884	7,612	1,483	4,260 to 5,002	29 to 34
Spruce Pine Hummocks	13,606	340	6,117	653	4,345	2,151	5,629 to 6,704	41 to 49
Valley Corridor	4,706	7	1,320	239	2,923	218	1,110 to 1,219	24 to 26
Spruce Hemlock Pine Hummocks and Hills	3,648	6	1,217	329	1,797	299	1,076 to 1,225	29 to 34
Marshes and Grasslands	1,843	4	405	30	1,392	13	318 to 324	17 to 18
Red and Black Spruce Flats	1,680	0	958	66	283	374	828 to 1,015	49 to 60
Tolerant Mixedwood Hills	1,254	0	407	165	494	188	394 to 487	31 to 39
Salt Marsh	1,013	12	728	26	239	7	567 to 570	56
Wetlands	219	0	150	13	55	0	116	53
Total	**42,801**	**480**	**16,045**	**2,405**	**19,140**	**4,732**	**14,298 to 16,664**	**33 to 39**

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
DKLD	2,976	4	513	34	2,408	17	401 to 410	13 to 14
ICHO	892	0	295	53	509	35	244 to 261	27 to 29
ICSM	86	0	39	6	34	7	32 to 36	38 to 42
IFHO	1,771	0	1,017	76	299	379	877 to 1067	49 to 60
IFKK	86	0	23	6	44	13	22 to 29	26 to 33
IFSM	972	9	362	61	470	70	313 to 348	32 to 36
IMHO	10,720	230	4,897	519	3,211	1,863	4,498 to 5,430	42 to 51
IMSM	3,154	103	1,098	118	1,601	234	1,014 to 1,131	32 to 36
WCHO	4,223	13	1,403	430	1,950	427	1,280 to 1,493	30 to 35
WMDS	101	0	56	5	11	29	50 to 65	50 to 64
WMHO	14,923	110	4,778	896	7,667	1,472	4,285 to 5,021	29 to 34
WMKK	1,072	0	330	155	441	146	323 to 396	30 to 37
WMSM	227	0	81	4	108	34	70 to 87	31 to 38
WTLD	281	0	170	13	98	0	131	47
XXMS	1,353	12	1,001	35	297	8	774 to 777	57
Total	**42,837**	**469**	**15,062**	**2,376**	**18,851**	**4,726**	**14,315 to 16,682**	**33 to 39**

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

Appendix 13:

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

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

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

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

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

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

Matrix	A widespread vegetation forest community which dominates the landscape and forms the background in which other smaller scale communities (patches) occur. The most connected or continuous vegetation type within the landscape, typically the dominant element. (Matrix is a fundamental feature of the "matrix, patch, corridor" concept of landscape structure).
Mature forest	A development class within the sequence of: 1) forest establishment; 2) young forest; 3) mature forest; and 4) multi-aged and old growth. Mature forests include multi-aged and old growth. Forests are typically taller than 11 metres, have an upper canopy fully differentiated into dominance classes, and regularly produce seed crops. Mature forests may develop over long periods, transitioning from early competitive stages where canopy gaps from tree mortality soon close, to later stages where openings persist and understories develop to produce multi-aged and old growth.
Memorandum of understanding (MOU)	An agreement between ministers defining the roles and responsibilities of each ministry in relation to the other or others with respect to an issue over which the ministers have concurrent jurisdiction.
Mixed stand	A stand composed of two or more tree species.
Multiple use	A system of resource use where the resources in a given land unit serve more than one user.
Natural disturbance	A natural force that causes significant change in forest stand structure and/or composition such as fire, wind, flood, insect damage, or disease.

Natural disturbance regimes	The patterns (frequency, intensity, and extent) of fire, insects, wind, landslides, and other natural processes in an area. Natural disturbances inherently influence the arrangement of forested ecosystems and their biodiversity on a given landscape. Three disturbance regimes recognized in Nova Scotia are: **Frequent:** Disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even age. The time interval between stand-initiating events typically occurs more frequently than the longevity of the climax species that would occupy the site – therefore, evidence of gap dynamics and understory recruitment is usually absent. This regime results in the establishment and perpetuation of early to mid-successional vegetation types. **Infrequent:** Stand-initiating disturbances which result in the rapid mortality of an existing stand and the establishment of a new stand of relatively even-age, but the time interval between disturbance events is normally longer than the average longevity of the dominant species – allowing gap dynamics and understory recruitment to evolve and become evident (eventually creating uneven-aged stands). This regime generally leads to the establishment and/or perpetuation of mid to late successional vegetation types. **Gap replacement:** Stand-initiating disturbances are rare. Instead, disturbances are characterized by gap and small patch mortality, followed by understory recruitment, resulting in stands with multiple age classes. This regime generally leads to the establishment and/or perpetuation of late successional vegetation types.
Old growth	Climax forests in the late stage of natural succession, the shifting mosaic phase, marked by mature canopy processes of gap formation and recruitment from a developed understory. Typical characteristics include a multi-layered canopy of climax species containing large old trees, decadent wolf trees, and abundant snags and coarse woody debris. In Nova Scotia, stands older than 125 years are classed as old growth.
Patch	A discrete community or element nested within a surrounding landscape, which is often a matrix forest. (Patch is a fundamental feature of the “matrix, patch, corridor” concept of landscape structure.)
Pre-commercial thinning	A silviculture treatment to reduce the number of trees in young stands before the stems are large enough to be removed as a forest product. Provides increased growing space and species selection opportunities to improve future crop tree growth.

Reserve	An area of forest land that, by law or policy, is usually not available for resource extraction. Areas of land and water set aside for ecosystem protection, outdoor and tourism values, preservation of rare species, gene pool and wildlife protection (e.g. wilderness areas, parks).
Riparian	Refers to area adjacent to or associated with a stream, floodplain, or standing water body.
Road deactivation	Measures taken to stabilize roads and logging trails during periods of inactivity, including the control of drainage, the removal of sidecast where necessary, and the re-establishment of vegetation for permanent deactivation.
Seral stage	Any stage of succession of an ecosystem from a disturbed, unvegetated state to a climax plant community. Seral stage describes the tree species composition of a forest within the context of successional development.
Species	A group of closely related organisms which are capable of interbreeding, and which are reproductively isolated from other groups of organisms; the basic unit of biological classification.
Species at risk	Legally recognized designation for species at federal and/or provincial levels that reflects varying levels of threats to wildlife populations. The four categories of risk are extirpated, endangered, threatened, and species of special concern.
Succession	An orderly process of vegetation community development that over time involves changes in species structure and processes.
Threatened species	A species that is likely to become endangered if the factors affecting its vulnerability are not reversed. A species declared as threatened under the federal or Nova Scotia species at risk legislation (NS Endangered Species Act or federal SARA).
Tolerance	The ability of an organism or biological process to subsist under a given set of environmental conditions. The range of these conditions, representing its limits of tolerance, is termed its ecological amplitude. For trees, the tolerance of most practical importance is their ability to grow satisfactorily in the shade of, and in competition with, other trees.
Vernal pool	A seasonal body of standing water that typically forms in the spring from melting snow and other runoff, dries out in the hotter months of summer, and often refills in the autumn.

Vulnerable species	A species of special concern due to characteristics that make it particularly sensitive to human activities or natural activities or natural events. May also be referred to as “species of special concern.” A species declared vulnerable under the federal or Nova Scotia endangered species legislation (NS Endangered Species Act or federal SARA).
Wilderness area	A part of the provincial landbase designated under the Wilderness Areas Protection Act (e.g. Canso Barrens).

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