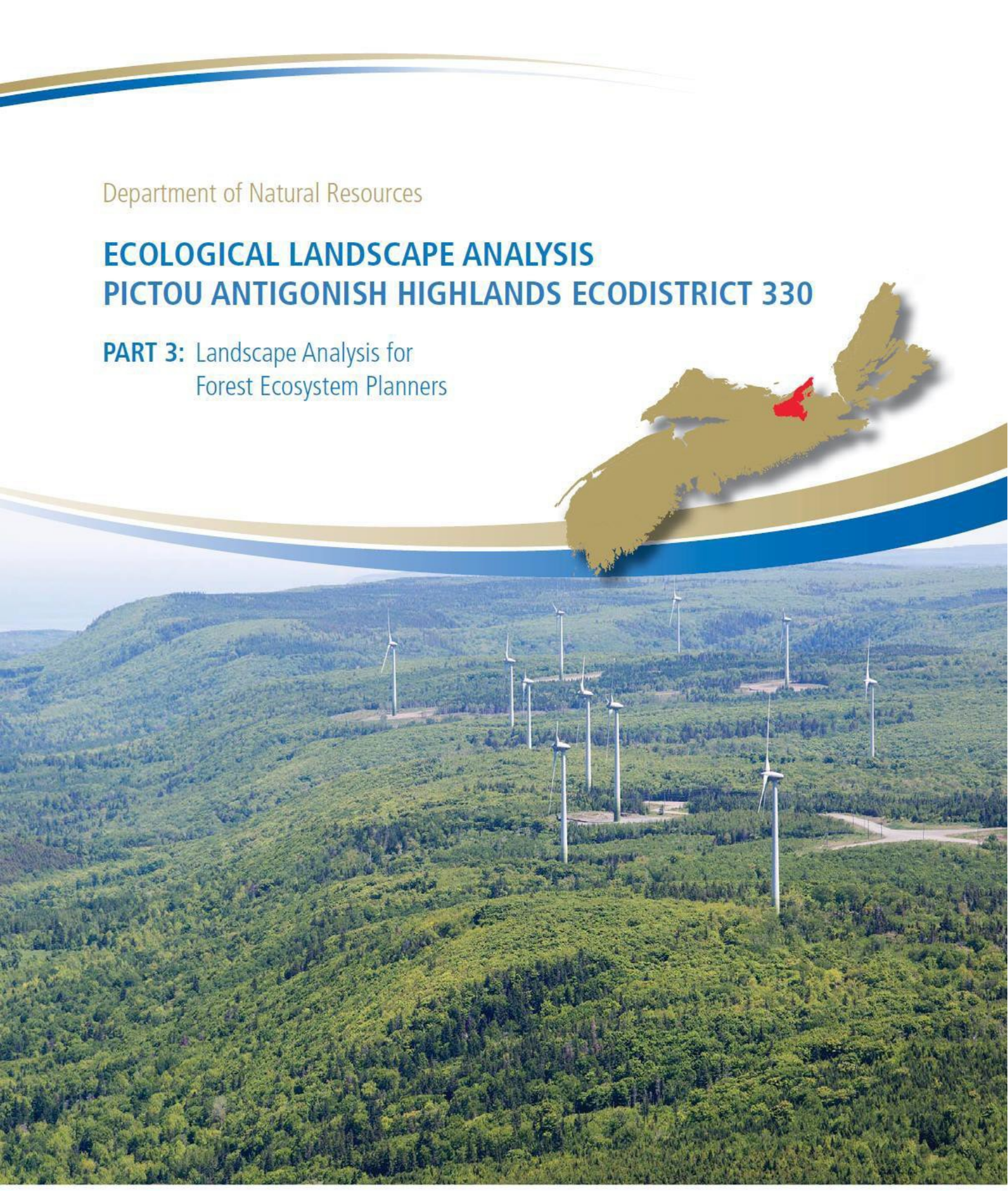
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS
PICTOU ANTIGONISH HIGHLANDS ECODISTRICT 330

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-330

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 330: Pictou Antigonish Highlands

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Pictou Antigonish Highlands 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 (1997 to 1999) – 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 Pictou Antigonish Highlands – *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 seven distinctive elements in the Pictou Antigonish Highlands Ecodistrict – one matrix, five patches, and a corridor. A matrix is the dominant element. Patches are smaller yet still distinctive elements. Corridors are natural linear elements, such as river valleys, that extend across ecodistricts (see connectivity section for full discussion of matrix, patch and corridor concepts).

Tolerant Hardwood Hills is the matrix element, representing 64% of the ecodistrict. This element represents shade-tolerant hardwoods, such as sugar maple, yellow birch, and beech, typical of the Acadian Forest. This type of forest can be seen on the slopes along the Trans-Canada Highway in the Marshy Hope area.

Red and Black Spruce Hummocks is the largest patch element, generally found on the plateau-like top of the ecodistrict. Red spruce is usually found on well-drained soils while black spruce is more likely found on soils that are wetter.

The other patch elements, in order of size, are **Tolerant Mixedwood Hills**, **Tolerant Mixedwood Slopes**, and **Floodplain.** *A tiny Wetlands element is also part of the ecodistrict.*

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

Flow – Element Interactions (Appendix 1; Map 2)

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

There is a natural percolation or movement throughout the ecodistrict but more specific locations of the flow phenomena are shown in Map 2.

One of the more well-defined flows is sea-run fish species that move from the salt water of the Northumberland Strait into the Pictou Antigonish Ecodistrict through freshwater streams.

River corridors promote connectivity.

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

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

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

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

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

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

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

The Pictou Antigonish Highlands Ecodistrict is dominated by forests to the extent that the general structure of the inherent forest conditions can still be observed.

Although there has been a general increase in the amount of younger development classes and early seral stage species, it is anticipated that the connective structure of the ecodistrict is still adequate to sustain most connective functions necessary for biodiversity.

Areas such as the corridors at Lochaber, Barneys River, and Garden of Eden likely have the highest levels of altered conditions that will pose the most difficulty for natural process and functions to occur.

Connective management strategies could include:

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

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

Most of the landscape flows identified (people, water, moose, deer, and fish) are also linkages to adjacent areas or ecodistricts (Map 2).

The hydrological system provides the most obvious physical connection among the Pictou Antigonish Highlands Ecodistrict, surrounding ecodistricts, and coastal ecosystems. The majority of the ecodistrict drains into the Northumberland Strait, with the exception of a southeast portion that drains into the St. Marys River system and eventually into the Atlantic Ocean. James River and East River are used as potable water supplies in adjacent ecodistricts.

James River obtains all its water from the Pictou Antigonish Highlands. The East River is partially feed by this ecodistrict. Anadromous fish that migrate up river from the sea to spawn and aquatic furbearers, including beaver, otter, mink, and muskrat, are tied to these watercourses that provide them with linkages to surrounding areas.

In the southern part of the ecodistrict, deer move south toward traditional winter areas along the St. Marys and East rivers. There are also smaller localized deer movement routes used in the winter to move to lower elevations within the ecodistrict and adjoining ecodistricts.

People provide a linkage to adjoining ecodistricts. Much of this movement is associated with the corridor features identified at Barneys River, Garden of Eden, and Lochaber.

Future management activities will recognize significant links to neighbouring ecodistricts and manage the forests in these areas to enhance and sustain connectivity.

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

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

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

Managing landscapes for biodiversity requires a variety of planning approaches and tools. Sustaining forest composition diversity by reflecting natural patterns of disturbance and

succession is one approach that DNR is employing to try and realize this objective. A number of additional approaches and planning tools are being developed which will be integrated with objectives defined in the ELA protocol.

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

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

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

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

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

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Pictou Antigonish Highlands

Element	Seral Stage					
	Early	% *	Middle	%	Late	%
Tolerant Hardwood Hills	IH3, IH4, IH5, IH6, MW4, MW5, OF1, OF2, OF4, OF5	30.0	IH7, SH10, TH6, TH7, TH8	17.0	**TH1, TH2,** TH3, TH4, TH5	34.0
Tolerant Mixedwood Hills	IH3, IH4, IH6, MW4, MW5, OF1, OF2, OF4, OF5	30.0	IH7, MW2, SH5, SH6, SH7, SH8, SH10, TH7, TH8	17.0	**MW1, MW3,** SH1, TH1, TH2, TH3, TH4	34.0
Tolerant Mixedwood Slopes	IH3, IH4, IH6, MW4, MW5, OW3, OW6	21.0	IH7, MW2, SH5, SH6, SH7, SH8, SH10, TH7, TH8	23	**MW1, MW3,** SH1, TH1, TH2	48.0
Red and Black Spruce Hummocks	IH1, IH3, IH4, IH6, MW4, MW5, SP6	30.0	MW2, SH5, SH6, SH7, SH8	21.0	**SH1, SH2, SH3,** SP5, SP7	30.0
Floodplain	OF1, OF2	38.0	FP6	34.0	**FP1**	24.0
Wetlands	*WC1, WC2, WC5, WC6, WD1, WD2, WD3, WD6, WD7, WD8, SP7*					

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.

It is recommended that the composition of the late seral forest covertypes be maintained in close proportion to the inherent climax forest covertypes as provided by ecological land classification interpretation. At the operational level, silvicultural systems should be selected to provide ecosystem structure and function necessary to conserve natural biodiversity.

Natural disturbance shapes the diversity of the forest ecosystem. In the Pictou Antigonish Highlands Ecodistrict, gap replacement is considered to be the predominant natural disturbance regime (NDR) when forest stands are in a late seral stage.

This type of disturbance pattern is characteristic of long-lived, tolerant species and a continual process of individual trees or small groups of mature to over mature trees falling out of the canopy. These openings are subsequently filled with regeneration creating multi-layer, multi-aged stands.

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.

In Pictou Antigonish Highlands, the overall EEI range is 52 to 62, reflecting a light to moderate intensity of land use.

About 60% falls in the extensive ecological class, followed by intensive (7%), converted (7%), and reserve (4%). The remaining 22% is unclassified.

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.

Appendix 7 and Map 5 depict the Road Index statistics for the Pictou Antigonish Highlands Ecodistrict, which has an overall RI value of 4. This means the ecodistrict has a Remote RI. The Valley Corridors element has the highest RI at 15 and the Red and Black Spruce Hummocks element has the lowest at 2.

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 pond; (2) wildlife corridors; 3) specialized habitats, such as cliffs, caves, thermal habitats, meadows, and vernal pools; 4) biological hotspots or places of intense biological activity, such as calving sites, over wintering grounds, and spawning habitats; and 5) remnants of old forest.

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

Landscapes and ecosystems comprise many species of plants, animals, and other organisms. Some of these species are given priority in planning, management, and stewardship because they are rare,

and/or at risk of going extinct locally or on a larger scale. The status and location of these species are important and data are collected, compiled, and assessed on an ongoing basis.

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

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

Species at Risk

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

Species of Conservation Concern

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

Species Ranking and Coding Systems

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

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

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

As of 2013 in the Pictou Antigonish Highlands Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: seven endangered, five threatened, and three vulnerable. In addition to the listed species, the national General Status process also identifies 11 orange-status species, 34 yellow-status species, and three undetermined for a total of 48 other species of conservation concern in this ecodistrict.

Designated provincial species at risk found within the Pictou Antigonish Highlands Ecodistrict include moose, little brown myotis, northern myotis, black ash, brook floater, snapping turtle, wood turtle and several bird species (barn swallow, rusty blackbird, common nighthawk, olive-sided flycatcher, eastern wood peewee, chimney swift, bobolink, and Canada warbler).

Other species of conservation concern known for the Pictou Antigonish Highlands Ecodistrict include spotted sandpiper, gray jay, pine siskin, cliff swallow, boreal chickadee (birds); coast creeping moss, lance leaf grape fern, blue cohosh, yellow lady’s slipper, and Canada lily (plants); jutta arctic and Maine snaketail (butterflies); and arctic kidney lichen.

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).*

Birds

As of 2013, four species have been listed under the NSESA as endangered (chimney swift, rusty blackbird, barn swallow, and Canada warbler); two ranked as threatened (common nighthawk and olive-sided flycatcher); and two listed as vulnerable (eastern wood peewee and bobolink). Additionally, there are 16 yellow-status (sensitive) bird species found in the ecodistrict (Appendix 3, Table 1b).

Habitat loss and land use practices in recent years have impacted all of these species. However, in recent years a drop in insect food species, unpredictable spring weather, and loss of nesting habitat

have resulted in a nation-wide decline in aerial insectivores such as chimney swifts, common nighthawks, and swallows.

Mammals

The mainland moose has been designated an endangered species under the NSESA. Mainland moose are genetically distinct from those on Cape Breton Island, where moose populations are healthy. One of the remnant populations of moose on the mainland is in northeastern Nova Scotia, in a large area containing most of Antigonish and Guysborough counties. This area is considered to be "occupied moose habitat" (an area with recurrent observations of moose over time). The Pictou Antigonish Highlands Ecodistrict falls within this moose concentration area.

Moose are commonly associated with forested landscape habitats that have been altered or disturbed by an event such as fire, wind (e.g. blowdown), disease or timber harvesting. The habitat requirements of moose are largely dependent on successional forest stages. Early successional hardwood trees and shrubs provide necessary browse vegetation while mature conifer cover is valuable for shelter, thermal cover, and protection in winter and summer.

Prior to the introduction of forest harvesting as a disturbance regime, the availability of moose habitat would have historically been tied to natural disturbances. The natural disturbance regimes for this ecodistrict have been determined to be mainly gap and frequent disturbances. Natural disturbance regimes of these types would have provided moose with a suitable mix of cover and food.

Nova Scotia's Forest / Wildlife Guidelines and Standards provide minimum habitat specifications for moose on Crown land through the 8% retention for old growth, maintenance of a 20 metre minimum buffer zone along water courses and through the maintenance of reasonable forest development class distribution. Additional measures to provide for specific habitat needs of moose have been identified. Special management practices (SMPs) addressing thermal refugia, aquatic feeding sites, calving areas, and clump size are required on Crown land within designated moose concentration areas.

In addition to mainland moose, there are two other mammal species that are provincially endangered: little brown myotis and the northern myotis. Both of these locally found bats have experienced significant population declines as the result of bat white-nose syndrome, a fungal disease that has spread throughout eastern North America, including Nova Scotia, during the past several years. Bats found in Nova Scotia are important predators of insects, including a variety of moth species whose larval stage impacts the foliage of forest trees.

Fish

Human influences have caused a decline in brook trout populations in Nova Scotia and as a result this species has been given a yellow status. Given the abundance of watercourses and branching tributaries in Pictou Antigonish Highlands, there should be considerable quality habitat for brook trout, including excellent spawning sites. There are also several anadromous fish species considered to be at risk or of conservation concern in watercourses within this ecodistrict. Atlantic

salmon, which have a red status in Nova Scotia, have historically utilized rivers in this ecodistrict for spawning. Salmon numbers have declined through much of the mainland in Nova Scotia. These salmon are divided into several populations, all of which are designated as endangered by COSEWIC and protected under the federal SARA.

Reptiles

Wood turtles are nationally and provincially threatened as the result of human land use activities and have been found in low numbers in this ecodistrict. These turtles are uncommon provincially but are abundant in ecodistricts south of the Pictou Antigonish Highlands, especially in the St.
Marys River Ecodistrict. Because they are a species at risk, there are special management practices in place that are mandatory on Crown lands and strongly encouraged on private lands. These practices deal with forestry, agriculture, and sand or gravel mining. General wildlife status for the species is yellow.

Snapping turtles are also listed as a species at risk federally and provincially because of their late reproductive maturity, unpredictable nest success, and vulnerability to human activities.

Plants and Lichens

Black ash is the only listed (threatened) plant species at risk in this ecodistrict under the NSESA. This tree species is known from only a few sites. There are an additional 17 plant and three lichen species known to occur in the Pictou Antigonish Highlands that are considered to be provincial species of conservation concern (orange status, four) or sensitive (yellow status, 16). None of these is listed under the NSESA, nor are any identified as species of national concern. Notable species of conservation concern in the ecodistrict include Bebb's sedge, spreading wild rye, Canada Lily, yellow lady's slipper, and arctic kidney lichen.

Invertebrates

The Pictou Antigonish Highlands Ecodistrict has one recognized invertebrate species at risk under the provincial NSESA. The brook floater is a provincially threatened freshwater mussel that is sensitive to land use practices that degrade water quality or threaten this species' host fish during its parasitic larval stage. The brook floater is found in the north branch of the St. Marys River, which bounds the southern extent of this ecodistrict.

The monarch butterfly is listed federally as a species of special concern because of its limited habitat requirements.

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

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

Landscape elements were identified by combining ecosections with similar characteristics. Table 9 provides explanations of ecosections and their relationship to elements. Ecosections that are rare (< 2% of ecodistrict area) or under high land use pressure (> 75% land conversion) are identified in Appendix 3.

Table 9 – Elements, Ecosections, Disturbance Regimes andClimax Types

330 Pictou Antigonish Highlands Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Hills (Matrix)	WCKK WMKK WCHO WMHO WCDM	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Red and Black Spruce Hummocks (Patch)	ICHO IMHO IFHO	Infrequent	red Spruce (rS), black Spruce (bS)
Tolerant Mixedwood Hills (Patch)	IFKK WFHO WFKK WFSM	Infrequent	rS, yB, sM, Be
Tolerant Mixedwood Slopes (Patch)	WCDS	Gap	rS, eH, wP, yB, sM
Floodplain (Patch)	ICSM IMSM	Gap	sM, white Ash (wA), American Elm (aE)
Wetlands (Patch)	*WTLD*	*Open Seral (Frequent)*	*bS, red Maple (rM), tamarack (tL)*
Valley Corridors (Corridor)	Various	Various	Various

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

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

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

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

Within the Pictou Antigonish Highlands Ecodistrict, there are 10 ecosections (ICSM, IFHO, IFKK, IMSM, WCDM, WFHO, WFSM, WMHO, WMKK, and WTLD) that each comprise 2% or less of the ecodistrict area. These 10 ecosections combined form less than 8% of the ecodistrict.

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

- Recognition of uncommon forest species for which genetic viability may be threatened, as indicated by DNR's General Status of Wildlife rating system. Many of these species are also listed under the NSESA or the federal SARA and many of these have recovery plans in place to direct conservation actions.
- Implementation of fine filter management opportunities related to conservation of significant habitats.
- Recognition of uncommon community conditions (e.g. old age, large live and dead trees and species associations).

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.

Provincial parks, the Eigg Mountain – James River Wilderness Area, and a protected beach are the legal reserves in the Pictou Antigonish Highlands, accounting for 5,706 hectares, or 4% of this ecodistrict (Appendix 5).

The provincial Old Growth Policy protects another 4,415 hectares of forest stands on Crown land under policy reserves.

In total this amounts to 10,120 hectares, nearly 8% of the ecodistrict, with legal reserve or policy reserve protection.

ELA Summary

Element Interpretation (All appendices and maps)

This ecodistrict has been described as an elevated triangle of resistant strata separating the Northumberland Lowlands Ecodistrict 530 of Pictou County from the St. Georges Bay Ecodistrict 520 lowlands of Antigonish County.

To the south, the highlands border the St. Marys River Ecodistrict 370 along the Chedabucto Fault.

This upland ecodistrict is crosscut by subsidiary faults trending north and south and northeast and southwest, creating many narrow valleys.

The most notable fault is the Hollow Fault, which extends from Cape George to near New Glasgow. The fault is marked by a 200 metre scarp – a steep slope – that has developed as a result of differential erosion.

Much of the province's geological history can be viewed in this ecodistrict, including ancient volcanoes and fossils more than 400 million years old at Arisaig.

The highlands reach a summit and then form a rolling plateau, best exemplified by The Keppoch, an area once extensively settled and farmed. The elevation is generally 210 to 245 metres above sea level and rises to 300 metres at Eigg Mountain.

The total area of this ecodistrict is nearly 134,000 hectares, or 13% of the North Nova Uplands Ecoregion.

Fresh water accounts for less than 1% of the ecodistrict.

Influenced by high elevations, the area has late, cool springs, cold winters, and low annual temperatures.

The dominant soils are mainly well-drained, sandy loams of medium fertility which support a zonal forest of sugar maple, beech, and yellow birch, prominent on the crests and upper slopes of hills and larger hummocks. These soils are often stony.

Other soils in the ecodistrict are derived from shales. Balsam fir, white spruce, and red spruce are found on the somewhat moist soils of hummocky upland terrain with the addition of hemlock on the lower slopes. Black spruce is commonly found on the imperfectly drained sites.

Mixedwood tolerant forests of beech, sugar maple, yellow birch, and red spruce with scattered hemlock grow on the steep slopes of streams and rivers flowing from the highlands. Where coarse-textured gravelly soils have been derived from glacial outwash, usually found along the streams and rivers, stands of white pine can occur.

A significant portion of the Highlands was settled and cleared for farming by Scottish settlers beginning in the late 1700s with large communities at Rossfield, Browns Mountain, and on The Keppoch. However, with the abandonment of these farms starting shortly after World War One and continuing as the rural population moved to urban centres, most of these lands are now back in a forested condition, usually pure stands of white spruce.

In Pictou Antigonish Highlands, natural disturbances appear to occur infrequently and create gaps in the canopy due to small patch or individual tree mortality usually caused by wind and winter storm damage, insects, and natural senescence.

The climax forests of tolerant hardwood can develop into old growth, with gap dynamics providing breaks in the canopy and allowing the development of uneven-aged stands.

Storms in this ecodistrict may be the most significant of the disturbance agents, with little evidence to support large stand-initiating events in the tolerant hardwood ecosystem. Evidence of windthrow is evident in much of the hardwood forest by the abundance of pit and mound relief.

Damage to hardwood crowns from ice storms can be significant as was documented in the similar Cobequid Hills Ecodistrict in 2003 when up to 30% of the hardwood canopy on approximately 100,000 hectares was affected.

Softwood forests on moist soils are susceptible to windthrow. Based on 40 years of fire records between 1959 and 1999, the occurrence of lightning-caused fires in the Pictou Antigonish Highlands is just under the provincial average of 1.33 per year. The low frequency of
lightning-caused fires can be attributed to an above average annual precipitation of 1,409 millimetres, which also reduces soil moisture deficit which in this ecodistrict is only significant during July.

Insects and diseases have been known to cause extensive damage to the forests of Pictou Antigonish Highlands.

The 1980 spruce budworm epidemic caused stand-level mortality in red spruce forests, most notably in the western portion. This was followed a few years later by the bark beetle which attacked stands stressed earlier by the budworm. The hardwood forests have also experienced significant mortality with individual species succumbing to pathogens.

The birch dieback was widespread in eastern Canada between 1932 and 1955, and on mainland Nova Scotia it was estimated that stand mortality of yellow birch was 15% to 40%.

The exact cause of the dieback has never been determined, but indications point to a series of climatic events (drought and freeze and thaw) that eventually caused enough stress, followed by secondary agents such as fungi, to cause tree mortality. The beech canker, introduced to the province in the 1890s, has reduced the once dominant beech to a lower canopy species.

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

Tolerant Hardwood Hills
(Matrix) (WCDM, WCHO, WCKK, WMHO and WMKK ecosections) (84,863 ha)

Historically, the identified matrix element within the Pictou Antigonish Highlands Ecodistrict was the dominant forest cover, consisting of tolerant hardwoods and softwoods, both shaped by gap disturbance favouring mature stands of late seral composition. Approximately half of this element is now in the establishment and young forest development classes, which is also about the same proportion of the element in the early to mid seral stages.

Flows

Humans (forestry, recreation, mineral exploration and development, oil and gas exploration and development, wind energy sites); water (regulation of water quality/quantity, headwaters for James River and East River potable water supplies); moose (cover/foraging significant portion of habitat for regionally large mainland moose population); deer (seasonal cover/foraging, portions of deer wintering areas in more sheltered lower elevation areas); fish (regulation of water quality/quantity).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (based on statistics up to 2006)
Composition of Tolerant Hardwood Hills

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	39%	12%	49% (40 Mat + 9 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	30%	17%	34%	19%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	33%	21%	8%

Desired Condition

Continuity of mature forest with large patches of unfragmented interior conditions.

Issues

- Restore a dominant condition of mature tolerant forest through stand tending, partial harvesting, long rotations, and harvest scheduling to promote patch aggregation.
- Currently, portions of the area defined as the matrix contain an overabundance of early seral species in softwood and mixedwood stands.

Red and Black Spruce Hummocks
(Patch) (ICHO, IFHO and IMHO ecosections) (19,291 ha)

This element features wet to imperfectly drained hummocks, supporting black spruce stands and mixedwood stands containing balsam fir, spruce, and early to mid seral hardwoods.

Flows

Humans (forestry, recreation, mineral exploration/development, gas/oil exploration/development); water (regulation of water quality/quantity some storage and purification functions); moose (cover/foraging calving areas); deer (seasonal cover/foraging); fish (regulation of water quality/quantity, cool water temperatures important).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (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
	45%	18%	37% (27 Mat + 10 OF)	10%
Seral Stage	Early	Mid	Late	Unclassified
	30%	21%	30%	19%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	47%	21%	23%	9%

Desired Condition

Spruce-dominated softwood stands with a variety of development classes and lesser amounts of mid to late seral hardwoods on medium to coarse soils.

Issues

- Forest harvest scheduling should take into consideration that 45% of the forest is in the establishment stage.
- Forest management should also focus on shifting mixedwood stands toward mature and multi-aged, late seral softwood stands.

Tolerant Mixedwood Hills

(Patch) (IFKK, WFHO, WFKK and WFSM ecosections) (17,335 ha)

This patch element is generally made up of fine-textured soils on knolls and hummocks.

A considerable area of the inherent tolerant mixedwood stands has been replaced by softwood and hardwood in the early to mid seral stages.

Flows

Humans (forestry, recreation, mineral exploration/development, gas/oil exploration/development); water (regulation of water quality and quantity); moose (cover/foraging); deer (cover/foraging some winter cover in vaults); fish (regulation of water quality and quantity, cool water temperature is important).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (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
	39%	12%	49% (40 Mat + 10 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	30%	17%	34%	19%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	38%	34%	20%	8%

Desired Condition

Mixedwood community of late seral species with the majority of the community in the mature development class.

Issues

- Forest management should work toward moving the large area of softwood and hardwood stands in the establishment and young development classes toward late seral mixedwood stands.

Tolerant Mixedwood Slopes

(Patch) (WCDS ecosection) (5,770 ha)

Approximately 70% of this element contains mature and multi-aged stands in mid to late seral stages. Hardwood and softwood covertypes have overtaken predicted inherent mixedwood covertype.

Flows

Humans (recreation, mineral exploration/development); water (regulate water quality and quantity, James River dam located in this patch type); moose (cover/foraging); deer (cover/foraging a portion of the James River wintering area in this patch type); fish (regulation of water quality and quantity, cool water temperature is important).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (based on statistics up to 2006) **Composition of Tolerant Mixedwood Slopes**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	18%	9%	73% (60 Mat + 13 OF)	13%
Seral Stage	Early	Mid	Late	Unclassified
	21%	23%	48%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	25%	43%	28%	4%

Desired Condition

Predominately mature and multi-aged mixedwood stands of tolerant hardwood, eastern hemlock, and spruce.

Issues

- Maintain mature and multi-aged mid to late seral stages as the dominant age and seral class distributions.
- Move softwood and hardwood covertypes toward tolerant mixedwood stands.

Floodplain

(Patch) (ICSM and IMSM ecosections) (884 ha)

This element type is located on smooth sites and made up of small floodplain and intervale features along watercourses.

Given the highland nature of this ecodistrict, this element type comprises a very small percentage of the total ecodistrict. Inherent covertypes are almost equally divided among softwood, mixedwood and hardwood.

Flows

Humans (recreation, mineral exploration/development, gas/oil exploration/development); water (regulate water quality and quantity, some storage function); moose (cover/foraging); deer (cover/foraging small portion of Garden of Eden wintering area in this patch type); fish (regulation of water quality and quantity, cool water temperature is important).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (based on statistics up to 2006) **Composition of Floodplain**				
Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	22%	20%	58% (33 Mat + 25OF)	25%
Seral Stage	Early	Mid	Late	Unclassified
	38%	34%	24%	4%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	62%	22%	15%	<1%

Desired Condition

An even distribution of softwood, mixedwood, and hardwood covertypes with a major portion of the element in the mature development class.

Issues

- Maintain an even distribution of softwood, mixedwood, and hardwood covertypes in the mid to late seral types tending toward mature and multi-aged development classes.

Wetlands

(Patch) (WTLD ecosection) (116 ha)

The wetlands element is a patch ecosystem comprising freshwater bogs, fens, swamps, and poorly drained areas. This element may occur as a large wetland complex associated with rivers and lakes, as narrow linear communities associated with flow accumulations and small streams, as a community of hydrophytic vegetation (sedges, sphagnum moss, false holly, and winterberry) associated with level terrain where drainage is impeded, or as a depression in the landscape where water remains in excess year round.

A significant wetland is associated with the Moose and Garden rivers where they enter Eden Lake. Another important wetland associated with a concentration of small streams and level terrain is Heffernans Marsh on Cape George. Smaller disjoint wetlands are often embedded within other elements, especially the Red and Black Spruce Hummocks element.

Wetlands are generally treeless or sparsely forested woodlands of black spruce, tamarack, and red maple. For the most part sites are underlain by poorly drained mineral soils derived from sandstone tills or organic soils derived from peat (sphagnum mosses) or sedges.

Inclusions of better-drained soils will support forests of red and black spruce.

This element plays a critical role in water collection, filtering, and groundwater recharge.

Composition

Pictou Antigonish Highlands Ecodistrict 330 (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
	38%	36%	26% (23 Mat + 3OF)	3%
Seral Stage	Early	Mid	Late	Unclassified
	24%	39%	30%	7%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	55%	20%	25%	0%

Valley Corridors

(Corridor) (Various ecosections) (4,977 ha)

The identified corridors are associated with faults and folds and resulting watercourses. These corridors are associated with a relatively large number of different ecosections, although these ecosections tend to be small in size.

The current forest cover contains a fairly well-balanced distribution of development and seral classes. The covertype distribution contains somewhat more softwood than predicted conditions, possibly due to land use activities in some parts of the identified corridors.

Flows

Human (settlements, transportation, agriculture, forestry, recreation, mineral exploration and development, unconsolidated aggregate, gas/oil exploration/development); water (channels for water flow); moose (seasonal cover/forage, summer temperature regulation); deer (cover/forage seasonal); fish (habitat, travel route, spawning).

Composition

Pictou Antigonish Highlands Ecodistrict 330 (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
	28%	11%	61% (43 Mat + 18 OF)	18%
Seral Stage	Early	Mid	Late	Unclassified
	33%	27%	24%	16%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	46%	18%	29%	7%

Desired Condition

Continuous natural forest conditions; however, given the ownership and areas of concentrated human activity, this will inevitably result in some corridors having significantly altered land use features.

Issues

- Sustain natural forest conditions to provide connective functions.
- Where possible, promote late seral species on areas significantly altered by intensive land uses.

Ecosystem Issues and Opportunities (All appendices and maps)

Management of the forest resource in the Pictou Antigonish Highlands 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:

- Maintaining a balance among the four ecological emphasis classes, attempting to keep EEI above 50 (current EEI range is 52 to 62, indicating light to moderate intensity of land use).
- Promoting and restoring red spruce in the matrix and intolerant mixedwood elements, with particular emphasis on the eastern portion of the ecodistrict where red spruce is generally lacking.
- Managing forest communities in relation to the natural disturbance regimes, development classes, and seral stages.
- Since land use has tended to reduce the extent of late seral hardwood and softwood stands with replacement by earl to mid seral mixedwood stands, silviculture should promote late seral successional species appropriate to the ecosection type.
- Subject to ownership constraints, enhancing connectivity of the corridor elements by maintaining, and where required, restoring natural forest conditions.
- Strategically planning for the construction, maintenance, and abandonment of access roads to conserve the distribution of low road density areas, which are of particular importance for moose habitat areas.

Appendix 1: Flow - Element Interactions

Element	Humans	Water	Moose	Deer	Fish (Trout and Sea-Run)
Matrix Tolerant Hardwood Hills	forestry, recreation, mineral exploration and development, oil and gas exploration and development, increasing interest in wind energy sites	regulation of water quality and quantity, Headwaters for two potable water supplies James River, East River	cover and foraging (represent a significant portion of habitat for regionally large population of mainland moose)	cover and foraging (seasonal) portions of deer wintering area in more sheltered lower elevation areas of matrix	regulation of water quality and quantity
Corridors Wrights River	forestry, recreation, mineral exploration/development, gas/oil exploration/development	Channels for water flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
Hollow Fault	forestry, recreation, mineral exploration/development	channels for water flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal) contains a portion of a deer wintering area	habitat, travel route, spawning
James River	forestry, recreation, mineral exploration/development, dam and water reservoir	channels for water flow James River dam represents an interruption of this flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
Eden Lake	settlements, transportation, agriculture, forestry, recreation, mineral exploration and development, unconsolidated aggregate, gas/oil exploration and development	Channels for flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
Barneys River	settlements, transportation, agriculture, forestry, recreation, mineral exploration and development, unconsolidated aggregate, gas/oil exploration and development, including Trans-Canada Highway and railway	channels for flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
French River	settlements, transportation, agriculture, forestry, mineral exploration/development, recreation	channels for flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning

Appendix 1: Flow - Element Interactions

Element	Humans	Water	Moose	Deer	Fish (Trout and Sea-Run)
Sutherlands River	settlements, transportation, agriculture, forestry, mineral exploration/development, recreation	channels for flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
Lochaber	settlements, transportation, agriculture, forestry, mineral exploration/development, recreation, gas/oil exploration/development	channels foe flow	seasonal cover / forage summer temperature regulation	Cover / forage (seasonal)	habitat, travel route, spawning
Patches Red and Black Spruce Hummocks ICHO IMHO IFHO	forestry, recreation, mineral exploration /development, gas/oil exploration/development	regulation of water quality & quantity some storage and purification functions	cover / foraging calving areas	cover / foraging (seasonal)	regulation of water quality and quantity (cool water temperatures important)
Tolerant Mixedwood Hills WFKK IFKK WFHO WFSM	forestry, recreation, mineral exploration /development, gas/oil exploration/development	regulate water quality and quantity	Cover / foraging	Cover / foraging some winter cover in vaults	regulation of water quality and quantity (cool water temperatures important)
Tolerant Mixedwood Slopes WCDS	recreation, mineral exploration / development	regulate water quality and quantity James River dam located in this patch type	cover / foraging	cover / foraging a portion of the James River wintering area in this patch type	regulation of water quality and quantity (cool water temperatures important)
Floodplain ICSM IMSM WFSM	recreation, mineral exploration / development, gas/oil exploration/development	regulate water quality and quantity some storage function	cover / foraging	Cover / foraging small portion of Garden of Eden winter area in this patch type	regulation of water quality and quantity (cool water temperatures important)

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
Within main body of matrix	Matrix	High	The Keppoch portion of matrix and Georgeville slope	Landscape	Gap	Early seral wS, bF, rM, wB, tA Mid seral rM, yB, sM, wA Late seral sM, yB, Be (wA)	Bounds and/or surrounds most of the different element types identified in this ecodistrict. Portions bound on adjacent ecodistricts. In Georgeville, Cape George area bounds on Northumberland Strait.	Converted land use, fields, settlements, roads. Higher percentage of early seral communities than indicated in the suggested ranges of seral class distribution for these ecosections. Too much access into significant moose habitat areas.	Relatively high level / duration of land disturbances. Fragmented ownership. Shorter rotations than would occur with only natural disturbances. Inadequate road planning, increasing interest in wind energy development	Encourage forest management that moves forest composition toward that recommended for the respective ecosections. Consideration of access issues related to land developments.
Disjunctive portions of matrix	Matrix	High	Fairmount and North Grant	Local	Gap	Early seral wS, bF, rM, wB, tA Mid seral rM, yB, sM, wA, Late seral sM, yB, bE, (wA)	These two portion of matrix are surrounded by Ecodistrict 520.	Converted land use, fields, settlements, pits, roads. Higher percentage of early seral communities than indicated in the suggested ranges of seral class distribution for these ecosections.	Relatively high level / duration of land disturbances. Fragmented private ownership. Shorter rotations than would occur with only natural disturbances.	Encourage forest management that moves forest composition toward that recommended for the respective ecosections.

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Wetlands	Mainly contained within patches. lesser number in matrix	High	Relatively small in size and number contained mainly in patches 1 and 5, to lesser extent in matrix.	Local	N/A	Mostly classified as bogs, lesser number of fens with the occasional deep marsh.	Mainly associated with bS, bF, intolerant hwd. Lesser number associated with tolerant hardwood.	Altered drainage patterns associated with roads. ATV travel within wetlands. Inadequate adjacent cover in relation to species requirements and/or functionality of the wetlands.	Land development encroaching on wetlands, harvesting up to wetland edge. Need for better road planning / use of proper construction techniques.	Situational assessment of wetlands to determine functional / species requirements. Application of specific wetland type guidelines.
Lakes	Mainly contained within patches. lesser number in matrix.	High	Relatively small in size and number contained mainly in patches 1 and 5, to lesser extent in matrix	Local	N/A	Relatively small shallow lakes.	Mainly associated with bS, bF, intolerant hardwood. Lesser number associated with tolerant hardwood.	Lakes in this ecodistrict appear relatively healthy and have not yet been subject to heavy development pressures.		Encourage forest management that moves forest composition toward that recommended for the surrounding ecosections. Plan and implement land use / development that addresses drainage patterns and riparian considerations.

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Mixed-wood Hills	Patch	Moderate	Tolerant softwood species rS, eH, wP	Local	Gap	Early seral bF, rM, wB, tA Mid seral rS, bF, yB, wA Late seral yB, sM, wA, rS, eH	Bounded mainly by matrix, the Northumberland lowlands ecodistrict and to the north by the shores of the Northumberland Strait.	High level and duration of land alteration agriculture, settlements, roads. Higher percentage of early seral communities than indicated in the suggested seral class distribution for this ecosection.	Reduced distribution and amount of tolerant softwood	Encourage forest management that moves the forest composition toward the suggested range of seral and species distributions. Investigate opportunities for restoration of red spruce and hemlock. Pure hemlock stands could be found in this patch type at one time.
Corridors	Corridor	High	Major rivers within the ecodistrict, in addition to the Hollow Fault.	Local	Frequent and Gap	With the exception of the Hollow Fault, all identified corridors associated with rivers. The sections of these rivers within this ecodistrict are relatively steep, fast flowing within bedrock and/or coarse substrate.	Immediate riparian communities tend to be more softwood and mixedwood as opposed to pure hardwood	With the exception of the Hollow Fault, and the portions of the James and Wrights Rivers within this ecodistrict; the corridors have some of the most intense land uses and more permanent land conversions, Settlements, highways, power lines agriculture.	Disrupted and/or no forest cover. Fragmented private landownership.	Understand the potential for addressing connectivity issues within the corridors. Plan, and where possible, implement land developments to minimize dissection of corridors. Encourage forestry and land use that maintains continuity of forest cover.

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 330)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS	-			
Chimney Swift	*Chaetura pelagica*	Endangered	Threatened	Threatened
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Rusty Blackbird	*Euphagus carolinus*	Endangered	Special Concern	Special Concern
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 - Gaspe - S. Gulf of St. Lawrence population	*Salmo salar*	N/A	N/A	Special Concern
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS	-			
Moose	*Alces americanus*	Endangered	N/A	N/A
Little Brown Myotis	*Myotis lucifugus*	Endangered	N/A	Endangered
Northern Myotis	*Myotis septentrionalis*	Endangered	N/A	Endangered
MOLLUSKS				
Brook Floater	*Alasmidonta varicosa*	Threatened	N/A	Special Concern
REPTILES				
Snapping Turtle	*Chelydra serpentina*	Vulnerable	Special Concern	Special Concern
Wood Turtle	*Glyptemys insculpta*	Threatened	Threatened	Threatened

Appendix 3: Special Occurrences (Ecodistrict 330)

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	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Northern Goshawk	*Accipiter gentilis*	Sensitive (Yellow)	S3
Eastern Bluebird	*Sialia sialis*	Sensitive (Yellow)	S1B?
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Black-billed Cuckoo	*Coccyzus erythropthalmus*	May Be At Risk (Orange)	S3?B
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
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
Gray Jay	*Perisoreus canadensis*	Sensitive (Yellow)	S3S4
Cliff Swallow	*Petrochelidon pyrrhonota*	May Be At Risk (Orange)	S3B
Great Cormorant	*Phalacrocorax carbo*	Sensitive (Yellow)	S3
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Sensitive (Yellow)	S3S4B
Scarlet Tanager	*Piranga olivacea*	Undetermined	S2B S3
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3S4B
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S2S3B
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	S3S4B
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	
BRYOPHYTES			
Coast Creeping Moss	*Conardia compacta*	Sensitive (Yellow)	S2?
False Willow Moss	*Platydictya jungermannioides*	Sensitive (Yellow)	S2?
Hooked Scorpion Moss	*Scorpidium scorpioides*	Sensitive (Yellow)	S2?
DICOTS			
Marsh Bellflower	*Campanula aparinoides*	Sensitive (Yellow)	S3
Blue Cohosh	*Caulophyllum thalictroides*	May Be At Risk (Orange)	S2
Hyssop-leaved Fleabane	*Erigeron hyssopifolius*	Sensitive (Yellow)	S3
Water Beggarticks	*Megalodonta beckii*	Sensitive (Yellow)	S3
Farwell's Water Milfoil	*Myriophyllum farwellii*	Sensitive (Yellow)	S2
Balsam Groundsel	*Packera paupercula*	Secure (Green)	S3
Marsh Grass-of-Parnassus	*Parnassia palustris var. parviflora*	May Be At Risk (Orange)	S2
Pennsylvania Smartweed	*Polygonum pensylvanicum*	Secure (Green)	S3
Stout Smartweed	*Polygonum robustius*	Secure (Green)	S3S4

Appendix 3: Special Occurrences (Ecodistrict 330)

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***
Orange-fruited Tinker's Weed	*Triosteum aurantiacum*	Sensitive (Yellow)	S2
Blue Vervain	*Verbena hastata*	Secure (Green)	S3
FERNS AND THEIR ALLIES			
Cut-leaved Moonwort	*Botrychium dissectum*	Secure (Green)	S3
Lance-Leaf Grape-Fern	*Botrychium lanceolatum var. angustisegmentum*	Sensitive (Yellow)	S2S3
Least Moonwort	*Botrychium simplex*	Sensitive (Yellow)	S2S3
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Ground-Fir	*Lycopodium sabinifolium*	Secure (Green)	S3?
Sitka Clubmoss	*Lycopodium sitchense*	Secure (Green)	S3?
INSECTS			
Henry's Elfin	*Callophrys henrici*	Secure (Green)	S2
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Northern Pygmy Clubtail	*Lanthus parvulus*	Secure (Green)	S3
Northern Pearly-Eye	*Lethe anthedon*	Secure (Green)	S3
Jutta Arctic Riffle	*Oeneis jutta*	May Be At Risk (Orange)	S1
Snaketail Maine	*Ophiogomphus carolus*	Secure (Green)	S3
Snaketail Mustard	*Ophiogomphus mainensis*	May Be At Risk (Orange)	S1
White Green	*Pieris oleracea*	Sensitive (Yellow)	S2
Comma Question	*Polygonia faunus*	Secure (Green)	S3
Mark Grey Comma	*Polygonia interrogationis*	Secure (Green)	S3B
Aphrodite Fritillary	*Polygonia progne*	Secure (Green)	S3S4
Black Meadowhawk	*Speyeria aphrodite*	Secure (Green)	S3S4
Northern Cloudywing	*Sympetrum danae*	Sensitive (Yellow)	S3
	Thorybes pylades	Sensitive (Yellow)	S2
LICHENS			
Blistered Tarpaper Lichen	*Collema furfuraceum*	Sensitive (Yellow)	S3?
Arctic Kidney Lichen	*Nephroma arcticum*	May Be At Risk (Orange)	S1S2
Naked Kidney Lichen	*Nephroma bellum*	Sensitive (Yellow)	S3?
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH

Appendix 3: Special Occurrences (Ecodistrict 330)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
MOLLUSKS			
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
MONOCOTS			
Short-awned Foxtail	*Alopecurus aequalis*	Sensitive (Yellow)	S2S3
Bebb's Sedge	*Carex bebbii*	May Be At Risk (Orange)	S1S2
Pennsylvania Sedge	*Carex pensylvanica*	Undetermined	S1S2
Yellow Lady's-slipper	*Cypripedium parviflorum*	Sensitive (Yellow)	S2S3
Yellow Lady's-slipper	*Cypripedium parviflorum var. pubescens*	Sensitive (Yellow)	S2
Spreading Wild Rye	*Elymus hystrix var. bigeloviana*	May Be At Risk (Orange)	S1
Canada Lily	*Lilium canadense*	Sensitive (Yellow)	S2S3
Blunt-leaved Pondweed	*Potamogeton obtusifolius*	Sensitive (Yellow)	S2S3
White-stemmed Pondweed	*Potamogeton praelongus*	Sensitive (Yellow)	S3?

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

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

Appendix 3: Special Occurrences (Ecodistrict 330)
Table 1c – Other Conservation Features

Feature	Type	Information Source	Legislation or Status Ranking System
Loon Nesting Lakes	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Environment Act Nova Scotia Forests Act (subsection: *Wildlife Habitat and Watercourses Protection Regulations*)
Bald Eagle Nesting Areas	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act Nova Scotia Forest Wildlife Guidelines and Standards
Deer Wintering Areas	Mammal Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act Nova Scotia Forest Wildlife Guidelines and Standards

Appendix 3: Special Occurrences (Ecodistrict 330)
Table 1d – Heritage Features

Feature	Type	Information Source
Abandoned Pioneer Settlements (Foundations, Mills)	Cultural/Community Heritage	Local Knowledge

Appendix 3: Special Occurrences

Table 2: Comparison of Ecological Emphasis Classification Index by Ecosection (Within Ecodistrict and Ecoregion) Ecosections that form 2% or less of the ecodistrict and/or ecoregion area or are more than 75% converted are highlighted. The table provides a sense of how unique or uncommon an ecosection and its associated climax communities are within the ecodistrict and across the ecoregion. The EEC Index value conveys an indication of relative land use pressure on the ecosection.

Ecosection	Climax Type	Ecodistrict Occurrence						Ecoregion Occurrence					
		Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted	Area of Ecosection		Area of Climax Type (1, 2, 3) *		EEC Index ecosection	% Converted
		Ha	%	Ha	%			Ha	%	Ha	%		
ICHO	bS	10,043	7.5	16,210	12.2	56 to 68	2.4	33,783	3.5	93,638	9.6	57 to 69	3.9
ICSM	aE sM wA	1,141	0.9	833	0.6	52 to 57	13.5	8,333	0.9	11,114	1.1	53 to 58	16.4
IFHO	bS	1,891	1.4	16,210	12.2	58 to 70	2.2	29,016	3.0	93,638	9.6	52 to 60	11.5
IFKK	rS sM yB Be	2,328	1.7	17,449	13.1	47 to 58	9.0	33,587	3.5	38,966	4.0	49 to 59	12.1
IMHO	bS	8,125	6.1	16,210	12.2	54 to 65	3.6	119,475	12.3	93,638	9.6	61 to 69	3.4
IMSM	bS	229	0.2	16,210	12.2	56 to 58	2.2	9,635	1.0	93,638	9.6	50 to 55	17.4
WCDM	rS	105	0.1	23,647	17.7	54 to 73	0.0	105	0.0	97,982	10.1	54 to 73	0.0
WCDS	rS eH sM yB Be	6,067	4.6	6,437	4.8	65 to 70	3.2	20,864	2.1	62,435	6.4	66 to 70	3.8
WCHO	rS	30,705	23.0	23,647	17.7	57 to 67	3.6	70,165	7.2	97,982	10.1	57 to 65	8.5
WCKK	sM yB Be	53,098	39.8	45,991	34.5	50 to 61	7.5	184,987	19.1	392,460	40.4	55 to 64	7.7
WFHO	rS sM yB Be	943	0.7	17,449	13.1	46 to 54	13.9	19,090	2.0	38,966	4.0	49 to 57	14.0
WFKK	rS sM yB Be	14,178	10.6	17,449	13.1	44 to 56	10.9	75,802	7.8	38,966	4.0	49 to 57	12.3
WFSM	rS eH sM yB Be	370	0.3	6,437	4.8	43 to 68	0.0	370	0.0	62,435	6.4	43 to 68	0.0

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

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	%		
WMHO	rS	1,929	1.4	23,647	17.7	46 to 61	10.8	78,601	8.1	97,982	10.1	55 to 65	5.5
WMKK	sM yB Be	1,111	0.8	45,991	34.5	49 to 65	1.2	166,912	17.2	392,460	40.4	57 to 65	6.6
WTLD	wetlands	344	0.3	0	0.0	44 to 45	31.1	6,067	0.6	0	0.0	60 to 64	6.7

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

Appendix 4: Ecological Representivity Worksheet

Ecosystem			Crown Responsibility	Legal Reserves		Policy Reserves (including unproclaimed legal reserve proposals)		Ecological Emphasis Classification "Reserve Class"					
Ecosection	Climax Type	Area (ha)	Percent of Area on Crown (%)	Crown Area (ha)	Private Area (ha)	Crown Area (ha)	Private Area (ha)	Crown		Private		Total Reserve	
								ha	% (EcoS)	ha	% (EcoS)	ha	% (EcoS)
WCKK	sM yB Be	53,098	17	0	3	1,032	0	1,032	1.9	3	0	1,035	1.9
WCHO	rS	30,705	31.5	0	0	2,174	0	2,174	7.1	0	0	2,174	7.1
WFKK	rS sM yB Be	14,178	10.1	1	6	99	0	99	0.7	6	0	105	0.7
ICHO	bS	10,043	32.8	1	8	375	0	375	3.7	8	0.1	383	3.8
IMHO	bS	8,125	50.2	0	0	245	0	245	3	0	0	245	3
WCDS	rS eH sM yB Be	6,067	29.3	0	2	650	0	650	10.7	2	0	652	10.7
IFKK	rS sM yB Be	2,328	8.9	0	0	0	0	0	0	0	0	0	0
WMHO	rS	1,929	40.4	0	0	1	0	1	0.1	0	0	1	0.1
IFHO	bS	1,891	32.7	0	0	0	0	0	0	0	0	0	0
ICSM	aE sM wA	1,141	21.1	0	0	12	0	12	1	0	0	12	1
WMKK	sM yB Be	1,111	31.2	0	0	1	0	1	0.1	0	0	1	0.1
WFHO	rS sM yB Be	943	30.1	0	0	11	0	11	1.1	0	0	11	1.1
XXWA	NONE	720	0	0	0	0	0	0	0	0	0	0	0
WFSM	rS eH sM yB Be	370	4.1	0	0	9	0	9	2.4	0	0	9	2.4
WTLD	wetlands	344	10.4	0	0	0	0	0	0	0	0	0	0
IMSM	bS	229	67.0	0	0	10	0	10	4.4	0	0	10	4.4
WCDM	rS	105	9.7	0	0	0	0	0	0	0	0	0	0
Total		**133,325**		**1**	**18**	**4,618**	**0**	**4,168**		**19**		**4,637**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act Designation	Area by Ownership		Policy Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Designated Provincial Parks and Park Reserves	163		Old Forest	4,415	
Operational Non Designated Parks and Reserves	34				
Protected Beaches	1	18			
Wilderness Area	4,150	1,340			

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 ELA 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	1,128
Utility corridors	3	119
Gravel Roads and active railways	6	1,036
Paved streets and roads collectors	10	156
Highways	15	23

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	53,690	40.3
Forest Resource	7 to 15	62,604	47.0
Mixed Rural	16 to 24	13,765	10.3
Agriculture Suburban	25 to 39	2,922	2.2
Urban	40 to 100	348	0.3
Total		**133,329**	**100**

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Hills	84,863	3
Valley Corridors	4,977	17
Tolerant Mixedwood Slopes	5,770	4
Floodplain	884	3
Red and Black Spruce Hummocks	19,291	2
Tolerant Mixedwood Hills	17,335	7
Wetlands	116	N/A
Total	**133,236**	**4**

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

Appendix 8: Development Classes and Seral Stages

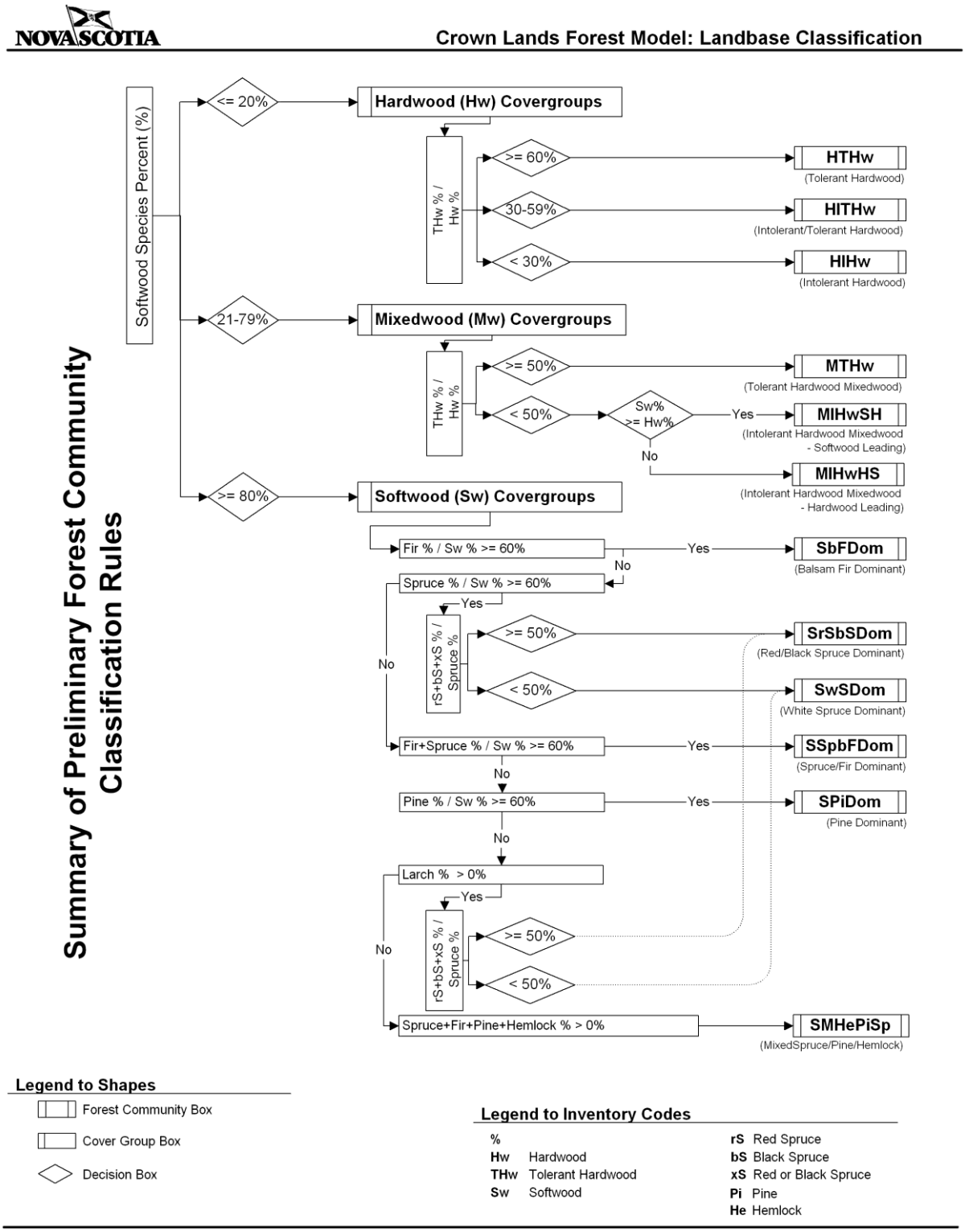
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6 m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and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

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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



Note: 1) Exotic species (Norway Spruce, Japanese Larch, etc.) were grouped with similar native species where required.
2) Unclassified species were assigned based on supplementary information (i.e.: Wood Acquisition Program / Regional Services)

Preliminary Draft: November 14, 2006

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Pictou Antigonish Highlands 330)

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	ICHO (51.2%) IMHO (38.8%) IFHO (10.0%)	Softwood	bS rS	frequent	15,335; 82	Early	876	679	526	164	2,245	8,201; 47.2	EARLY	5,193; 29.9
						Mid	435	388	379	287	1,489			
						Late	1,616	500	616	432	3,164			
						Uncl	1,302	0	0	0	1,302			
		Mixedwood				Early	308	436	307	161	1,212	4,012; 23.1	MID	3,626; 20.9
						Mid	255	312	533	281	1,381			
						Late	55	38	203	94	390			
						Uncl	1,030	0	0	0	1,030			
		Hardwood	sM yB Be	gap	3,366; 18.0	Early	83	242	424	68	817	3,646; 21.0	LATE	5,229; 30.1
						Mid	66	182	427	82	757			
						Late	43	263	1,238	131	1,675			
						Uncl	398	0	0	0	398			
		Unclassified				Early	754	51	115	0	919	1,507; 8.7	UNCL	3,317; 19.1
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	587	0	0	0	587			
Total					**19,291***	**# ha**	**7,809**	**3,091**	**4,767**	**1,699**	**17,366**			
						%	**45.0%**	**17.8%**	**27.5%**	**9.8%**	**100.0%**			

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

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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	IMHO (21.4%) WCKK (18.3%) ICSM (13.9%) WCHO (4.9%) WCDS (8.9%) WFKK (8.5%) WTLD (6.8%) WMHO (6.7%) WMKK (5.8%) ICHO (4.8%)	Softwood	bS rS rs eH	frequent gap gap	2,176; 43.7	Early	151	171	235	69	627	1,587; 46	EARLY	1,117; 32.4
						Mid	32	23	136	45	237			
						Late	89	53	211	84	437			
						Uncl	287	0	0	0	287			
		Mixedwood	rS eH sM yB Be rS sM yB Be	gap	740; 14.8	Early	32	41	79	77	229	998; 28.9	MID	934; 27.1
						Mid	5	26	289	179	499			
						Late	3	13	121	19	156			
						Uncl	115	0	0	0	115			
		Hardwood	sM yB Be aE sM wA	gap	1,540; 30.9	Early	19	18	56	59	152	630; 18.3	LATE	851; 24.7
						Mid	5	17	125	52	199			
						Late	1	16	197	45	259			
						Uncl	20	0	0	0	20			
		Unclassified				Early	84	3	23	0	109	236; 6.8	UNCL	548; 15.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	126	0	0	0	126			
Total					**4,977***	**# ha**	**968**	**382**	**1,472**	**629**	**3,450**			
						%	**28.1%**	**11.1%**	**42.7%**	**18.2%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Pictou Antigonish Highlands 330)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills	WCKK (61.2%) WCHO (35.7%) WMHO (2.0%) WMKK (1.1%) WCDM (0.1%)	Softwood	rS eH rS bS	Gap	43,551; 51.3	Early	5,225	3,168	3,627	1,231	13,252	29,495; 37.9	EARLY	23,170; 29.8
						Mid	1,450	640	1,162	665	3,917			
						Late	3,283	594	1,255	706	5,838			
						Uncl	6,489	0	0	0	6,489			
		Mixedwood				Early	1,515	1,065	1,557	633	4,770	15,975; 20.5	MID	13,536; 17.4
						Mid	757	984	3,005	1,518	6,265			
						Late	86	155	1,387	407	2,035			
						Uncl	2,905	0	0	0	2,905			
		Hardwood	sM yB Be	Gap	41,312; 48.7	Early	289	342	1,197	221	2,049	26,130; 33.6	LATE	26,640; 34.2
						Mid	457	544	1,942	411	3,355			
						Late	360	1,662	15,346	1,399	18,767			
						Uncl	1,959	0	0	0	1,959			
		Unclassified				Early	2,578	78	444	0	3,100	6,120; 7.8	UNCL	14,374; 18.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	3,007	0	14	0	3,021			
Total					**84,863***	**# ha**	**30,361**	**9,231**	**3,0936**	**7,192**	**77,720**			
						%	**39.1%**	**11.9%**	**39.8%**	**9.3%**	**100%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Pictou Antigonish Highlands 330)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Mixedwood Slopes	WCDS (100.0%)	Softwood				Early	174	122	282	72	649	1,383; 25.3	EARLY	1,142; 20.9
						Mid	10	8	166	58	242			
						Late	112	22	121	45	299			
						Uncl	193	0	0	0	193			
		Mixedwood	rS eH sM yB Be	Gap	5,770; 100.0	Early	93	77	149	61	379	1,525; 27.9	MID	1,272; 23.3
						Mid	36	59	421	189	705			
						Late	7	34	249	75	364			
						Uncl	77	0	0	0	77			
		Hardwood				Early	14	10	26	4	53	2,367; 43.3	LATE	2,602; 47.7
						Mid	40	64	189	33	325			
						Late	12	106	1,656	166	1,940			
						Uncl	49	0	0	0	49			
		Unclassified				Early	42	6	13	0	60	186; 3.4	UNCL	445; 8.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	126	0	0	0	126			
Total					**5,770***	**# ha**	**983**	**506**	**3,270**	**702**	**5,462**			
						%	**18.0%**	**9.3%**	**59.9%**	**12.9%**	**100.0%**			

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

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Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Floodplain	ICSM (76.5%) IMSM (23.5%)	Softwood	bS	Freq	369; 41.7	Early	46	46	96	36	224	446; 62.3	EARLY	269; 37.6
						Mid	7	21	18	56	102			
						Late	66	2	7	24	98			
						Uncl	22	0	0	0	22			
		Mixedwood				Early	3	11	6	6	26	106; 14.8	MID	247; 34.5
						Mid	5	16	21	28	70			
						Late	0	0	6	1	7			
						Uncl	3	0	0	0	3			
		Hardwood	aE sM wA	Gap	474; 53.6	Early	0	17	2	0	19	162; 22.6	LATE	172; 24.0
						Mid	0	26	32	18	76			
						Late	0	3	50	13	67			
						Uncl	2	0	0	0	2			
		Unclassified				Early	0	0	1	0	1	1; 0.2	UNCL	28; 3.9
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
Total					**884***	**# ha**	**155**	**141**	**239**	**181**	**715**			
						%	**21.6%**	**19.8%**	**33.4%**	**25.3%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Pictou Antigonish Highlands 330)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Wetlands	WTLD (100.0%)	Softwood				Early	3	0	1	0	5	21; 55.1	EARLY	9; 23.5
						Mid	2	4	1	0	8			
						Late	3	1	1	1	6			
						Uncl	3	0	0	0	3			
		Mixedwood				Early	2	0	0	0	2	9; 25	MID	15; 38.5
						Mid	0	6	1	0	7			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood	aE sM WA		12; 100.0	Early	0	2	0	0	2	8; 19.9	LATE	11; 29.8
						Mid	0	0	0	0	0			
						Late	1	0	4	0	6			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.0	UNCL	3; 8.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**116***	**# ha**	14	14	9	1	38			
						%	**38.1%**	**36.2%**	**22.8%**	**2.9%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Pictou Antigonish Highlands 330)

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	WFKK (79.2%) IFKK (13.2%) WFHO (5.5%) WFSM (2.1%)	Softwood	bS			Early	5,225	3,168	3,627	1,231	13,252	29,495; 38.0	EARLY	23,170; 29.8
						Mid	1,450	640	1,162	665	3,917			
						Late	3,283	594	1,255	706	5,838			
						Uncl	6,489	0	0	0	6,489			
		Mixedwood				Early	1,515	1,065	1,557	633	4,770	15,975; 20.6	MID	13,536; 17.4
						Mid	757	984	3,005	1,518	6,265			
						Late	86	155	1,387	407	2,035			
						Uncl	2,905	0	0	0	2,905			
		Hardwood	rSsMyBBe rSeHsMyBBe	Gap	17,335; 100	Early	289	342	1,197	221	2,049	26,130; 33.6	LATE	26,640; 34.3
						Mid	457	544	1,942	411	3,355			
						Late	360	1,662	15,346	1,399	18,767			
						Uncl	1,959	0	0	0	1,959			
		Unclassified				Early	2,578	78	444	0	3,100	6,120; 7.9	UNCLASS	14,374; 18.5
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	3,007	0	14	0	3,021			
Total					**17,335***	**# ha**	**30,361**	**9,231**	**30,936**	**7,192**	**77,720**			
						%	**39.1%**	**11.8%**	**39.8%**	**9.3%**	**100.0%**			

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

Appendix 10: Table 2: Composition of Forest Communities (in Pictou / Antigonish Highlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Red and Black Spruce Hummocks	ICHO IFHO IMHO	Frequent Frequent Frequent	bS bS bS	S	SrSbSDom	4,237	27.3%	M	**Moist to Well-drained** Early - bF, rM, wB, tA mid - rS, bF, yB, wA late - yB, sM, wA, rS, eH **Wet sites** bS, rM, bF, (tL)
				S	SbFDom	2,056	13.3%	E	
				S	SwSDom	991	6.4%	E	
				S	SSpbFDom	654	4.2%	M	
				S	SPIDom	38	0.2%	L	
				M	MIHwSH	1,702	11.0%	E/M	
				M	MIHwHS	1,163	7.5%	M	
				M	MTHw	1,061	6.8%	L	
				H	HTHw	2,139	13.8%	L	
				H	HIHw	1,091	7.0%	E	
				H	HITHw	365	2.4%	E/M	
Total						**15,497**	**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 Pictou / Antigonish Highlands 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 IMHO IMSM WCDS WCHO WCKK WFKK WMHO WMKK WTLD	Frequent Gap Frequent Frequent Frequent Gap Gap Gap Gap Gap Gap None	bS aE sM wA bS bS bS rS eH sM yB Be rS sM yB Be rS sM yB Be rS sM yB Be	S	SwSDom	330	15.7%	E	Refer to Table 9 for successional types for the various ecosections within the identified corridor elements.
				S	SrSbSDom	326	15.5%	M	
				S	SbFDom	142	6.8%	M	
				S	SSpbFDom	102	4.9%	M	
				S	SMHePiSp	35	1.7%	L	
				S	SPiDom	6	0.3%	L	
				M	MTHw	336	16.0%	L	
				M	MIHwSH	205	9.8%	E/M	
				M	MIHwHS	163	7.8%	E/M	
				H	HTHw	244	11.6%	L	
				H	HIHw	162	7.7%	E	
				H	HITHw	47	2.2%	E/M	
Total						**2,098**	**100.0%**		

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

Appendix 10: Table 2: Composition of Forest Communities (in Pictou / Antigonish Highlands 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	IFKK WFHO WFKK WFSM	Gap Gap Gap Gap	rS sM yB Be rS sM yB Be rS sM yB Be rSeHsMyBBe	S	SwSDom	2,762	19.9%	E	**Well-drained** Early - bF, rM, wB, tA mid - rS, bF, yB, wA late - yB, sM, bFwA, rS, eH
				S	srSbSDom	1,702	12.3%	M	
				S	SbFDom	1,190	8.6%	E	
				S	SSpbFDom	307	2.2%	E/M	
				S	SMHePiSp	76	0.5%	L	
				S	SPiDom	65	0.5%	L	
				M	MIHwSH	2,061	14.9%	E/M	
				M	MIHwHS	1,579	11.4%	E/M	
				M	MTHw	865	6.2%	L	
				H	HIHw	1,720	12.4%	E	
				H	HTHw	1,034	7.5%	L	
				H	HITHw	509	3.7%	E/M	
Total						**13,870**	**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 Pictou / Antigonish Highlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WCDM WCHO WCKK WMHO WMKK	Gap Gap Gap Gap Gap	rS rS sM yB Be rS sM yB Be	S	SwSDom	9,702	13.6%	E	**Well-Drained** Early – wS (old field),bF,rM,wA mid - rM, yB, sM, wA late - sM, yB, Be, wA **Moist** early bF, rM, wB, tA mid bF, rS, yB late rS, eH, yB
				S	SrSbSDom	8,787	12.3%	L	
				S	SbFDom	8,579	12.0%	M	
				S	SSpbFDom	1,950	2.7%	M	
				S	SPiDom	388	0.5%	M	
				S	SMHePiSp	89	0.1%	L	
				M	MTHw	7,776	10.9%	L	
				M	MIHwSH	4,580	6.4%	E/M	
				M	MIHwHS	3,619	5.1%	E/M	
				H	HTHw	21,379	29.9%	L	
				H	HIHw	3,155	4.4%	E/M	
				H	HITHw	1,596	2.2%	M	
Total						**71,600**	**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 Pictou / Antigonish Highlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Mixedwood Slopes	WCDS	Gap	rS eH sM yB Be	S	SbFDom	393	7.5%	E	**Well-drained** Early - bF, rM, wB, tA mid - rS, yB late - rS, eH, yB, sM, Be **Moist** early - bF, rM, wB, tA mid - bF, rS, yB late - rS, eH, yB **Wet** bS, rM, bF, (tL)
				S	SwSDom	371	7.0%	E	
				S	SrSbFDom	336	6.4%	M	
				S	SSpbFDom	244	4.6%	M	
				S	SMHePiSp	39	0.7%	L	
				M	MTHw	1,068	20.2%	L	
				M	MIHwSH	264	5.0%	E/M	
				M	MIHwHS	193	3.7%	E/M	
				H	HTHw	2,110	40.0%	L	
				H	HITHw	145	2.7%	M	
				H	HIHw	112	2.1%	E/M	
Total						**5,275**	**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 Pictou / Antigonish Highlands Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Floodplain	ICSM IMSM	Gap Freq	aE sM wA bS	S	SrSbSDom	153	21.4%	L	**Moist sites** early - wS, rM,tA mid - wS,rM,wA late - sM, wA, elm **Wet sites** bS, tL
				S	SwSDom	109	15.2%	E	
				S	SbFDom	131	18.3%	E	
				S	SSpbFDom	52	7.3%	M	
				M	MIHwHS	25	3.5%	E/M	
				M	MIHwSH	34	4.8%	E/M	
				M	MTHw	48	6.7%	L	
				H	HTHw	103	14.4%	L	
				H	HIHw	31	4.3%	E/M	
				H	HITHw	29	4.1%	M	
Total						**715**	**100.0%**		

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

Appendix 10:

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

Climax Type	Ecodistrict		Ecoregion	
	Hectares	Percent	Hectares	Percent
sM yB Be	45,991	34.5	392,460	40.4
rS	23,647	17.7	97,982	10.1
rS eH	21,684	16.3	22,790	2.3
rS sM yB Be	17,449.30	13.1	38,966.30	4.0
bS	16,209.90	12.2	93,637.50	9.6
rS eH sM yB Be	6,436.50	4.8	62,434.80	6.4
aE sM wA	833	0.6	11,114	1.1
Total	**132,250**	**99.2***	**719,383**	**73.9****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

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

Appendix 12a: Ecological Emphasis Index Worksheet – Elements

Landscape Element	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
Tolerant Hardwood Hills	79,090	3,202	47,643	5,764	5,090	18,283	44,945 to 54,087	56 to 68
Red and Black Spruce Hummocks	18,189	630	11,514	1,877	350	4,394	10,833 to 13,029	58 to 69
Tolerant Mixedwood Hills	15,483	116	8,241	1,103	1,868	3,980	7,567 to 9,557	49 to 63
Tolerant Mixedwood Slopes	5,448	556	3,966	206	180	540	3,717 to 3,987	68 to 73
Valley Corridors	4,613	104	1,814	111	681	368	1,584 to 1,768	52 to 59
Floodplain	800	31	767	115	39	208	687 to 790	66 to 68
Wetlands	116	0	109	2	2	3	83 to 85	72 to 73
Total	**123,739**	**4,637**	**74,054**	**9,177**	**8,210**	**27,776**	**69,333 to 83,220**	**56 to 67**

These classes have been given a weighting percentage representing their ecological emphasis level: Reserve (100), Extensive (75), Intensive (25), and Converted (0). These percentages are applied to the area of land in each class to determine the "effective area" which is divided by "total area" to calculate the index.

The Unclassified land is too young to determine if it is being managed extensively or intensively. Therefore, an EEI range is reported based on it being all one or the other.

Water was not included as an element type. Areas were rounded to the nearest hectare.

EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total Land Area (ha)	Ecological Emphasis Classes					Ecological Emphasis Index	
		Reserve Area (ha)	Extensive Forest Management Area (ha)	Intensive Forest Management Area (ha)	Conversion to Non-Forest Area (ha)	Unclassified Land Use Area (ha)	Effective Area Range (ha)	EEC Index Range
ICHO	9,735	383	5,955	794	236	2,367	5,639 to 6,823	58 to 70
ICSM	1,029	12	727	24	155	112	591 to 647	57 to 63
IFHO	1,876	0	1,290	117	42	427	1,104 to 1,317	59 to 70
IFKK	2,132	0	1,243	203	209	476	1,102 to 1,341	52 to 63
IMHO	7,870	245	4,678	973	291	1,683	4,417 to 5,258	56 to 67
IMSM	221	10	133	62	5	11	128 to 133	58 to 60
WCDM	105	0	61	3	0	41	57 to 77	54 to 74
WCDS	5,743	652	4,146	204	196	545	3,948 to 4,221	69 to 73
WCHO	29,211	2,174	17,487	2,245	1,102	6,203	17,401 to 20,502	60 to 70
WCKK	48,842	1,035	29,163	3,428	3,969	11,247	26,576 to 32,200	54 to 66
WFHO	857	11	484	71	131	161	431 to 512	50 to 60
WFKK	12,616	105	6,754	831	1,549	3,378	6,222 to 7,911	49 to 63
WFSM	360	9	127	45	0	179	160 to 250	44 to 69
WMHO	1,844	1	950	92	209	591	885 to 1181	48 to 64
WMKK	1,027	1	578	83	13	352	543 to 719	53 to 70
WTLD	316	0	196	3	107	10	150 to 155	48 to 49
Total	**123,782**	**4,637**	**73,972**	**9,177**	**8,214**	**27,782**	**69,356 to 83,247**	**56 to 67**

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

Appendix 13:

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

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

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

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

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

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

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

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

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

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