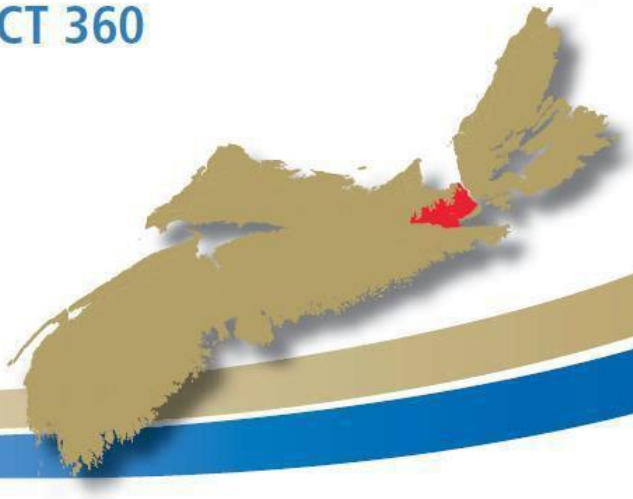
Department of Natural Resources

ECOLOGICAL LANDSCAPE ANALYSIS MULGRAVE PLATEAU ECODISTRICT 360

PART 3: Landscape Analysis for Forest Ecosystem Planners



ELA 2014-360

NOVA SCOTIA

Ecological Landscape Analysis, Ecodistrict 360: Mulgrave Plateau

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This report, one of 38 for the province, provides descriptions, maps, analysis, photos and resources of the Mulgrave Plateau 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 & 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 Mulgrave Plateau – *For Forest Ecosystem Planners*

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

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

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Understanding the Landscape as an Ecological System

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

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

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

Elements Within Landscapes (Map 2)

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

Tolerant Hardwood Hills is the matrix element, representing 52% of the ecodistrict. This element naturally supports climax forests of long-lived species that generally grow well in shade, such as sugar maple, beech, and yellow birch, which dominate on crests and upper and middle slopes. On lower slopes, shade-tolerant species such as red spruce, hemlock, and yellow birch are found, along with white spruce.

Forests of black spruce, white spruce, and balsam fir are most common in **Spruce Pine Flats**, the largest patch element. The remaining patch elements, in order of size, are **Tolerant Hardwood Hills and Drumlins**, **Wetlands, Floodplain** – with the largest floodplain on the Milford Haven River – **Salt Marsh** and **Coastal Beach**.

Valley Corridors is a linear 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, moose, anadromous fish, and aquatic furbearers.

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

River corridors promote connectivity.

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

Connectivity refers to the ease or difficulty that resources, such as water, animals, or even events – such as fires – can move within an area. As a basic ecological

requirement, the ability to move without excessive risk is of critical importance for maintaining biodiversity at all levels, including genetic, individual, species, population, community, and ecosystem.

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

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

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

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

The matrix in the Mulgrave Plateau Ecodistrict, because of its size and distribution, plays an important connective function that affects connectivity among patches and corridors imbedded within it. The matrix in the ecodistrict is primarily the Tolerant Hardwood Hills forested slopes of the plateau that perimeters the dominant plateau elements of Spruce Pine Flats and Tolerant Hardwood Hills and Drumlins.

Historically, land use has likely had a significant influence on connectivity. In this ecodistrict, conversion from forested conditions has been relatively minor; however, forest management activities and the creation of roads has fragmented the matrix overall.

Forest harvesting has resulted in an overall shift to younger forests. Percentages of the ecodistrict in early and mid seral forest community stages are approximately equal to the percentage of late seral forest communities. Large patch sizes for species requiring interior habitat are more common in upland hardwood ecosections.

Ecological connectivity among patch elements may be compromised for some processes and species groups because of the fragmented nature of the matrix. Riparian corridors, besides being important habitat, can be critical connectors of ecosystem elements – particularly in a fragmented matrix

An additional concern in ecological planning is the maintenance of connectivity among conservation areas, such as wilderness or remote areas, and potential old growth. Consequently, connectivity at some point must be considered at a larger scale, including conditions in adjacent ecodistricts.

The ecological emphasis index of 62 to 69 indicates that connectivity through this element may have barriers either due to forest cover or land use conversion. Even though this ecodistrict is mostly rural, settlement has concentrated in this element creating land use changes that influence connectivity (e.g. agricultural fields and transportation corridors).

Since Mulgrave Plateau is made up of two distinct plateau portions separated by the Roman Valley and Milford Haven rivers, connectivity between the two plateaus is significantly influenced by land use in the Valley Corridors and Floodplain elements that separate them. Barriers to flow are easily constructed in these elements by settlement, land use, and transportation corridors.

The road index value is very low throughout the ecodistrict with an overall value of 1 to 4 for the three dominant elements, indicating a remote location. Forest harvesting, particularly clearcutting, has caused a significant increase in establishment and young forest development classes. However, due to the large extent of low productive forests, barrens, and wetlands on the plateau, the overall road index value still indicates a remote location that provides excellent connectivity.

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

Many of the landscape flows – such as people, deer, moose, water, and fish – have linkages to the adjacent ecodistricts – St. Georges Bay, Pictou Antigonish Highlands, St. Marys River, Eastern Interior, and Cape Breton Coastal.

People provide linkages through an assortment of activities (recreation, transportation, settlement, and industrial activities).

The Mulgrave Plateau Ecodistrict includes headwaters for streams and rivers flowing to the Northumberland Strait and Atlantic Ocean. Maintaining natural water quality and quantity are important attributes to ensure during forest resource and other land uses. Negative impacts on water can be detrimental to fish and other aquatic-focused wildlife.

An appropriate level of forest development classes and minimal barriers in the matrix Tolerant Hardwood Hills element is critical to maintain connectivity with all the adjacent ecodistricts. In most cases this connectivity is through the Valley Corridors element as it follows streams off the plateau and connects to the adjacent lowlands and coastal ecodistricts.

Ridgelines are other connectivity mechanisms that link ecodistricts of similar elevation. Connectivity to Cape Breton Island across the Strait of Canso is unknown but potentially possible if mammals can access the Canso Causeway or use sea ice coverage during the winter.

All future management activities should recognize significant linkages to adjoining ecodistricts and manage these areas to enhance and sustain connectivity functions.

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

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

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

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

Target Ranges for Composition Indicators

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

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

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

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

Forest Vegetation Types for Seral Stages in Each Element

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

Table 8 – Forest Vegetation Types[1] Within Elements in Mulgrave Plateau

Element	Seral Stage					
	Early	%*	Middle	%	Late	%
Spruce Pine Flats	OW2, SP8	18.0	SP6, SH9	22.0	**SP7**, SH8, **SH10**	48.0
Tolerant Hardwood Hills	OF1, OF2, OF4, IH6	24.0	MW2, SH5, SH6, SH8, SH10, TH7	21.0	MW1, MW3, SH3, **TH1, TH2,** TH3, TH4, TH5, **TH8**	41.0
Tolerant Hardwood Hills and Drumlins	OF1, OF2, OF4, IH6	21.0	MW2, SH5, SH6, SH8, SH10, TH7	21.0	MW1, MW3, SH3, **TH1, TH2, TH8**	49.0
Floodplain	FP6	53.0	FP3	11.0	**FP1**	11.0
Wetlands	FP3, WC1, WC2, WC5, WC6, WC7, WD1, WD2, WD3, WD6, WD7, WD8, SP7					
Coastal Beach	CO7, Beach grass, Bayberry, Rose spp., White spruce					
Salt Marsh	Grasslands of *Spartina spp.*					

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

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

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

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

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

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

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

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

The overall EEI for Mulgrave Plateau is 62 to 69 (Appendices 12a and 12b).

About two-thirds of the land falls in the extensive EEC. This implies land managed for multiple values using ecosystem-based techniques that conserve biodiversity and natural ecosystem conditions and practices.

Almost 8% of the ecodistrict has been converted. This is land that has been changed to an unnatural state for human use, mostly settlements, farms, urban development, and transportation and utility corridors.

The reserve class accounts for 6% of the area and is divided into two categories: legal reserves and policy reserves. The legal reserves are those areas that have legal status under the IUCN (The International Union for the Conservation of Nature and Natural Resources) codes of I, II, or III such as wilderness areas, protected beaches, and designated provincial parks. The second type of reserves is those set aside under various provincial policies, such as the Old Forest Policy.

Almost 4% of the ecodistrict falls in the intensive class, representing lands managed intensively to optimize resource production from sites maintained in a native forested state. Management may eliminate or reduce the duration of some development processes, particularly old forest stages, and may include exotic species, old field spruce, and monoculture plantations. Despite intensive practices, these lands are an important component of landscape structure and composition.

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.

Mulgrave Plateau has an overall Road Index value of approximately 3, which falls within the Remote Index range of 0 to 6. Approximately 53% of the ecodistrict has a Remote RI. The highest road densities occur around the small Salt Marsh and Coastal Beach elements, along with the corridors where there are settlements and the major transportation systems.

Roads can contribute to habitat fragmentation and environmental degradation. Since 59% of land ownership in the ecodistrict is in private hands, efforts could be made to:

- Encourage sharing of access roads and decommissioning of excess roads.
- Educating about proper road construction.
- Encourage road maintenance.
- Encourage maintenance of areas without roads and promote linkages among them and other areas without roads either within or outside the ecodistrict.

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

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

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

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

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

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

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

Species at Risk

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

Species of Conservation Concern

The term "species of conservation concern" refers to those species that are a high priority for conservation and special attention during planning, management, and stewardship. These species may be rare and/under a variety of threats but the threats do not currently warrant species at risk designation. In some cases these species could meet the criteria for a species at risk but a formal

species at risk assessment has not been done. Species of conservation concern are a priority in landscape planning because a focus on them now can prevent these species from becoming species at risk later.

Species Ranking and Coding Systems

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

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

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

As of 2013 in the Mulgrave Plateau Ecodistrict, there are documented occurrences (under the NSESA) of the following number of formally listed species at risk: three endangered, four threatened, and three vulnerable. In addition to the listed species, the national General Status process also identifies one red-listed species, 22 yellow-listed species, six orange-listed species, and five undetermined species for a total of 34 other species of conservation concern in this district. The Atlantic Canada Conservation Data Centre lists 31 species in this ecodistrict as extremely rare (S1) to uncommon (S3).

Provincially designated species at risk found within the Mulgrave Plateau Ecodistrict include moose, wood turtle, snapping turtle, brook floater mussel, and several bird species (barn swallow, bobolink, common nighthawk, eastern wood pewee, olive-sided flycatcher, and Canada warbler).

Other species of conservation concern identified through provincial General Status Rankings or the Atlantic Canada Conservation Data Centre (S Ranks) for this ecodistrict include Atlantic salmon and brook trout (fish); Baltimore checkerspot, common branded skipper, green comma, mustard white, and question mark butterflies (insects); willet, northern goshawk, boreal chickadee, boreal owl, common tern, gray catbird, and pied-bill grebe (birds); and Canada anemone, disguised St John's wort, downy willowherb, gmelin's buttercup, golden alexander, lance-leaved figwort, northern commandra, satiny willow, sharp-fruited knotweed, swamp milkweed, and maiden hair spleenwort (plants).

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).*

In Mulgrave Plateau, 3,800 hectares, or about 10% of Crown land, has been identified under the policy, the majority is in the sugar maple-yellow birch-beech community type.

Birds

At this time, there are six confirmed bird species listed under the NSESA that occur in this ecodistrict: barn swallow and Canada warbler are endangered; common nighthawk and olive-sided flycatcher are threatened; and the bobolink and eastern wood pewee are vulnerable. Nationally, the Canada warbler, olive-sided flycatcher, and common nighthawk are designated threatened under the Species at Risk Act. There has been a nationwide decline in common nighthawks, as well as other aerial insectivores due to declines in insect food species and nesting habitat.

Northern goshawk occurs in this ecodistrict and has threatened status in Canada, but is not presently listed under the NSESA in Nova Scotia. Rusty blackbird is likely present as well and is endangered within the province and threatened nationally. Habitat loss and land use practices in recent years have impacted both of these species.

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 occurs in this ecodistrict. With the exception of an area near Mulgrave, much of this ecodistrict is considered to be "occupied moose habitat" (an area with recurrent observations of moose over time). However, moose can occur anywhere in this ecodistrict.

Moose are commonly associated with forested landscape habitats that have been altered or disturbed by an event such as fire, wind (i.e. 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.

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 watercourses, and through the maintenance of reasonable forest development class distribution. Additional measures to provide for specific habitat needs of moose have been

identified and special management practices addressing thermal refugia and clump size are used on Crown land where appropriate.

As of July 2012, Mainland Moose Special Management Zones have been identified for the province. Land use practices in support of moose are mandatory on Crown lands within these zones. These practices can be found at http://novascotia.ca/natr/wildlife/habitats/terrestrial/.

In 2013, Nova Scotia listed the little brown myotis as endangered. This once very common bat has been severely compromised by a fungus that results in a disease known as White-nose-Syndrome. The disease has killed several millions of bats in eastern North America in the past decade and estimates of a 90% percent decline in Nova Scotia have taken place in just five years since the disease was first recorded. There is no known cure and the disease affects all bat species that hibernate in caves and abandoned mines through the winter.

Fish

Human impacts have caused a decline in brook trout populations throughout Nova Scotia, and as a result this species has been given a yellow status. Given the number of watercourses and branching tributaries in the Mulgrave Plateau, there is suitable habitat for brook trout, including suitable spawning sites, available in this ecodistrict.

Similarly, anadromous fish species such as Atlantic salmon, considered to be at risk or a conservation concern, occur in watercourses within this ecodistrict. Atlantic salmon, which have a red status in Nova Scotia, have historically utilized rivers in this ecodistrict for spawning but are presently thought to be in decline in some rivers.

Reptiles

Wood turtles are both federally and provincially classed as a threatened species. A single wood turtle has been found the Mulgrave area and the possibility exists of others occurring in the far western reaches of this ecodistrict. With the exception of a few localized areas these turtles are uncommon province-wide. General wildlife status for the species is yellow.

Similarly, the much more common snapping turtle is also a conservation concern. Although this turtle is frequently seen, it is vulnerable to human activities and nest predation which can negatively impact these long-lived turtles.

Freshwater Mussels

Freshwater mussels are valuable as indicators of ecological health. There are two mussels in this ecodistrict that have conservation concerns. The brook floater is designated both nationally (COSEWIC; special concern) and provincially (threatened) as a species at risk. Healthy riparian zones with unobstructed fish passage and good water quality are key to mussel persistence.

Plants

A total of 16 plant species, known to occur in the Mulgrave Plateau are considered to be provincial "species at risk." None of these is listed under the NSESA, nor are any identified as species of national concern. Golden alexander and lance-leaved figwort have S1 classifications with the Atlantic Canada Conservation Data Centre.

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

The Ecological Land Classification for Nova Scotia (Neily et al. 2003) classifies ecosections

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

360 Mulgrave Plateau Ecodistrict			
Landscape Element and Type	**Ecosections***	**Dominant Natural Disturbance Regime**	**Dominant Climax Type**
Tolerant Hardwood Hills (Matrix)	WCKK WFKK WMKK	Gap	sugar Maple (sM), yellow Birch (yB), Beech (Be)
Spruce Pine Flats (Patch)	IFHO IMHO IMSM IFSM	Frequent	black Spruce (bS), balsam Fir (bF)
Tolerant Hardwood Hills and Drumlins (Patch)	WCHO WFHO WMDM WMHO	Gap	sM, yB, Be
Floodplain (Patch)	WMSM	Gap	sM, white Ash (wA), american Elm (aE)
Wetlands (Patch)	WTLD	Open Seral (Frequent)	bS, red Maple (rM), tamarack (tL)
Salt Marsh (Patch)	XXMS	Open Seral (Frequent)	*Spartina spp.* (cordgrass)
Coastal Beach (Patch)	XXCB	N/A	N/A
Valley Corridors (Corridor)	Various	Various	Various

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

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

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

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

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.

Mulgrave Plateau contains six ecosections that are rare at the ecodistrict level, that is, less than 2% of total area – IFSM, IMSM, WMSM, WCHO, WCKK, and WTLD. None of the ecosections are seriously converted with IMSM having 17.4% land conversion. Ecosections IFSM, IMSM, and WFSM are also rare at the ecoregion level. These rarer ecosections are usually associated with riparian zones and floodplains and occasionally large areas of level topography creating the headwaters of streams leaving the plateau.

Two of the ecosections, WCHO and WCKK, are very common in the ecoregion and support a similar forest of sugar maple and yellow birch.

Practices or policies that might be implemented or devised to address conservation issues include:

- Conservation of species that are threatened as indicated by DNR's General Status Rank of Wild Species in Nova Scotia (yellow and red listed) or those listed as S1, S2 or S3 in the Atlantic Canada Conservation Data Centre rankings.
- Conservation of significant habitats considered to be rare.
- Identification of sites of cultural significance.
- Ecological restoration where resource use or land conversion has significantly altered species composition (i.e. agricultural areas in the Tolerant Hardwood Hills and Floodplain elements).

Ecological Representivity (Appendices 4, 5)

Ecological representivity describes the degree that the range of natural ecosystem diversity (elements, ecosections) is secured within reserve systems (e.g. Parks, Wilderness, Old Growth Policy).

The overall goal is biodiversity conservation through protection of natural habitat diversity. Ecological representation is employed as a "coarse scale" ecosystem planning concept. The analysis evaluated and identified the reserve status of the ecosections and climax communities located within the ecodistrict where two levels of reserves were recognized: legally protected reserves, such as Wilderness Areas, and policy protected reserves under the IRM classification to include old forest, Eastern Habitat Joint Venture Sites, non- designated provincial park reserves, and non-designated sites of ecological significance.

The only legally protected reserve within Mulgrave Plateau is the 5,200 hectare Ogden Round Lake Wilderness Area. Policy protected reserves in the ecodistrict are made up of the IRM classification which includes the operational designated and non-designated Provincial Parks and Reserves and areas selected under the Old Forest Policy. A summary of the Mulgrave Plateau representivity can be found in Appendix 4. A summary of ecodistrict reserves and protected areas is provided in Appendix 5.

Almost 14% of the Crown land ownership is under legal protection and another 2% is protected under policy, much of this in the Spruce Pine Flats and Tolerant Hardwood Hills and Drumlins elements.

Further effort in improving representivity of the Tolerant Hardwood Hills matrix is required and of the small patch level Floodplain element which will require participation from private landowners and organizations, such as the Nature Conservancy of Canada and the Nova Scotia Nature Trust.

Considerations in improving representation might focus on:

- ecosections of the matrix, which for its size has relatively little representivity
- ecosections that have no representivity
- improving connectivity between riparian corridors

ELA Summary

Element Interpretation (All appendices andmaps)

The Mulgrave Plateau Ecodistrict is located west of the Strait of Canso and northwest of Chedabucto Bay. These two bodies of water make the area prone to strong coastal winds. The total area of the Mulgrave Plateau Ecodistrict is 1,028 square kilometres, or 10.6% of the Nova Scotia Uplands Ecoregion.

Both plateau portions of the ecodistrict comprise extensive areas of imperfectly drained level to hummocky topography. The steep slopes of these elevated plateaus, approximately 200 metres above sea level, are well-drained and support a mixture of tolerant hardwoods and softwoods. Areas are often gravelly sandy loams except for the eastern portion which is imperfectly drained. Clay loams on the drumlinized till plain are also imperfectly drained.

The eastern portion of the ecodistrict is appreciably wetter than the western portion and is drained by the St. Francis Harbour River. The river flows out of Goose Harbour Lake, which has been dammed for use as an industrial water supply in Port Hawkesbury. Two other lakes, Grant and Summers, have also been dammed for water supply for Mulgrave, while another reservoir has been created at Englands Lake for future industrial use. However, only 3% of the ecodistrict is made up of fresh water.

Low relief drumlins dot the eastern portion of the ecodistrict around Goose Harbour Lake. The Roman Valley River flows toward Chedabucto Bay by the Milford Haven River which, along with Guysborough Harbour, is an example of a drowned estuary in which the mouth of a river is submerged due to a rise in sea level.

The Chedabucto Fault passes through this ecodistrict, which is underlain by the Guysborough Group, consisting of sandstone, shale, and conglomerate rocks. The Roman Valley River has exploited the fault line, creating a scarp also known as Roman Valley which has underlain strongly folded granite, gabbro, and allied rocks. Significantly, the fault separates these groups of rocks creating an important physiographic feature.

The forests on the well-drained, coarse-textured hills that border the Strait of Canso and Chedabucto Bay are similar to the coastal forests of the Atlantic Coastal Ecoregion.

An association of red maple and yellow birch dominate the drumlins, with scattered sugar maple on the lower slopes. Red spruce and hemlock are more prevalent in the sheltered ravines and along streams and steep slopes of the ecosections. The forest is mostly black spruce and red maple on the wetter soils, with tolerant hardwoods, white spruce, and white pine on the better-drained soils found on the well-drained slopes. Balsam fir usually regenerates on the better-drained land and much of the area is used for Christmas tree production.

Almost 75% of tree mortality has been influenced by gap disturbances, but forestry has been the dominant resource activity.

Tolerant Hardwood Hills
(Matrix) (WCKK, WFKK and WMKK ecosections) (52,144 ha)

Historically, the Mulgrave Plateau Ecodistrict was dominated by matrix forests of tolerant hardwood shaped by gap disturbance processes favouring mature stands of late seral composition.

Included within this hardwood matrix were small and medium sized areas and ribbons of imperfectly and poorly drained spruce and bog. Currently, this type of matrix forest condition continues to dominate Mulgrave Plateau, although the overall area has been reduced by land settlement, farming, and conversion to softwood through old field succession and forestry. Most of these changes are along valley slopes where settlement and roads are concentrated.

The Tolerant Hardwood Hills matrix functions as a well-connected forest with interior conditions. Movement is characterized by percolation and is relatively free flowing, except in a couple of places where large areas are constricted or dissected by narrow valley corridors.

Flow through the matrix seems to be concentrated in a wide band extending across the plateau and crossing the upper portions of the valley corridors. At the eastern end of the ecodistrict, the hardwood matrix naturally fades into mixedwood and softwood patch elements in the Melford area.

The Nova Scotia Uplands Ecoregion is dominated by tolerant hardwoods, providing connection to the Mulgrave Plateau at a provincial scale. Forest management should strive to sustain or restore tolerant hardwood forests. Mature and uneven-aged stands should predominate, and practices that sustain overstoreys consistent with gap disturbance regimes should be favoured.

In addition, management should promote the formation of large connected areas, reduce fragmentation, and increase interior forest conditions. The natural isolation of softwood patches included in the hardwood matrix should be maintained and managed to provide a variety of development and seral class conditions appropriate for their disturbance regime.

Flows

People (forestry, hunting, trails); birds (goshawk nesting/fledging); water (absorption, evapotranspiration, seeps, and vernal pools).

Composition

Mulgrave Plateau Ecodistrict 360 (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
	31%	19%	50% (44 Mat +6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	24%	21%	41%	14%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	42%	33%	21%	4%

Desired Condition

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

Issues

- Restore a dominant condition of mature tolerant hardwood forest through stand tending, partial harvesting, long rotations, and harvest scheduling to promote patch aggregation.
- Currently, there is an overabundance of early seral species in softwood and mixedwood stands at all development stages.

Spruce Pine Flats
(Patch) (IFHO, IMHO, IMSM and IFSM ecosections) (24,391 ha)

This element is dominated by imperfectly drained flats associated with lakes, streams, and bogs, interspersed with low hardwood hills.

Water is an important flow, with functions of collection, filtration, and storage regulating many headwater streams. The area provides important timber resources, recreational opportunities,

and industrial water. Other important flows include moose habitat (cover, food, thermal regulation, calving), and four-toed salamander habitat (along sphagnum - stream edges).

This element type contains much of the productive softwood forest in the Mulgrave Plateau Ecodistrict, as well as many low productivity sites.

Black spruce is the most common tree species, although frequent disturbances also promote balsam fir, larch, red maple, and white birch, as well as abundant ericaceous shrub growth.

Forest management should strive to maintain a variety of area types and sizes, favouring black spruce within a naturally diverse species mix. Short and medium rotation forest renewal practices that protect and promote natural regeneration are appropriate.

Hardwood knolls should be managed to maintain a natural hardwood and mixedwood character.

Road and trail infrastructure must be planned and managed to minimize water impacts and road density. Many of the soils are susceptible to compaction and rutting and require special practices to minimize damage.

Flows

Water; people (timber, recreation, water); moose; four-toed salamander.

Composition

Mulgrave Plateau Ecodistrict 360 (based on statistics up to 2006)
Composition of Spruce Pine Flats

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	27%	30%	43% (34 Mat + 9 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	18%	22%	48%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	60%	19%	17%	4%

Desired Condition

Spruce-dominated softwood stands, in a variety of development stages and seral classes. Inclusions of tolerant and intolerant hardwood and mixedwood hills.

Issues

- Maintain a mix of covertypes, seral classes, and development stages, favouring natural regeneration of late seral species such as black spruce on the flats, and sugar maple and yellow birch on hills.

Tolerant Hardwood Hills and Drumlins

(Patch) (WCHO, WFHO, WMDM and WMHO ecosections) (20,907 ha)

This large patch level element occurs on hummocky terrain and drumlin landforms on the plateau. Soils are typically well-drained, coarse, medium, and fine-textured derived from glacial tills of conglomerates, sandstones, and shales.

Red maple and yellow birch dominate on most slope positions with sugar maple and white ash becoming more prominent where soils are richer such as along toe slopes and on seepage sites. White spruce, balsam fir, and yellow birch increase in stand abundance on the moister middle and lower slopes.

The dominant natural disturbance in the tolerant hardwood component of this element creates small gaps and patches in the canopy due to insects or disease, windthrow or storm breakage. As such, these tolerant hardwood forests can be uneven-aged and stands can develop old forest characteristics.

Stand-level disturbance is rare and forest harvesting creates conditions for early successional species such as white birch, red maple, and balsam fir. Mixedwood forests of white spruce, hemlock, and yellow birch are more susceptible to stand-level disturbances however these are infrequent and uneven-aged forests and old forests can develop over time.

A portion of this element has been converted to other uses, primarily agriculture and settlement. When fields are abandoned, white spruce are quick to reforest the sites.

A long history of forest harvesting has also increased the abundance of earlier successional species such as red maple, balsam fir, and white birch.

Flows

Deer (yards, year round habitat); furbearers (fox, coyote, bobcat); people (forestry, farm, recreation, habitation).

Composition

Mulgrave Plateau Ecodistrict 360 (based on statistics up to 2006)
Composition of Tolerant Hardwood Hills andDrumlins

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	26%	24%	50% (44 Mat + 6 OF)	6%
Seral Stage	Early	Mid	Late	Unclassified
	21%	21%	49%	9%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	43%	33%	20%	4%

Desired Condition

Hardwood and mixedwood hills with sustained canopies of mid and late seral species, surrounded by softwood forests of mixed development and seral stages. A dominant mix of late seral, mature hardwood forest uplands, and imperfectly drained softwood and mixedwood, within a landscape containing a significant composition of altered forest and non-forest patches resulting from farm and forest use.

Issues

- Increase composition of mid and late seral species. Restore hardwood and mixedwood forest on well-drained upland ecosections, and spruce on imperfectly drained flats.
- Move current overabundance of young, early seral softwood forest towards a greater proportion of late seral hardwood and mixedwood composition.

Wetlands

(Patch) (WTLD ecosection) (819 ha)

The Wetlands element is a small patch ecosystem comprising freshwater bogs, fens, swamps, and poorly drained areas.

In this ecodistrict, the element primarily occurs 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.

The largest wetlands are west of Goose Harbour Lake and are associated with the poorly drained soils on level terrain.

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.

On the higher ground with better-drained soils softwood and mixedwood forests of red and black spruce, balsam fir, and red maple will occur.

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

Flows

People (recreation, hunting, fishing); deer (seasonal cover/foraging, deer often pass through the wetland complexes in their travels from the interior to the coast); migratory birds (lakes and embedded wetlands, breeding); water (collection, filtering, storage); furbearers (travel, food, habitat).

Composition

Mulgrave Plateau Ecodistrict 360 (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
	14%	28%	58% (47 Mat + 11 OF)	11%
Seral Stage	Early	Mid	Late	Unclassified
	25%	20%	49%	6%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	57%	29%	14%	0%

Desired Condition

Bog and fen complexes should be left undisturbed with wet forests of black spruce, tamarack, and red maple on the perimeter of these open, treeless wetlands dominated by sphagnum mosses, sedges, and woody shrubs.

Issues

- Large wetlands are uncommon in the ecodistrict but many smaller wetlands are embedded within other elements, especially the Spruce Pine Flats, and will require special attention when developing access roads.
- Indiscriminate off-highway vehicles (OHV) use can create long-term damage in these sensitive wetland complexes. Public education on wetland ecological value is required.
- Developing ecosystem management techniques to ensure the conservation of this element will be required.
- Forty percent of the element is privately owned.
- Two percent of the element is in protected areas of which all is Crown land.

Floodplain
(Patch) (WMSM ecosection) (161 ha)

The largest floodplain occurs on the Milford Haven River. Other smaller floodplains may be found along the Salmon and Roman Valley rivers. Where annual or periodic flooding along these watercourses has deposited alluvial sediments the terrain is generally smooth and level.

These are linear, small patch-level elements with soils that can be quite gravelly and coarse-textured and most often are imperfectly drained. The climax forest for this element occurring on the better-drained alluvial soils is the shade-tolerant hardwood forest of sugar maple, white ash, and elm.

Small gap disturbances in this climax forest maintain a canopy that provides important ecosystem functions along these watercourses. Earlier successional forests include red maple, black cherry, and white spruce.

Where soils are poorly drained they support a forest comprised of black spruce that is subjected to frequent stand-level disturbances such as flooding and windthrow. As the soils get progressively wetter tamarack, red maple, willows, and alders become more abundant.

Where soils could be farmed they have been converted to agriculture use and when abandoned tend to reforest to white spruce, tamarack, and alders.

Flows

Human (recreation, hunting, fishing); deer (seasonal cover/foraging); wood turtles (important habitat and feeding areas); water (collection, filtering, storage); furbearers (travel, food, habitat); fish (trout, salmon, eel); furbearers (general habitat broadly accessible).

Composition

Mulgrave Plateau Ecodistrict 360 (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
	58%	9%	33% (22 Mat + 11 OF)	9%
Seral Stage	Early	Mid	Late	Unclassified
	53%	11%	11%	25%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	78%	8%	8%	6%

Desired Condition

Early to late successional floodplain forests evenly distributed throughout the element with most of the forest mature and/or old growth.

Issues

- Most of the element has been converted to other land uses including settlement and agriculture.
- No representation in protected areas.

Salt Marsh

(Patch) (XXMS ecosection) (17 ha)

The estuaries of the Milford Haven and Salmon rivers both have small salt marshes created by periodic flooding by the tide. These salt marshes have formed from coastal sediments deposited in low-lying, sheltered, intertidal areas.

Deposits of silty clay loam sediments with semi-decomposed grasses and sedges trapped in the accumulating layers, formed along the tidal shores. The dominant natural vegetation is *Spartina* grasses.

Flows

People (fishing, trapping, settlement, roads, harbour development); water (coastal ponds, marine estuaries); deer (winter habitat and feeding); furbearers (travel, food, habitat); migratory birds (travel routes, summer habitat); seabirds (nesting).

Composition

Mulgrave Plateau Ecodistrict 360 (based on statistics up to 2006)
Composition of Salt Marsh

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	37%	18%	45% (45 Mat + 0 OF)	0%
Seral Stage	Early	Mid	Late	Unclassified
	31%	57%	0%	12%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	41%	0%	59%	0%

Desired Condition

A natural salt marsh ecosystem with a minimum of human intervention is preferred.

Issues

- Crown ownership is 24% of the element.
- Only 11% of the element is protected.
- Salt marshes are critical habitat.

Coastal Beach
(Patch) (XXCB ecosection) (10 ha)

Several small coastal barrier beaches at the end of Chedabucto Bay have been created by the deposition of sand, gravel, cobbles, and other sizes of sediments. These barrier beaches often enclose lagoons and lakes which in most cases are brackish.

Where stable conditions have developed on these coastal beaches, a variety of vegetation can establish. Pioneer species such as beach grass and associates occur near the high-water mark.

A progressing development of woody shrubs such as bayberry, juniper, wild rose, foxberry, crowberry, and white spruce occur as the soil stabilizes and incorporates organic content and water retaining capabilities.

Many coastal beaches are too small to map and have been left as inclusions in other elements.

Flows

People (recreation, camping, hiking, hunting); water (coastal ponds, marine estuaries), deer (winter habitat and feeding); furbearers (travel, food, habitat), migratory waterfowl (travel routes, summer habitat); seabirds (nesting).

Composition

Mulgrave Plateau Ecodistrict 360 (based on statistics up to 2006)
Composition of Coastal Beach

Development Class	Establishment	Young Competing	Mature (incl. multi-aged and old forest)	Multi-aged and Old Forest
	77%	23%	0% (0 Mat +0 OF)	0%
Seral Stage	Early	Mid	Late	Unclassified
	77%	0%	23%	0%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	100%	0%	0%	0%

Desired Condition

Natural beach systems with minimal human impact to dunes and lagoons (brackish water lakes and ponds) will ensure long term integrity of these fragile ecosystems.

Issues

- Only 20% (all Crown ownership) of this sensitive and iconic element is protected although some beaches are covered under the Protected Beaches Act.
- Two endangered bird species, piping plover and roseate tern, use this element for nesting and are very sensitive to human disturbance/presence/traffic
- Indiscriminate OHC use on dune systems resulting in the destruction of wildlife habitat and plant communities.
- Development of beach complexes – residential, can threaten both wildlife and their habitat.
- Use of beach materials for aggregates can threaten beach stabilization and/or infrastructure associated with beach developments.
- Coastal erosion due to rising sea levels.

Valley Corridors

(Corridors) (Various ecosections) (1,342 ha)

Valleys associated with major rivers provide corridors within the ecodistrict that were naturally composed of black spruce flats, hardwood intervales, and hardwood slopes. Most of the corridor areas have been heavily altered by concentrated human activity that has created a patchy system of fields, forest, brush land, and settlement, intersected with roads, power lines, and other linear features.

A considerable amount of forest exists along the valley bottoms and slopes. However, much has been altered to favour early seral species such as white spruce and aspen. Intact hardwood intervales are scarce. Two notable sections of intact natural forest exist at the upper end of two of the corridor systems. Movement of native and adapted species, as well as people and goods, is a prominent function that is heavily influenced by the physical structure of valleys and rivers, as well as land use patterns and current inhabitants. The land use changes have restricted movement for some species while enhancing opportunities for others.

Forest management should focus on enhancing the connective function of the corridor systems. This can be accomplished by sustaining existing natural forest conditions, particularly within the two intact upper valley sections, and by restoring natural forest conditions in several key areas identified during landscape analysis. In addition, hardwood intervales should be sustained or restored where opportunity exists. In general, there is currently an overabundance of young and establishing, early seral softwood forests. Forest management should encourage the development of more mature and multi-aged forest with a greater proportion of late seral hardwood composition.

Flows

Humans (settlement, travel, utilities, farm, recreation, timber); furbearers (travel, habitat); fish; deer; songbirds.

Composition

Mulgrave Plateau Ecodistrict 360 (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
	29%	19%	52% (42 Mat + 10 OF)	10%
Seral Stage	Early	Mid	Late	Unclassified
	34%	31%	27%	8%
Covertype	Softwood	Hardwood	Mixedwood	Unclassified
	58%	16%	21%	5%

Desired Condition

Well-connected natural forest conditions through the valley corridors intermixed with altered human land use features.

Issues

- Maintain and restore natural conditions in existing forest and restore forest in key areas with important connective functions.
- Move current overabundance of young, early seral softwood forest towards a greater proportion of late seral hardwood and mixedwood composition.

Ecosystem Issues and Opportunities (All appendicesand maps)

Management of the forest resource in the Mulgrave Plateau 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:

- To maintain the low to moderate land use intensity as indicated by the EEI value 62 to 69 for the ecodistrict and ranging from 58 to 73 for the matrix and large patch elements.
- Additional Crown lands are of interest as wilderness areas as part of the 12% initiative, including many of which make up the Upper Tracadie watershed.
- Maintenance of connectivity with the coastal ecodistricts – St. Georges Bay 520 and Eastern Shore 820 – due to the seasonal importance of the coastal habitat for many terrestrial wildlife species.
- The ecodistrict is a significant wood supply area for the nearby paper mill in Port Hawkesbury which may lead to unplanned harvests to mitigate short term wood supply issues.

Appendix 1: Flow - Element Interactions

Element	Humans	Moose	Anadromous Fish	Aquatic Furbearers
Matrix Tolerant Hardwood Hills	Forestry, Woods roads, OHVs, Outdoor recreation, exploration and development of minerals / oil and gas	Travel ways, Foraging, cover	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Denning, travel, Foraging (beavers)
Patches Spruce Pine Flats	Forestry, Woods roads, OHVs, Outdoor recreation, exploration and development of minerals / oil and gas	Travel ways, Foraging, Thermal cover	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Breeding, nesting, foraging
Tolerant Hardwood Hills and Drumlins	Forestry, Woods roads, OHVs, Outdoor recreation, exploration and development of minerals / oil and gas	Travel ways, Foraging	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Denning, travel, Foraging (beavers)
Coastal Beach	Outdoor recreation (Swimming, etc.)	-	-	-
Wetlands	Outdoor recreation (e.g .hunting)	Travel ways, Foraging, calving areas, summer temperature regulation	Water quality maintenance	Denning (e.g. muskrat), travel, Foraging
Salt Marsh	Outdoor recreation (e.g. hunting)	-	Foraging (prey species)	Breeding, foraging (e.g. otter), rearing
Floodplain	Outdoor Recreation (Hunting, fishing, Trapping, etc.)	Travel ways, Foraging	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Travel ways, denning, foraging
Valley Corridors	Forestry, Woods roads, OHVs, Outdoor recreation, exploration and development of minerals / oil and gas	Travel ways, Foraging	Water quality maintenance, riparian habitat (e.g. stream cooling, siltation, undercut banks)	Travel ways, denning, foraging

Appendix 2a: Landscape Connectivity Worksheet

Feature	Structure Type (corridor, matrix, patch, island)	Importance in Ecodistrict (high, moderate, low)	Significant Cases (species, ecosections, specific rivers)	Scale and Pattern of Operation (local, landscape)	Associated Natural Disturbance Regime	Characteristic Community	Characteristic Neighbour(s)	Barriers - Impediments to Functionality	Significant Issues	Management Strategy
Tolerant Hardwood Hills	Matrix	High	WCKK WFKK WMKK	Landscape	Gap	- climax tolerant hardwood - current forest mixedwood, intolerant hardwood, red spruce, white spruce, some tolerant hardwood	- matrix - dissections	- condition in the matrix - interior conditions (patch sizes), change in species composition - ownership (property size)	- harvesting practices - fragmentation	- land purchase by government - extension and education - ecological restoration - patch aggregation - manage under gap disturbance regime
Spruce Pine Flats	Patch	High	IFHO IMHO	Landscape	Frequent	climax black spruce - intolerant hardwood on poor and shallow soils	WCKK WFKK WMKK WCHO WFHO WMDM WMHO	- condition in the matrix - interior conditions (patch sizes), change in species composition - ownership (property size)	- harvesting practices - fragmentation	- land purchase by government - extension and education - ecological restoration - patch aggregation - manage under gap disturbance regime
Tolerant Hardwood Hills and Drumlins	Patch	High	WCHO WFHO WMDM WMHO	Local	Gap	- climax tolerant hardwood - current forest yellow birch, red maple, sugar maple, white ash, white spruce	IFHO IMHO	- conditions in matrix or associated ecodistrict - roads	- harvesting in matrix - uniqueness within region	- ensure connectivity is addressed in adjacent ecodistricts if dissections converge
Wetlands	Patch	High	WTLD	Landscape	Open Seral	- current forest intolerant hardwood (red maple), mixedwood, black/white spruce, shrubs	WFKK, IFHO, WCKK	- alteration, - susceptible to blowdown from harvesting in adjacent ecosections Aquatic connectivity can be affected by improper road construction	- conversion - infilling - forest harvest produces in adjacent ecosections	- education - land use practices - mimic natural disturbance if appropriate in adjacent ecosections - maintain wetland and water quality

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
Floodplain	Patch	Low	IFSM IMSM WMSM	Local	Gap	- climax black spruce - current forest black spruce, mixedwood intolerant hardwood	WFKK, WCKK	- fragmentation due to land use such as agriculture, settlement, and transportation.	- conversion	- ensure concerns of potential blowdown addressed in possible adjacent harvest blocks
Salt Marsh	Patch	Low	XXMS	Local	Open Seral	- climax oak, white pine, red pine - current forest intolerant	WFHO	- changes in species composition	- amount of early seral species	- appropriate forest practices to increase late seral species
Coastal Beach	Patch	Low	XXCB	Local	N/A	-wave-dominated deposits of mixture of sand, gravel, and cobbles. Some with forest of white spruce	Tolerant Hardwood	Beach erosion	human development, beach erosion, Channel openings	ensure connectivity along coast
Valley Corridors	Corridor	High	Various	Landscape	Variable	- current forest largely mixedwood with some tolerant softwood and black spruce	- primarily matrix	- loss of linear continuity in waterways	- hydroelectric structures - potential building of mercury behind dams	- alternate sources of electrical power - adoption of forest practices to maintain riparian zone integrity

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 natural disturbance regime (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 360)

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

SPECIES		DESIGNATION		
Common Name	**Scientific Name**	**Provincial**	**Federal**	**COSEWIC**
BIRDS				
Barn Swallow	*Hirundo rustica*	Endangered	N/A	Threatened
Bobolink	*Dolichonyx oryzivorus*	Vulnerable	N/A	Threatened
Canada Warbler	*Wilsonia canadensis*	Endangered	Threatened	Threatened
Common Nighthawk	*Chordeiles minor*	Threatened	Threatened	Threatened
Eastern Wood-Pewee	*Contopus virens*	Vulnerable	N/A	Special Concern
Olive-sided Flycatcher	*Contopus cooperi*	Threatened	Threatened	Threatened
INSECTS				
Monarch	*Danaus plexippus*	N/A	Special Concern	Special Concern
MAMMALS				
Moose	*Alces alces*	Endangered	N/A	N/A
Little Brown Myotis	*Myotis lucifugus*	Endangered	Endangered	Endangered
FISH				
Atlantic Salmon - Southern Uplands Population	*Salmo salar - Southern Upland Pop.*	N/A	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 360)

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

SPECIES		DESIGNATION	
Common Name	**Scientific Name**	**Provincial General Status Rank**	**ACCDC S-Rank***
AMPHIBIANS			
Four-toed Salamander	*Hemidactyliumscutatum*	Secure (Green)	S3
BIRDS			
Four-toed Salamander	*Hemidactyliumscutatum*	Secure (Green)	S3
Bay-breasted Warbler	*Dendroica castanea*	Sensitive (Yellow)	S3S4B
Black-backed Woodpecker	*Picoides arcticus*	Sensitive (Yellow)	S3S4
Boreal Chickadee	*Poecile hudsonica*	Sensitive (Yellow)	S3
Boreal Owl	*Aegolius funereus*	Undetermined	S1B
Common Loon	*Gavia immer*	May Be At Risk (Orange)	S3B,S4N
Common Tern	*Sterna hirundo*	Sensitive (Yellow)	S3B
Eastern Phoebe	*Sayornis phoebe*	Sensitive (Yellow)	S3S4B
Gray Catbird	*Dumetella carolinensis*	May Be At Risk (Orange)	S3B
Gray Jay	*Perisoreuscanadensis*	Sensitive (Yellow)	S3S4
Pied-billed Grebe	*Podilymbuspodiceps*	Sensitive (Yellow)	S3B
Pine Siskin	*Carduelis pinus*	Sensitive (Yellow)	S3S4B,S5N
Rose-breasted Grosbeak	*Pheucticusludovicianus*	Sensitive (Yellow)	S3S4B
Solitary Sandpiper	*Tringa solitaria*	Secure (Green)	S1?B,S4S5M
Spotted Sandpiper	*Actitis macularius*	Sensitive (Yellow)	S3S4B
Tennessee Warbler	*Vermivora peregrina*	Sensitive (Yellow)	S3S4B
Willet	*Tringa semipalmata*	May Be At Risk (Orange)	S2S3B
Yellow-bellied Flycatcher	*Empidonaxflaviventris*	Sensitive (Yellow)	S3S4B
DICOTS			
Canada Anemone	*Anemone canadensis*	May Be At Risk (Orange)	S2
Disguised St John's-wort	*Hypericum dissimulatum*	Sensitive (Yellow)	S2S3
Downy Willowherb	*Epilobium strictum*	Sensitive (Yellow)	S3
Gmelin's Water Buttercup	*Ranunculus gmelinii*	Secure (Green)	S3
Golden Alexanders	*Zizia aurea*	May Be At Risk (Orange)	S1
Lance-leaved Figwort	*Scrophularia lanceolata*	Undetermined	S1
Northern Comandra	*Geocaulon lividum*	Sensitive (Yellow)	S3
Satiny Willow	*Salix pellita*	Undetermined	S2S3
Seabeach Ragwort	*Senecio pseudoarnica*	Sensitive (Yellow)	S2
Sharp-fruited Knotweed	*Polygonum raii*	Undetermined	S2S3
Swamp Milkweed	*Asclepias incarnata*	Secure (Green)	S3

Appendix 3: Special Occurrences (Ecodistrict 360)

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***
FERNS AND THEIR ALLIES			
Bulblet Bladder Fern	*Cystopteris bulbifera*	Secure (Green)	S3S4
Maidenhair Spleenwort	*Asplenium trichomanes*	Sensitive (Yellow)	S2
INSECTS			
Baltimore Checkerspot	*Euphydryas phaeton*	Secure (Green)	S3
Common Branded Skipper	*Hesperia comma*	Secure (Green)	S3
Green Comma	*Polygonia faunus*	Secure (Green)	S3
Grey Comma	*Polygonia progne*	Secure (Green)	S3S4
Mustard White	*Pieris oleracea*	Sensitive (Yellow)	S2
Question Mark	*Polygonia interrogationis*	Secure (Green)	S3B
MAMMALS			
Cougar - Eastern population	*Puma concolor pop. 1*	Undetermined	SH
MOLLUSKS			
Eastern Lampmussel	*Lampsilis radiata*	Sensitive (Yellow)	S2
Triangle Floater	*Alasmidonta undulata*	Secure (Green)	S2S3
MONOCOTS			
Hooker's Orchid	*Platanthera hookeri*	Secure (Green)	S3
Large Purple Fringed Orchid	*Platantheragrandiflora*	Secure (Green)	S3
Ovate Spikerush	*Eleocharis ovata*	Sensitive (Yellow)	S2?
Showy Lady's-Slipper	*Cypripedium reginae*	May Be At Risk (Orange)	S2
Yellow Lady's-slipper	*Cypripedium parviflorum var. pubescens*	Sensitive (Yellow)	S2

*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 360)
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 ProtectionRegulations*)
Eagle Nests	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act (NSWA)
Osprey Nests	Bird Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act
Deer wintering areas	Habitat	Significant Habitats of Nova Scotia Database	Nova Scotia Wildlife Act
Mainland moose concentration area	Habitat	Database Forestry Special Management Practices	Nova Scotia Endangered Species Act Crown Lands Act
Wilderness Areas- Ogden Round Lake	Ecosystems/ Recreation	DNR Restricted Land Use Database	Nova Scotia Wilderness Areas Protection Act
Provincial Park – Boylston	Ecosystems/ Recreation	DNR Restricted Land Use Database	Nova Scotia Parks Act
Non-designated Water Supply – Grant Lake	Ecosystems	DNR Restricted Land Use Database	Nova Scotia Environment Act
Old growth/old forest	Ecosystems	Regional GIS Database	Old Forest Policy

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	%		
IFHO	bS	2,205	2.1	27,047	26.3	53 to 62	6.6	31,024	2.8	95,529	8.7	51 to 59	12.8
IFSM	aE sM wA	348	0.3	843	0.8	64 to 70	5.8	511	0.0	11,044	1.0	51 to 54	12.9
IMHO	bS	21,014	20.4	27,047	26.3	68 to 74	2.7	121,008	11.1	95,529	8.7	60 to 69	3.4
IMSM	bS	1,726	1.7	27,047	26.3	61 to 65	9.5	9,670	0.9	95,529	8.7	50 to 55	17.4
WCHO	sM yB	1,880	1.8	50,202	48.8	54 to 62	16.5	69,678	6.4	55,327	5.1	58 to 65	8.5
WCKK	sM yB	1,946	1.9	50,202	48.8	53 to 62	13.0	190,197	17.4	55,327	5.1	55 to 64	7.6
WFHO	rM yB	5,019	4.9	20,239	19.7	57 to 63	11.7	19,086	1.7	20,239	1.9	49 to 57	14.0
WFKK	rM yB	10,240	10.0	20,239	19.7	59 to 68	5.8	75,788	6.9	20,239	1.9	49 to 57	12.3
WMDM	rM yB	4,098	4.0	20,239	19.7	67 to 73	1.0	20,068	1.8	20,239	1.9	57 to 68	3.1
WMHO	sM yB	9,921	9.6	50,202	48.8	67 to 73	5.8	84,128	7.7	55,327	5.1	55 to 65	5.2
WMKK	sM yB	40,189	39.1	50,202	48.8	59 to 67	10.2	184,216	16.8	55,327	5.1	58 to 66	5.8
WMSM	aE sM wA	346	0.3	843	0.8	31 to 38	40.3	2,952	0.3	11,044	1.0	38 to 40	14.3
WTLD	bS	819	0.007	27,047	26.3	71 to 73	2.1	6,085	0.6	95,529	8.7	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)
WMKK	sM yB	40,189	26.8	1,942	1	508	0	2,450	6.1	1	0.0	2,451	6.1
IMHO	bS	21,014	53.0	1,477	0	139	0	1,616	7.7	0	0.0	1,616	7.7
WFKK	rM yB	10,240	47.2	0	0	29	0	29	0.3	0	0.0	29	0.3
WMHO	sM yB	9,921	50.8	1,789	4	7	0	1,796	18.1	4	0.0	1,799	18.1
WFHO	rM yB	5,019	29.9	0	0	49	0	49	1.0	0	0.0	49	1.0
WMDM	rM yB	4,098	54.3	0	0	0	0	0	0.0	0	0.0	0	0.0
IFHO	bS	2,205	34.0	0	0	0	0	0	0.0	0	0.0	0	0.0
WCKK	sM yB	1,946	26.7	0	0	0	0	0	0.0	0	0.0	0	0.0
WCHO	sM yB	1,880	21.1	0	0	138	0	138	7.3	0	0.0	138	7.3
IMSM	bS	1,726	41.4	0	0	0	0	0	0.0	0	0.0	0	0.0
WTLD	bS	819	60.3	0	0	14	0	14	1.7	0	0.0	14	1.7
WMSM	aE sM wA	348	37.1	0	0	0	0	0	0.0	0	0.0	0	0.0
IFSM	aE sM wA	346	3.6	0	0	0	0	0	0.0	0	0.0	0	0.0
XXMS	saltmarsh	29	22.1	0	0	3	0	3	10.8	0	0.0	3	10.8
XXCB	coastal beach	10	19.0	0	0	2	0	2	19.0	0	0.0	2	19.0
Total		**99,752**		**5,208**	**4.1**	**885**	**0.0**	**6,093**		**4.1**		**6,097**	

See Appendix 12b for full Ecological Emphasis worksheet.

Appendix 5: Ecodistrict Reserves and Protected Areas Summary

Legal Reserves			Policy Reserves (including unproclaimed legal proposals)		
Act - Designation	Area by Ownership		Policy - Program	Area by Ownership	
	Crown (ha)	Private (ha)		Crown (ha)	Private (ha)
Wilderness Areas	5,208	0	Operational Non Designated Parks and Reserves	198	0
Protected Beaches	0	4.1	Old Forest	3,800	0
			Areas Under Special Places Act	57	
			Designated Provincial Parks and Park Reserves	91	0

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

Appendix 6: Description of Road Density Index

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

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

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

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

Main Concepts

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

Road density has a well-documented influence on many factors, including wildlife movements, fragmentation, human access, hydrology, and fire patterns (Forman and Hersperger, 1996). Forman & Deblinger (2000) report great variance in road effect zones, with average cumulative effects extending 300 metres from road edges, and some impacts penetrating up to a kilometre. Consequently, Index values are determined by assessing the transportation network within a one kilometre radius. The Index algorithm is applied to a grid of one hectare squares representing the landscape in question. The calculation provides a measure of the density of the transportation network and the specific distance to the transportation features.
The resulting index values are scaled to provide a potential range of 0 to 100. For the purpose of map interpretation these values have been grouped into benchmark ranges that reflect characteristic patterns of land use in NovaScotia.

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

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

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

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

Appendix 7: Road Density Index Worksheets

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

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

Road Type	Road Index Weighting	Length (km)
Trails, tracks, abandoned roads, and railways	1	844
Utility corridors	3	107
Gravel roads and active railways	6	658
Paved streets and roads collectors	10	144
Highways	15	11

Table 2: Distribution of Road Index Classes

Road Index Value		Area of Ecodistrict Affected	
Indication	**Range**	**Hectares**	**Percent**
Remote	0 to 6	54,449	53.0
Forest Resource	7 to 15	36,508	36.0
Mixed Rural	16 to 24	9,719	9.0
Agriculture Suburban	25 to 39	1,789	2.0
Urban	40 to 100	360	<1.0
Total		**102,825**	

Table 3: Road Index Values for Each Landscape Element Type

Landscape Element	Area (ha)	Road Index
Tolerant Hardwood Hills	52,144	4
Spruce Pine Flats	22,786	1
Tolerant Hardwood Hills and Drumlins	20,907	3
Floodplain	1,766	5
Wetlands	819	3
Salt Marsh	17	37
Coastal Beach	10	29
Valley Corridors	1,342	14
Total	**99,791**	**3**

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

Appendix 8: Development Classes and Seral Stages

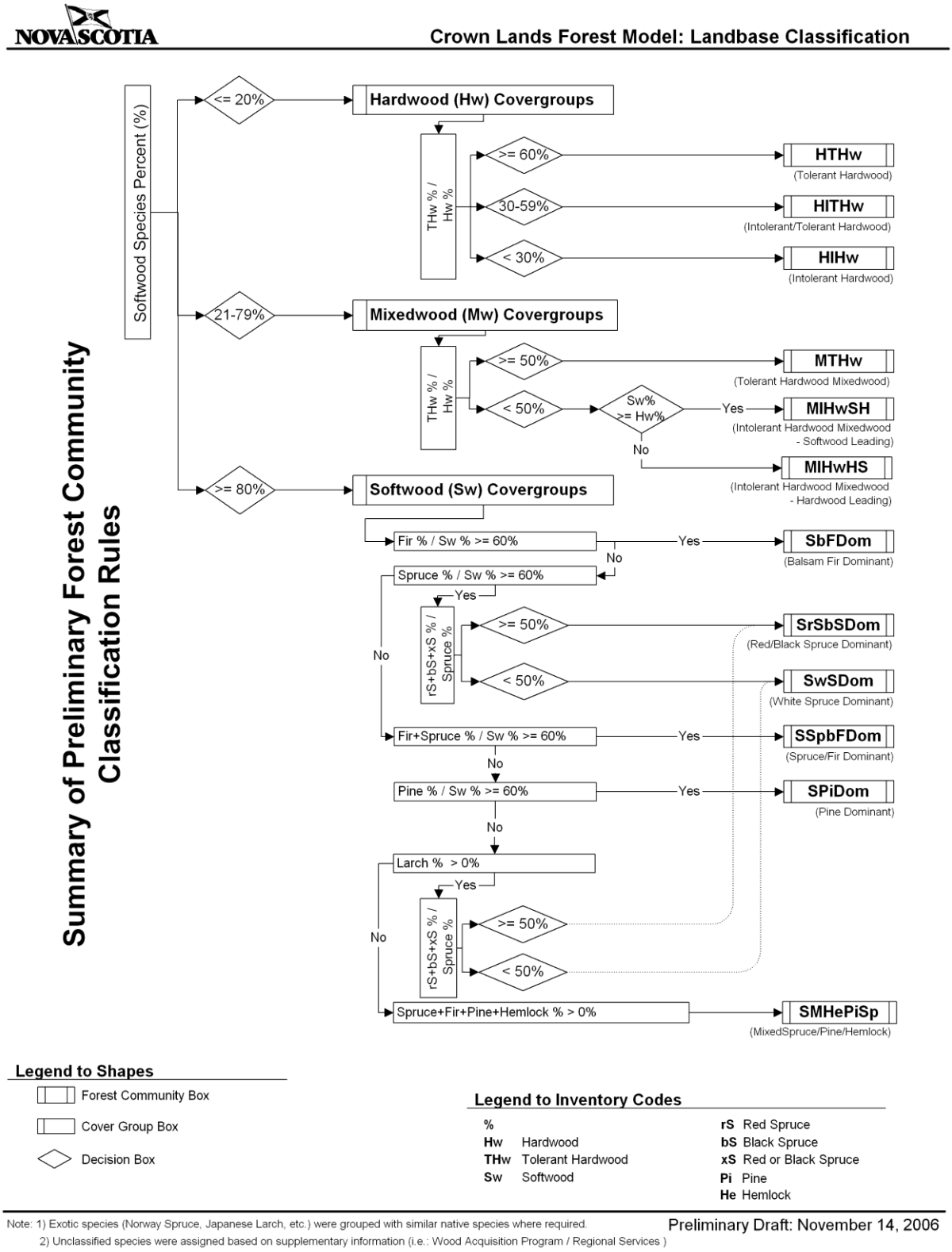
Development Class	Seral Stage
1. Forest Establishment (Height 0 to 6m) • establishment of new growth following a stand-initiating disturbance • high diversity of forbs, shrubs, and tree regeneration, many of which are short-live shade-intolerant "pioneer" species • peak seed production by forbs and shrubs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

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

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

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

Appendix 9: Vegetation Community Classification – Forest Model



Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Tolerant Hardwood Hills (Matrix)	WCKK (3.7%) WFKK (19.5%) WMKK (76.8%)	Softwood	rS eH wP	Infrequent	195; 0.4	Early	2,391	2,628	2,389	610	8,017	19,143; 42.4	EARLY	10,720; 23.7
						Mid	473	966	1,013	370	2,822			
						Late	1,672	1,141	1,047	469	4,330			
						Uncl	3,975	0	0	0	3,975			
		Mixedwood				Early	565	402	403	130	1,499	9,299; 20.6	MID	9,400; 20.8
						Mid	960	1,137	2,206	538	4,842			
						Late	77	357	1,002	182	1,618			
						Uncl	1,340	0	0	0	1,340			
		Hardwood	sM yB Be	Gap	51,949; 99.6	Early	25	29	36	1	90	14,812; 32.8	LATE	18,655; 41.3
						Mid	331	546	785	74	1,736			
						Late	345	1,297	10,820	246	12,708			
						Uncl	277	0	0	0	277			
		Unclassified				Early	803	72	238	0	1,113	1,937; 4.3	UNCL	6,415; 14.2
						Mid	0	0	0	0	0			
						Late	0.0	0.0	0.0	0.0	0			
						Uncl	824	0	0	0	824			
Total					**52,144***	**# ha**	**14,057**	**8,574**	**19,940**	**2,620**	**45,190**			
						%	**31.1%**	**19.0%**	**44.1%**	**5.8%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Spruce Pine Flats (Patch)	IMHO (84.4 %) IFHO (9.0 %) IMSM (5.1%) IFSM (1.5%)	Softwood	Frequent	bS	22,477; 92.1	Early	577	1,076	696	276	2,624	11,381; 59.7	EARLY	3,440; 18.1
						Mid	372	786	632	383	2,173			
						Late	1,076	2,060	1,291	763	5,191			
						Uncl	1,394	0	0	0	1,394			
		Mixedwood				Early	150	107	84	18	358	3,323; 17.4	MID	4,196; 22.0
						Mid	263	467	704	122	1,556			
						Late	30	344	506	107	987			
						Uncl	422	0	0	0	422			
		Hardwood	Gap	rMyB	1,272; 5.2	Early	2	2	1	0	4	3,647; 19.1	LATE	9,251; 48.6
						Mid	65	135	252	16	467			
						Late	104	551	2,359	59	3,074			
						Uncl	102	0	0	0	102			
		Unclassified				Early	310	60	85	0	454	702; 3.7	UNCL	2,166; 11.4
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	248	0	0	0	248			
Total					**24,391***	**# ha**	**5,115**	**5,587**	**6,609**	**1,743**	**19,054**			
						%	**26.8%**	**29.3%**	**34.7%**	**9.1%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

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)				
Wetland (Patch)	WTLD (100.0%)	Softwood	bS	None	410; 50.0	Early	17	30	33	4	84	226; 57.0	EARLY	96; 24.3
						Mid	1	17	10	4	32			
						Late	7	38	28	28	101			
						Uncl	8	0	0	0	8			
		Mixedwood				Early	1	6	3	0	10	55; 13.8	MID	80; 20.2
						Mid	0	10	8	1	19			
						Late	0	2	9	0	11			
						Uncl	15	0	0	0	15			
		Hardwood	aEsMwA	None	82; 10.0	Early	0	0	0	0	0	113; 28.6	LATE	195; 49.2
						Mid	0	2	22	4	29			
						Late	6	6	71	1	84			
						Uncl	1	0	0	0	1			
		Unclassified				Early	0	0	2	0	3	3; 0.7	UNCL	25; 6.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**819***	**# ha**	**57**	**111**	**186**	**43**	**396**			
						%	**14.3%**	**27.9%**	**47.0%**	**10.8%**	**100%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

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 Drumlins and Hummocks (Patch)	WCHO (9.0%) WFHO (24.0%) WMDM (19.6%) WMHO (47.4%)	Softwood	bS		3,537; 16.9	Early	617	1,160	669	268	2,715	7,756; 42.5	EARLY	3,784; 20.7
						Mid	385	546	512	183	1,626			
						Late	864	799	622	200	2,484			
						Uncl	931	0	0	0	931			
		Mixedwood				Early	177	98	139	23	437	3,722; 20.4	MID	3,910; 21.4
						Mid	287	424	788	181	1,679			
						Late	72	318	625	125	1,141			
						Uncl	465	0	0	0	465			
		Hardwood	rMyBsMyB	Gap	17,370; 83.1	Early	21	3	5	0	30	5,998; 32.9	LATE	8,855; 48.5
						Mid	82	248	262	16	607			
						Late	103	764	4,280	83	5,230			
						Uncl	131	0	0	0	131			
		Unclassified				Early	481	27	93	0	602	768; 4.2	UNCL	1,692; 9.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	166	0	0	0	166			
Total					**20,907***	**# ha**	**4,784**	**4,388**	**7,995**	**1,078**	**18,244**			
						%	**26.2%**	**24.1%**	**43.8%**	**5.9%**	**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 (Mulgrave Plateau 360)

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 (Patch)	WMSM (100 %)	Softwood	bS bF	Frequent	17,778; 58.0	Early	15	5	19	8	48	85; 78.0	EARLY	58; 53.3
						Mid	3	0	0	1	4			
						Late	6	0	0	0	6			
						Uncl	27	0	0	0	27			
		Mixedwood				Early	0	2	2	0	4	9; 8.2	MID	12; 10.9
						Mid	2	0	1	3	5			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood	aE sM wA	GaP	129; 80.0	Early	0	0	0	0	0	9; 8.2	LATE	12; 11.0
						Mid	1	1	0	1	2			
						Late	4	0	2	0	6			
						Uncl	0	0	0	0	0			
		Unclassified				Early	6	0	0	0	6	6; 5.7	UNCL	27; 24.8
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**30,622***	**# ha**	**64**	**9**	**24**	**12**	**108**			
						%	**58.7%**	**7.9%**	**21.9%**	**11.5%**	**100.0%**			

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Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

Element	Ecosection (% land area)	Covertype	Climax Species (M=Mid; L=Late Seral)	Natural Disturbance Regime	Total Land Area of Potential Forest* (ha; %)	Seral Stage	Current Forest - GIS Inventory							
							Development Class (ha)				Total Forested Area (ha)	Covertype (ha; %)	Seral Stage Summary (ha; %)	
							Establish-ment (1)	Young Forest (2)	Mature Forest (3)	Multi-aged (4)				
Salt Marsh (Patch)	XXMS (59.0%)	Softwood				Early	0	1	1	0	2	3; 40.7	EARLY	2; 31.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	1	0	0	0	1			
		Mixedwood				Early	0	0	0	0	0	4; 58.8	MID	4; 56.8
						Mid	2	0	2	0	4			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	0	0	0	0; 0.0	LATE	0; 0.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0.5	UNCL	1; 12.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**17***	**# ha**	**2**	**1**	**3**	**0**	**7**			
						%	**36.4%**	**18.2%**	**45.5%**	**0.0%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

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 (corridors)	IMSM (34.9%) IMHO (32.2%) WMSM (13.8%) WMKK (12.4%) WFKK (4.8%) WMHO (0.8%)	Softwood	bS	Infrequent Frequent	624; 46.4	Early	32	59	75	13	179	415; 58.3	EARLY	240; 33.8
						Mid	13	21	42	8	85			
						Late	30	15	55	7	106			
						Uncl	44	0	0	0	44			
		Mixedwood				Early	4	1	21	3	29	150; 21.1	MID	219; 30.8%
						Mid	19	13	38	14	85			
						Late	0	4	17	9	30			
						Uncl	7	0	0	0	7			
		Hardwood	aEsMwA sMyB rMyB	Gap	482; 35.9	Early	0	0	0	0	0	110; 15.4	LATE	193; 27.2
						Mid	13	5	25	7	49			
						Late	5	16	28	7	57			
						Uncl	4	0	0	0	4			
		Unclassified				Early	31	1	0	0	32	36; 5.0	UNCL	59; 8.3
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	4	0	0	0	4			
Total					**1,342***	**# ha**	**206**	**135**	**302**	**68**	**711**			
						%	**29.0%**	**18.9%**	**42.5%**	**9.6%**	**100.0%**			

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

Appendix 10: Table 1: Forest Landscape Composition Worksheet (Mulgrave Plateau 360)

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)				
Coastal Beach	XXCB (100 %)	Softwood				Early	1	0	0	0	1	1.6; 100	EARLY	1.2; 77.2
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Mixedwood				Early	0	0	0	0	0	0; 0.0	MID	0; 0.0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Hardwood				Early	0	0	0	0	0	0; 0.0	LATE	0.4; 22.8
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
		Unclassified				Early	0	0	0	0	0	0; 0	UNCL	0; 0
						Mid	0	0	0	0	0			
						Late	0	0	0	0	0			
						Uncl	0	0	0	0	0			
Total					**10***	**# ha**	**1**	**0**	**0**	**0**	**2**			
						%	**75.0%**	**25.0%**	**0.0%**	**0.0%**	**100.0%**			

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

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

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Tolerant Hardwood Hills	WMKK WCKK WFKK	Gap	sM yB Be	S	SbFDom	6,148	14.2%	E	**Well-drained** Early-Mid VT: rM, wB Late VT: yB, sM, rM, Be **Moist** Early-Mid VT: bF, wS, rM Late VT: wS, yB, rM **Old Fields** Early VT:
				S	SrSbSDom	6,023	13.9%	L	
				S	SwSDom	5,403	12.5%	E	
				S	SSpbFDom	1,504	3.5%	M	
				S	SPiDom	64	0.1%	L	
				S	SMHePiSp	2	0.0%	L	
				M	MIHwSH	4,400	10.2%	E/M	
				M	MIHwHS	3,468	8.0%	E/M	
				M	MTHw	1,431	3.3%	L	
				H	HTHw	8,654	20.0%	L	
				H	HIHw	3,849	8.9%	E/M	
				H	HITHw	2,309	5.3%	M	
Total						43,254	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 Mulgrave Plateau Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Spruce Pine Flats	IMHO IFHO	Frequent	bS wP	S	SrSbSDom	6,682	36.4%	L	**Well-drained** Early VT: tA, rM, pCh, gB Mid-Late VT: bF, wS **Moist** Early-Late VT: bF, bS, rM **Poorly Drained** Early-Late VT: bS, bF, tL, rM
				S	SbFDom	3,043	16.6%	E	
				S	SwSDom	853	4.6%	E	
				S	SSpbFDom	794	4.3%	E/M	
				S	SMHePiSp	6	0.0%	L	
				S	SPiDom	4	0.0%	L	
				M	MIHwSH	1,759	9.6%	E/M	
				M	MIHwHS	1,213	6.6%	E/M	
				M	MTHw	351	1.9%	L	
				H	HTHw	1,485	8.1%	L	
				H	HIHw	1,355	7.4%	E/M	
				H	HITHw	807	4.4%	M	
Total						**18,351**	**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 Mulgrave Plateau 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 and Drumlins	WCHO WFHO WMDM WMHO	Gap	sM yB	S	SrSbSDom	3,323	19.0%	E	**Well-drained** Early-Mid VT: rM, wB Late VT: yB, sM, rM, Be **Moist** Early-Mid VT: bF, wS, bS, rM Late VT: wS, yB, rM **Old Fields** Early VT: wS, bF
				S	SbFDom	2,862	16.4%	L	
				S	SwSDom	1,027	5.9%	E	
				S	SSpbFDom	507	2.9%	E/M	
				S	SPiDom	38	0.2%	L	
				M	MIHwSH	1,966	11.2%	L	
				M	MIHwHS	1,408	8.1%	E/M	
				M	MTHw	349	2.0%	E/M	
				H	HTHw	2,566	14.7%	L	
				H	HIHw	2,100	12.0%	L	
				H	HITHw	1,331	7.6%	E/M	
Total						**17,476**	**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 Mulgrave Plateau 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	IFSM IMSM WMSM	Gap	aE sM wA	S	SwSDom	66	64.2%	E	**Well-drained** Early – Mid VT: wS, bF, rM, yB, wB Late VT: sM, aE **Moist - Poorly Drained** Early-Late VT: rM, bS, tL
				S	SbFDom	12	11.9%	E	
				S	SrSbSDom	7	6.5%	L	
				M	MIHwSH	8	7.4%	E/M	
				M	MTHw	1	1.2%	L	
				H	HIHw	7	6.5%	E/M	
				H	HTHw	2	2.2%	L	
Total						**102**	**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 Mulgrave Plateau Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Wetlands	WTLD	None	bS	S	SrSbSDom	127	32.3%	L	**Moist** Early-Late VT: bF, bS, rM **Poorly Drained** Early-Late VT: bS, tL, rM
				S	SbFDom	70	17.7%	E	
				S	SwSDom	16	4.0%	E	
				S	SSpbFDom	13	3.3%	E/M	
				M	MIHwSH	28	7.1%	E/M	
				M	MTHw	20	5.2%	L	
				M	MIHwHS	6	1.6%	E/M	
				H	HIHw	44	11.2%	E/M	
				H	HTHw	42	10.6%	L	
				H	HITHw	28	7.0%	M	
Total						**393**	**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 Mulgrave Plateau Grouped by Landscape Element)

Element	Ecosections	Dominant NDR	Dominant Climax Type	Covertype	Forest* Community (Crown Model)	Area (ha)	Percent of Forest Community	Successional Stage	Successional Types
Salt Marsh	XXMS	Open seral	Salt Marsh	S	SwSDom	3	42.9%	E	
				M	MTHw	2	30.2%	L	
				H	MIHwSH	2	27.0%	E/M	
Total						**7**	**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 Mulgrave Plateau 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
Coastal Beach	XXCB	None	Coastal Beach	S	SwSDom	1	100.0%	E	**Dry:** Early – Late VT: wS, bS
Total						**1**	**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 Mulgrave Plateau 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	IMHO IMSM WFKK WMHO WMKK WMSM XXMS XXWA	Various	bS bS rM yB sM yB sM yB aE sM wA Salt Marsh	S	SrSbSDom	149	28.2%	L	**Well-drained** Early-Mid VT: bF, wS, rM, wB Late VT: yB, sM, Be, eH, rS **Moist** Early-Late VT: bF, bS, rM **Poorly Drained** Early-Late VT: bS, bF, tL, rM
				S	SbFDom	127	24.1%	E	
				S	SwSDom	81	15.4%	E	
				S	SSpbFDom	53	10.1%	E/M	
				S	SPiDom	5	1.0%	L	
				M	MIHwSH	96	18.2%	E/M	
				M	MIHwHS	34	6.4%	E/M	
				M	MTHw	21	3.9%	L	
				H	HIHw	76	14.5%	E/M	
				H	HTHw	23	4.4%	L	
				H	HITHw	11	2.0%	M	
Total						**676**	**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	50,202	48.8	55,327	5.1
bS	27,047	26.3	95,529	8.7
rM yB	20,239	19.7	20,239	1.8
aE sM wA	843	0.8	11,044	1.0
rS eH	195	0.2	22,788	2.1
Total	**98,526**	**95.8***	**204,926**	**18.7****

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

Appendix 11: Ecological Emphasis Classes and Index Values

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

Ecological Emphasis Class	Conservation Factor	Description
Reserve	**1**	• Reserved lands which meet biodiversity conservation goals through preservation of natural conditions and processes. Resource management activities are not usually permitted except where required to perpetuate desired natural conditions. This class is assigned based on the types of laws and policies governing the management (for example: Wilderness, Parks, Conservation Easement, Old ForestPolicy).
Extensive	**0.75**	• Lands managed for multiple values using ecosystem-based techniques that conserve biodiversity, and natural ecosystem conditions and processes. • Forestry practices employ ecosystem-based prescriptions which consider natural disturbance regimes, successional trends, structure, and composition. Natural regeneration is favoured to provide the next forest. Practices may include protection from fire and insects. • Management complies with the Forest Code of Practice, and excludes the use of herbicides, exotic tree species, off-site native species, genetically modified organisms,and 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 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	48,064	2,476	30,900	1,779	4,859	8,051	28,109 to 32,134	58 to 67
Spruce Pine Flats	23,743	1,563	17,881	790	765	2,744	15,857 to 17,229	67 to 73
Tolerant Hardwood Hills and Drumlins	20,195	1,986	13,341	929	1,514	2,424	12,830 to 14,042	64 to 70
Floodplain	121	0	27	14	47	33	32 to 49	27 to 40
Valley Corridors	1,250	58	764	31	303	93	662 to 709	53 to 57
Wetlands	816	14	735	17	18	32	578 to 594	71 to 73
Salt Marsh	12	3	6	0	1	1	8 to 9	70 to 74
Coastal Beach	10	2	4	1	3	0	5	53
Total	**94,210**	**6,102**	**63,659**	**3,562**	**7,509**	**13,378**	**58,081 to 64,770**	**62 to 69**

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 using the ELC. Rounding, overlapping, and averaging of figures may lead to small differences in tables. EEI values are benchmarks that will be monitored over time.

Appendix 12b: Ecological Emphasis Index Worksheet – Ecosections

Ecosection	Total 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
IFHO	2,126	0	1,266	230	145	485	1,128 to 1,371	53 to 64
IFSM	308	0	252	2	20	34	198 to 215	64 to 70
IMHO	20,524	1,616	15,650	504	575	2,179	14,024 to 15,114	68 to 74
IMSM	1,621	0	1,248	86	163	125	988 to 1051	61 to 65
WCHO	1,736	138	969	68	310	252	945 to 1071	54 to 62
WCKK	1,593	0	1,028	22	252	291	849 to 995	53 to 62
WFHO	4,731	49	3,218	271	588	605	2,682 to 2,984	57 to 63
WFKK	9,446	29	6,629	368	591	1,828	5,550 to 6,464	59 to 68
WMDM	4,042	0	3,392	141	39	469	2,697 to 2,932	67 to 73
WMHO	9,696	1,799	5,772	449	579	1,097	6,515 to 7,064	67 to 73
WMKK	37,240	2,451	23,378	1,389	4,085	5,938	21,816 to 24,785	59 to 67
WMSM	301	0	108	14	140	40	94 to 114	31 to 38
WTLD	816	14	735	17	18	32	578 to 594	71 to 73
XXCB	10	2	4	1	3	0	5	55
XXMS	20	3	12	0	3	2	12 to 13	65 to 68
Total	**94,210**	**6,102**	**63,660**	**3,562**	**7,509**	**13,378**	**58,081 to 64,770**	**62 to 69**

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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