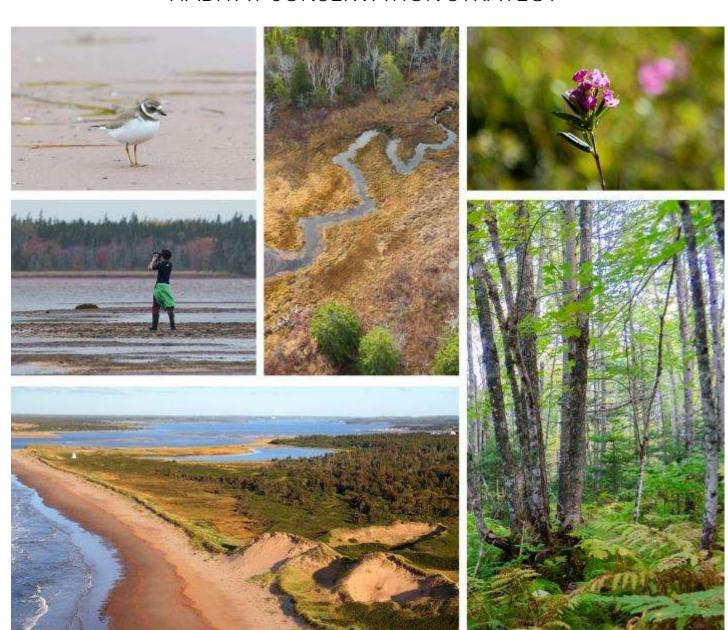
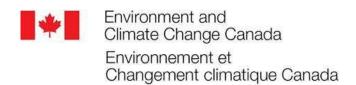
PRINCE EDWARD ISLAND HABITAT CONSERVATION STRATEGY



Prepared March 2018 - Edited & Shared May 2019





THANK YOU

Epekwitk (Prince Edward Island), meaning "lying in the water", is home to dynamic, ecologically, and culturally significant ecosytems. The Mi'kmaq are the Island's original land stewards, caring for and living on this unique, dynamic landscape for thousands of years.

That landscape is constantly changing. Today, Prince Edward Island (PEI) has vibrant rural communities, a prominent tourism industry, and a growing population. Undeniably fragmented, PEI remains home to important, remarkable natural systems that support native wildlife and the ecosystem services upon which we rely. Now more than ever there is a need to come together to protect these natural systems.

The Prince Edward Island Habitat Conservation Strategy (HCS) was prepared in 2017 with the support and participation of over 18 partner organizations. While the Nature Conservancy of Canada (NCC) was the lead author on this report, an HCS is truly a collaborative account of the conservation vision, strategies, and actions that play out on the natural landscapes we call home.

We would like to thank each and every individual who participated in this process. Based on our shared vision for PEI, the hope is that with increased cooperation and partnership between groups on the Island, we can lead an organized, strategic approach to conservation.

Sincerely,

NCC PEI

EXECUTIVE SUMMARY

This Habitat Conservation Strategy (HCS) was developed through collaboration among member organizations of the Eastern Habitat Joint Venture (EHJV) Prince Edward Island Steering Committee and partner conservation groups. This HCS encompasses the entire geographic area of Prince Edward Island (PEI).

HCSs are intended to respond to the need to better communicate, coordinate, and inform conservation actions taken by regional and local conservation organizations. In addition to providing decision support for these groups, following an ecosystem approach, it is hoped that HCS development will create opportunities to enhance partnerships, recognizing that each organization is guided by its own particular mission, vision, priority actions framework and/or guiding principles.

A Shared Approach

HCSs and their bioregional boundaries are based on meaningful ecological units and important watershed boundaries. HCS bioregions are scaled in a way that captures regional conservation context, priorities, threats and conservation actions. They are also scaled to facilitate the implementation of conservation actions, from land securement to stewardship activities.

In the first section, each HCS presents descriptions, in general terms, of the spatial extent and ecological significance of the bioregion, the dominant ecological systems found within the bioregion, and the processes that shape them. Each HCS also presents the significance of important habitats for identified species of conservation significance, with a focus on species at risk and other rare taxa, including Bird Conservation Region 14 priority birds (and also bird species making use of adjacent Marine Biogeographic Units, if applicable). The approach taken in the development of the narrative is meant to be thorough but not exhaustive, emphasizing references to more detailed work and in-depth studies.

The second section presents habitat prioritization based on uniqueness, representivity, and patch size. It also presents different perspectives on species-based prioritization by looking at various assemblages of species. Species-based prioritization relies on relative abundance maps derived from best available occurrence data for each species. The reader is cautioned that best available occurrence data for most species remains incomplete, to varying degrees, with availability being a function of survey timing and effort, leading to variable, but important bias in some related maps. As such, multi-species composite maps and all other maps derived from these maps should be used only as a guide rather than as a definitive source of information.

Ultimately, the habitat prioritization map (composite of all habitats) and species prioritization map (composite of all species) are combined to yield a Conservation Value Index (CVI) map of the bioregion. For various reasons, including introduced bias, the CVI map, priority habitat maps and various multi-species composite maps can present contrasting perspectives on spatial priorities. This is expected, as it reflects the need for contrasting approaches to conservation to conserve the diversity of species and the habitats that host them (i.e. land acquisition versus stewardship).

The second section also presents threats to conservation priority habitats and species. These are identified, assessed, and where possible, mapped at the bioregional scale.

In the third section, each HCS presents conservation and stewardship actions that organizations plan to undertake to mitigate identified threats and contribute to the conservation of habitats (and the species they host) over the course of a 5-year planning period. Though they cannot be considered comprehensive, actions are presented for each partner organization within a matrix structured according to IUCN categories.

In addition to presenting avenues for collaboration in the implementation of actions, this matrix presents gaps that can be interpreted as potential opportunities for development of new complementary conservation actions.

No single map can provide decision support that aligns fully with all priorities of all conservation partners. As such, users of this and all other HCSs are encouraged to carefully consider the full suite of maps and information presented to obtain the decision-support that is most appropriate to their needs.

Objectives

The conservation goals that have been identified to guide the development of the PEI Bioregion Habitat Conservation Strategy are:

- 1) Identify key conservation areas that are critical for priority species and habitats.
- 2) Establish, support, and enhance conservation partnerships to facilitate decision-making and focus collaborative efforts.
- 3) Maintain healthy, intact, and fully functioning ecosystems by building on existing conservation work through partnerships, and by informing efforts for the acquisition of conservation lands.
- 4) Support the management and protection of corridors between existing protected areas and other conservation lands through land securement, partnerships, and community outreach.
- 5) Support the recovery of populations of species at risk through collaborative actions.
- 6) Support the advancement of biodiversity-related research to inform conservation planning and decision-making.
- 7) Advance community support by strengthening local knowledge of biodiversity values through educational and stewardship initiatives.

Vision

The PEI Bioregion has struck a balance between human activities and the natural world. Agriculture and tourism industries are practicing more sustainable ways of operating, while respecting the natural landscape. Education and outreach programs have raised awareness of the importance of natural spaces in PEI; as a result, natural habitats are recovering, species are better connected across the region, and PEI's forests have begun restoration toward historic Acadian Forest conditions. There is increased cooperation and partnership between conservation groups on the Island, leading to an organized, strategic approach to conservation. A provincial endangered species act is in place and there is better understanding of rare species' distribution across the province. Islanders understand the impacts of climate change on PEI's coasts and forests, and there is a general recognition that land-use activities must consider future conditions.

Ecological Context

At 564,994 ha, PEI is the smallest of the Maritime Provinces, where it is nestled between the Gulf of St. Laurence and the Northumberland Strait. As a result of heavy land conversion since European settlement, the province has lost much of its original forest cover and only scattered patches of mature Acadian forest remain. Most conservation efforts across the province focus on the remaining mature forest and the province's

renowned coastline, which hosts salt marshes, estuaries, beaches, dunes, and cliffs. The province is largely a natural resource-based economy; the three largest industries are agriculture, aquaculture, and tourism.

The rich coastal areas provide nesting and staging habitat for a variety of shorebirds and waterfowl, including the federally listed Piping Plover (*Charadrius melodus melodus*) and Red Knot (*Calidris canutus rufa*). Malpeque Bay is an internationally designated RAMSAR wetland and the province supports 16 Important Bird Areas (table 5). There is one Migratory Bird Sanctuary, which contains a representative barrier beach pond ecosystem at Black Pond. The province has 17 wildlife management areas and protects land through the Natural Areas Protection Act. Local organizations, including NCC, Island Nature Trust, the PEI Wildlife Federation, and Ducks Unlimited Canada (PEI chapter) all protect land on PEI, for a conserved land total of 22,384 ha.

Beach and dune habitats in the province are generally harsh environments, and therefore host a variety of rare plants capable of growing in these extreme conditions, including Beach Pinweed (*Lechea maritima*) and Gulf-of-St-Lawrence Aster (*Symphyotrichum laurentianum*). The bioregion contains a wide variety of rare and uncommon lichens, discovered in 38 sites across the province, 10 of which have received a recommended species' rarity ranking of S1 or S2 (imperiled/at risk) (McMullin, 2015).

The Northern Appalachian-Acadian Ecoregional Plan (NAAP; Anderson et al., 2006) identified a number of critical ecological systems for the PEI bioregion including beaches, salt marshes, freshwater wetlands, and riparian systems. The NAAP also identified 13 species that are considered "primary targets" – those that cannot be adequately conserved by the protection of ecosystems alone but require explicit and direct conservation action. Additionally, there are 30 federal (COSEWIC) species at risk in the Bioregion. There are 17 globally significant species (G1-G3G4) also identified within the bioregion, 5 of which are COSEWIC listed.

Conservation Priority Habitats

Based on habitat affinities of rare species at risk, and bird species identified as conservation priorities, the following seven habitat types were determined to be conservation priorities for the PEI bioregion.

- 1. Beaches and Sand dunes
- 2. Salt marshes and Estuaries
- 3. Coastal Islands
- 4. Rivers, Streams, and Riparian Areas
- 5. Acadian Forest Mosaic
- 6. Agroecosystems
- 7. Freshwater Wetlands

The species composite maps, found in Figs. 24 - 37 (p. 78 - 94), illustrate the distribution of flora and fauna that comprise the whole of the significant species included in this analysis. To supplement these figures, Appendix H presents a summary of the species presented in each map, and the datasets used to represent these species. It is important to note that priority habitat composite maps do not incorporate information on species occurrence records. The final integration of habitat and species information results in a Conservation Value Index (CVI) map for the bioregion (Figure III). When using this document for decision support, the reader is advised to compare and contrast the priority habitat composite map (Figure II) with the Conservation Value Index (CVI) map (Figure III).

Threats

The following 11 threats have been identified as medium - high for these habitats:

- 1.1 Housing, Cottage, and Recreational Development
- 2.1 Agricultural Land Practices
- 3.3 Wind Energy Development
- 4.1 Road Fragmentation
- 7.2 Culverts and Stream Crossings
- 8.1 Invasive Non-native or Alien Species
- 9.3 Agricultural Effluents
- 11.1 Coastal Erosion

The overall threat status for the Bioregion is high.

Conservation Actions

The following summary presents the conservation strategies suggested by organizations working in the PEI bioregion. A more detailed list of conservation actions, including links to the threats associated with each of the different conservation priority habitats, is presented in Table 12.

Nature Conservancy of Canada

- A National land trust organization, operating in PEI since 1985
- Aquires natural spaces of ecological signifiance to be conserved in perpetuity, places land holdings under the *PEI Natural Areas Protection Act*
- Activiely manages and stewards NCC Nature Reserves to maintain ecological integrity using an active land Stewardship Program with the help of local community groups and volunteer land stewards
- Work with the Watershed Alliance to assist with consolidating stream connectivity data to isolate areas of best and worst stream connectivity.
- Identify areas of significant forest ecosystem in Bioregion.
- Increase knowledge of distribution of rare mammals, reptiles and amphibians in the Bioregion.
- Develop management plans for all newly acquired NCC property and deliver priority site management activities
- Investigate/research best management practices and/or alternatives to coastal armoring through ecosystem service approach
- Work with the PEI Invasive Species Council to identify and coordinate definitive invasive species maps and databases; consolidate data collected by various conservation groups in the NA
- Improve site access to properties in PEI where appropriate; where not possible, implement a "virtual access" program through video footage

The Mi'kmag Confederacy of Prince Edward Island

- Working on online land-use database (a 'living memory') of culturally important species on PEI. This
 database will provide information on areas of traditional land use (with the exception of sensitive
 sites)
- Ensuring the perpetuation and healthy population of culturally important species on PEI, so that traditional use and harvest of these species can continue without risk to the species' population.
- Working with Province of PEI to co-manage Black Ash (*Fraxinus nigra*) on identified properties.

- Partnership project with the Province of PEI and the PEI Wildlife Conservation Fund to operate the Abegweit First Nations Fish Hatchery, which aims to restore Brook trout (*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar*) populations to historic levels.
- The Abegweit First Nations Hatchery participates in 'Fish Friends', a program aimed towards children from grades 4-7 to raise awareness and education around native fish species and their cultural importance to First Nations in PEI.
- The Abegweit First Nation maintains a native species greenhouse to propagate culturally important species on PEI, with the future hopes of providing a seed bank for certain plant species.
- Working with Nature Conservancy of Canada, the Provincial government of PEI, and Parks Canada to create a co-management strategy for the Hog Islands, which are currently undergoing a land claim negotiation.
- The Hog Islands are currently the site of an archeological dig site intended to locate predominant locations of ancient artifacts and evidence of recognized First Nations' use.
- The Lennox Island First Nation partnered with the UPEI Climate Lab to monitor and measure sea level rise on Lennox Island, which is at significant risk of loss and damages as the planet's climate changes. Their work has been recognized on several occasions, including National Geographic Magazine

Parks Canada – PEI National Park

- Parks Canada is in preliminary discussions with the University of Prince Edward Island and other
 academic partners to study dune geomorphology and migration in PEI. Their goal is to collect the
 information necessary to develop a prediction model for shifting dunes that will facilitate
 management decisions in both conservation and asset protection.
- In order to manage preservation areas and recreational areas, Parks Canada employs a 'Standardized Nature Reserve Triage', which helps balance eco-tourism activities and conservation areas home to sensitive habitat types, rare flora and fauna and species-at-risk.
- Parks Canada is actively involved in educating guests at the PEI National Park about the sensitivity of the area and the importance of conserving the province's dunes as a natural buffer system.
- Parks Canada works towards forest restoration as an alternative to wood harvest. They also manage a
 'Field to Forest' program, which offers advice and assistance to landowners who want to convert
 abandoned agricultural field back to native Acadian forest.
- Parks Canada addresses road fragmentation by reclamation of low-use park roads.
- There are 7 watersheds located within the boundaries of PEI National Park; Parks Canada manages these through annual stream monitoring (ensuring connectivity and health). Most restorative efforts are focused on the Lake of Shining Waters and its encompassing watershed.
- Parks Canada directly manages 5 invasive species within PEI National Park boundaries: Purple Loosestrife, Garlic Mustard, Scots Pine, Gypsy Moth, and Glossy Buckthorn. In addition, they actively monitor the growth and distribution of 30 other known invasive species. Most of their active preventative work is based on upcoming invasive threats that may migrate here due to the planet's changing climate and newly accommodating weather conditions.

Province of Prince Edward Island - Department of Fish & Wildlife

- Continue to assess provincial lands for conservation through the *PEI Natural Areas Protection Act*, along with working with private landowners who wish to place their property under the Natural Areas Protection Act
- Continue management and protection of existing provincially protected lands and resource lands

- In conjunction with the Department of Agriculture and Environment, Fish & Wildlife manages the ALUS (Alternative Land Use Services) program, a community-based program that offers incentives to farmers to implement agricultural practices that encourage diversity and sustainability. There are currently 10,000 acres and 415 farmers enrolled in the PEI ALUS program.
- The Province manages the Forest Enhancement Program, which can provide woodland owners with advice and financial assistance for their woodlands for recreation, forest products, wildlife habitat, and forest restoration and health.

Nature PEI

- Continue general education program, monthly meetings, field trips and awareness events, to further public awareness about PEI's natural history
- Coordinate citizen science efforts that allow interested individuals to get involved and contribute towards increasing knowledge of PEI's flora and fauna
- Focus on increasing the knowledge of understudied species groups on PEI
- Encourage government for changes that promote conservation of PEI's flora, fauna, and natural habitats

Atlantic Canada Conservation Data Centre

- Enhance data management and information on biodiversity in the bioregion through the maintenance of the most comprehensive and current database on the distribution of biological diversity in Atlantic Canada.
- Due for completion in 2018, conducting 3 years of calcareous plant species surveys to better understand the distribution of calcareous ecosystems in Atlantic Canada

<u>University of Prince Edward Island - Biology</u>

- North River "environmental flows" project to determine ecological impacts of high-volume water withdrawals (UPEI and Province of PEI)
- Determination of appropriate fish passage designs for non-salmonids (UPEI and Ducks Unlimited Canada)

University of Prince Edward Island - Climate Lab

- The Climate Research Lab maintains and operates two coastal change monitoring programs across the Province; a traditional terrestrial monitoring method using peg-line measurements, and an emerging method using sUAS (small Unmanned Aerial Systems).
- The UPEI Climate Lab is developing the PEI Climate Change Adaptation Recommendations Report for the Government of PEI. With input from the public and sector representatives, specific recommendations will be provided for each of the identified sectors: Agriculture, Education, Energy, Fish & Aquaculture, Forestry & Biodiversity, Insurance, Public Health & Safety, Tourism, Transportation & Infrastructure, and Water.
- The UPEI Climate Lab is working with federal, provincial, university, commercial, indigenous and volunteer partners to bring together observations such as wind, temperature, precipitation and solar radiation from climate stations across the province. A reference climate data record is a key element in understanding PEI's changing climate and helps in applied climatology needs for agriculture, forest

- and tourism operations, in reducing model uncertainties in climate variances, and in providing reference ground truth data to better evaluate climate model predictions.
- The Climate Lab coordinates The Climate Diary: The Climate Diary is a means for citizen scientists and to identify and record observations of naturally occurring plant and animal life cycle events over time on PEI.
- The Climate Research Lab at the University of PEI developed a valuable tool for researchers who require climate projections for anywhere on the planet. The lab has downloaded raw data from 40 global climate models and translated, analyzed, verified, and converted it into a usable dataset for researchers.
- Precision agriculture is a farming management approach that uses data to identify and respond to inter and intra-field variability in crops. This approach was tested for potato crops in PEI. Indications are that early-season field health maps derived from sUAS collected data (July and early August) can provide a farmer with an idea of where their crop will produce well, and areas that won't produce as well. This information, in combination with field data from other sources (i.e., soil sampling, past years yield data, topographic information, etc.) can be used to make management decisions on the farm as part of a precision agriculture approach, and has the potential to boost farmers profits by increasing yields and potentially reducing input costs.
- The Climate Research Laboratory at the University of Prince Edward Island hosted the first international symposium entitled "Impacts of Climate Change on Human Health". The symposium was held at PEI Greenwich National Park from October 5 to 7, 2017.
- As coastal communities and property owners respond to the threat of coastal flooding and accelerated rates of erosion due to climate change, the impacts of coastal adaptation strategies on coastal ecosystems will require ongoing monitoring and evaluation. Shoreline stabilization structures can influence regional sediment transport processes, beach width and profile, and habitat connectivity between the marine, littoral and terrestrial zones. The first step to evaluate the effectiveness of these structures and their potential long-term impacts on the coastline of PEI will be to develop an inventory of existing shoreline structures and to assess the historic changes to the coastal geomorphology since their installation. The project will demonstrate the complex relationship between coastal environmental processes and human responses.
- The Economics Working Group of Natural Resources Canada's Adaptation Platform aims to enhance the understanding of the regional and sector-specific economic impacts of climate change and to generate knowledge of comparing relative costs and benefits of potential adaptation measures. As one of four regions to receive support from Natural Resources Canada to undertake a cost—benefit analysis (CBA) of climate change adaptation options, the Atlantic Climate Adaptation Solutions Association (ACASA) selected six coastal areas within the Atlantic Provinces for case study analysis. In each of the selected sites the risks to significant infrastructure and properties were assessed under the projected threat of coastal flooding and costal due to climate change, where applicable.
- The Atlantic Climate Adaptation Solutions Association (ACASA) has partnered with Natural Resources Canada and leading researchers to develop the Coastal Community Adaptation Tool-kit to support communities in better understanding and preparing for the impacts of climate change.

Ducks Unlimited Canada (PEI Chapter)

• DUC is active in scientific research across Atlantic Canada, including PEI, as a part of their Atlantic Fishway Initiative, which helps identify rivers-at-risk from connectivity loss, and the best designs for fish ladders and other types of passageways.

- DUC works with government to encourage appropriate wetland conservation policies within the province of PEI
- DUC hosts two educational programs: 'Project Webfoot' and 'Youth Waterfowler Heritage Day' to help build awareness around wetlands and the wildlife who depend on them. These programs are for everyone but structure for kids to help raise young conservationists.
- DUC partners with the Province of PEI to inspect, maintain and repair water control structures that are not functioning.
- DUC partners with Acadia University and UPEI to research fish passage and how to improve it.
- Management of protected areas and other resource lands for conservation, like the Wolfe Inlet Salt Marsh

PEI Watershed Alliance

- Offers courses and workshops to PEI watershed groups and other conservation partners that provide new training opportunities and new innovations in watershed management
- Creates literature and resources for managing healthy watersheds in PEI
- Maintains a biosecurity protocol for farmers and landowners who have land or watercourses adjacent to farmer fields
- Provides external resources and information for the public on watershed management
- Currently developing a PEI watershed strategy in conjunction with the Province of PEI
- Advocates for healthy watersheds, encouraging government to refrain from hydraulic fracking and offshore oil and gas development around PEI
- Active in research and outreach regarding fish kills occurring in PEI
- In conjunction with the Province of PEI, develops and maintains the PEI Nature Tracker App

PEI Invasive Species Council

- Educational awareness through publications, presentations and putting up display boards at events
- CCIS PEIISC has a representative that volunteers/works with the Canadian Council for Invasive Species- an organization that "works collaboratively across jurisdictional boundaries to support actions and information that can help reduce the threat and impacts of invasive species"
- Maintains a volunteer base for detecting new invasive species, and recording locations of known invasive species the Spotter's Network
- Continues to identify and update invasive plant species list
- Explores mechanisms and strategies for control of invasive species and prevention of new introductions
- Develops distribution maps for priority invasive species present in PEI

<u>Island Nature Trust</u>

- A provincial-in-scope, private land trust that acquires ecologically sensitive and representative land to be protected and conserved for future generations
- Protects land from development through ownership and legislative protection under the *PEI Natural Areas Protection Act*
- Stewards Island Nature Trust *Natural Areas* to restore and/or maintain ecological integrity, with the assistance of community partners and Conservation Guardian volunteers who are often neighbours

- Assists private landowners navigate through the provincial legislative mechanisms (the PEI Natural Areas Protection Act, PEI Wildlife Conservation Act) to voluntarily protect their lands in perpetuity with restrictive covenants
- Runs the Piping Plover stewardship and monitoring program, working with Plover Guardian
 volunteers to protect this endangered shorebird during breeding on all provincial beaches outside of
 the National Park.
- Tracks Piping Plover numbers and nest success in PEI for the Canadian Wildlife Service, publishing an
 annual report, conducting the annual national census, and the more comprehensive international
 census every five years as part of the larger international collaborative effort to conserve the species
- Works with rural landowners and farmers to help protect nesting habitat for farmland bird species, the Bobolink and the Barn Swallow in agroecosystems across the Province
- Monitors fledge dates for Bobolink and estimates their productivity as part of a federal provincial
 collaborative effort to develop best practices for grassland management in PEI and incentives for
 delayed hay through the ALUS program
- Assesses the habitat needs for threatened birds in forested natural areas in PEI and monitors the forest songbird community in peak summer breeding months. Data derived informs INT's own forest management practices, and possibly future sustainability certification or carbon credit forestry programs
- Works with partner organizations on- and off-island to conduct conservation research and education programs relevant to PEI landscapes and species; currently that includes tools to use ecosystem services in inland flood risk reduction, evaluation of old growth forest scoring protocols and exploration of hotspots for uncommon flora in western PEI
- Develops and delivers curriculum modules for PEI school classrooms about local ecosystems-at-risk, particularly the north shore beach – dune ecosystem
- Maintains a provincial hub for data regarding PEI's Important Bird Areas and shares information with national coordinators at Nature Canada and Bird Studies Canada
- Administers the PEI Wildlife Conservation Fund for a volunteer awards committee and maintains their website
- Provides dune restoration services and shorebird monitoring services for federal marine projects where requested
- Delivers the field trip component of DU's Project Webfoot in PEI

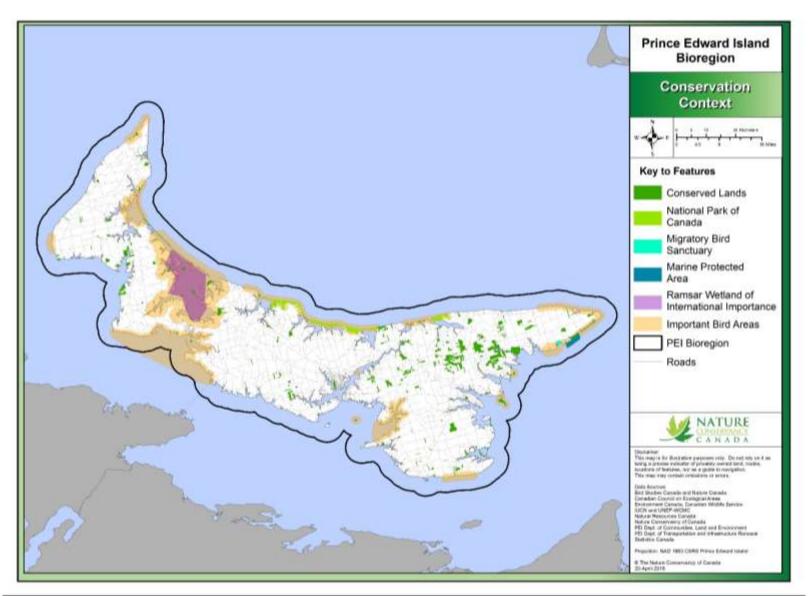


Figure I - Conservation Context for PEI Bioregion

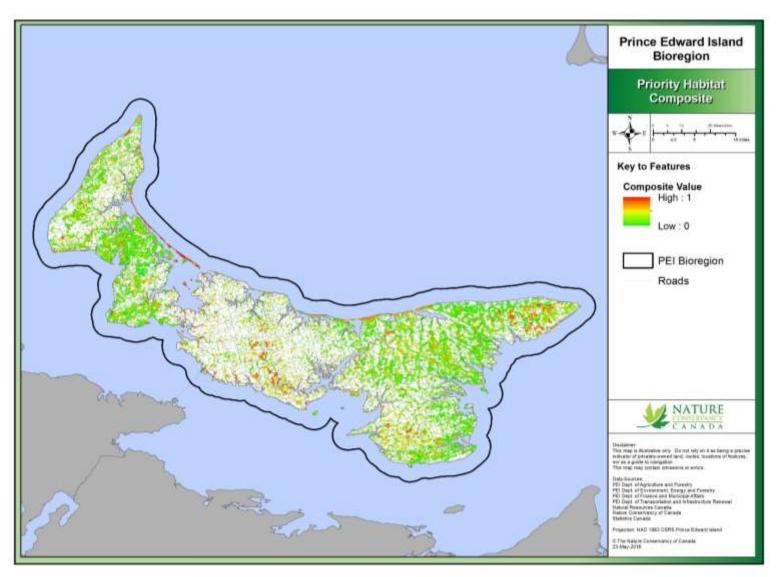


Figure II – Conservation priority habitats for the PEI Bioregion

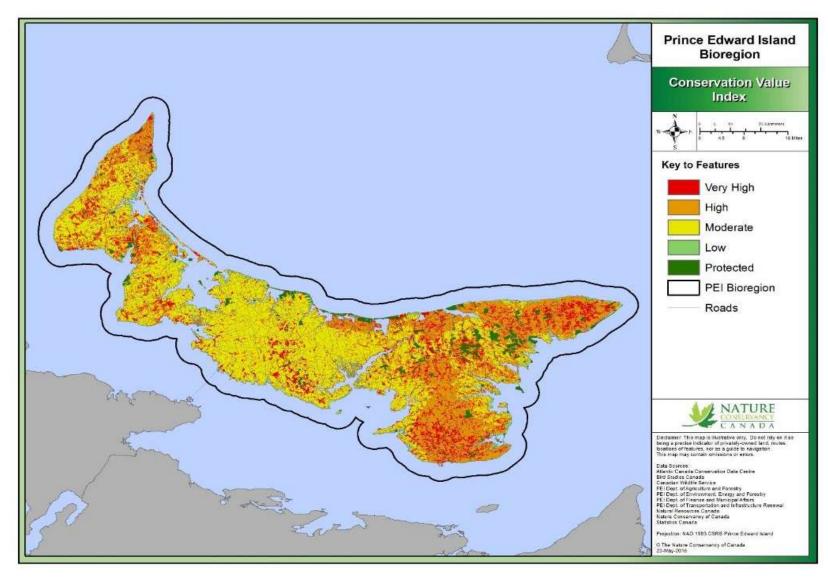


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- Table 12. Conservation Actions and Associated Information for the PEI Bioregion

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1. CONSERVATION CONTEXT

A. Bioregion Scope

i. Location and Size

The Prince Edward Island (PEI) Bioregion encompasses the entire province and falls within both the Atlantic Maritime Ecozone (Ecological Stratification Working Group, 1995) and the Northumberland-**Bras D'Or** lowlands subregion of the Northern Appalachian-Acadian ecoregion (Anderson *et al.* 2006). The bioregion also falls within Bird Conservation Region 14 – Atlantic Northern Forest in the North American Bird Conservation Initiative, and Marine Biogeographic Unit 12. The intertidal and marine components of the bioregion fall within the Gulf of St. Lawrence bioregion (Government of Canada, 2011).

Relative to the other provinces and States in the Northern Appalachian-Acadian ecoregion, PEI is ecologically uniform, with its defining red sandstone and soils found throughout the province. However, there are some locally recognized ecological distinctions: poorly drained soils and lowlands are found in the western third and the southeastern regions, while well-drained soils and rolling hills are prevalent through the remainder of the province.

The PEI bioregion is approximately 564,994 ha in size, of which 529,933 ha is terrestrial and 39,482 ha is intertidal and marine. There is approximately 3,300 km of coastline dotted with sheltered estuaries, natural harbours, and offshore islands. The province is surrounded by two principle bodies of water: the Gulf of St Lawrence on the north and west, and the Northumberland Strait on the east and south (Figure 1).

NAAP Subregion ¹	Ecozone ²	Ecoregion ²	Ecodistrict ²
Northumberland - Bras D'Or Lowlands			534
			535
	Atlantic Maritimes	PEI	536
			537
			538

Table 1. Ecological land classification of the PEI Bioregion.

ii. Boundary Justification

Bioregions are geographic areas defined by natural boundaries (i.e. physical and environmental features), including watershed boundaries and soil and terrain characteristics. The principal element guiding the delineation of the bioregion was the Northern Appalachian-Acadian Ecoregion conservation blueprint, which identifies sub-regions on which to focus conservation efforts based on biodiversity value, the level of threats to priority habitats, and opportunities for conservation action.

The boundary of the bioregion encompasses the entire province of PEI. This decision was made based on the lack of large-scale ecological classifications for the province of PEI; the landscape context of PEI is more appropriately viewed as a single unit rather than dividing the land base into multiple bioregions. Furthermore, PEI is considered to be one ecoregion within the Atlantic Maritime Ecozone (Ecological

¹ Northern Appalachian Ecoregion (NAAP; Anderson et al., 2006)

² A National Ecological Framework for Canada (Ecological Stratification Working Group, 1996)

Stratification Working Group, 1996), which characterizes regions by distinctive factors such as climate, physiography, vegetation, soil, water, fauna, and land use.

iii. Ecological Significance

PEI is Canada's smallest province with its own unique landscape. Low-lying, with a coastline dotted with shallow harbours and rugged cliffs, the landscape boasts a rich natural history. The wetlands and marshes of the PEI bioregion create ideal habitat for waterfowl, shorebirds, and seabirds (Ecological Stratification Working Group, 1995). Part of the Acadian Forestregion, PEI hosts a variety of forest stand types. Well-drained, upland sites tend to be dominated by species such as American Beech (*Fagus grandifolia*), Yellow Birch (*Betula alleghaniensis*), Sugar Maple (*Acer saccharum*), White Pine (*Pinus strobus*), Eastern Hemlock (*Tsuga canadensis*), Red Oak (*Quercus rubra*), and White Ash (*Fraxinus americana*) (Province of PEI, 2015). Poorly drained sites, or sites with poor soil or other limiting factors (exposure, land clearances), tend to be comprised of species such as White Spruce (*Picea glauca*), Black Spruce (*Picea mariana*), Eastern Larch (*Larix laricina*), Poplar (*Populus tremuloides*), or White Birch (*Betula papyrifera*) (Province of PEI, 2015).

A long history of human settlement has resulted in an increase of disturbed ecosystems; most conservation efforts in the province are largely focused on the management and/or conservation of the historical ecological features of PEI. The combination of protecting existing pristine wetlands and mature forests, as well as the strategic restoration and management of disturbed ecosystems, further justifies the need for a Habitat Conservation Strategy for the entire province.

PEI is considered a high priority area within the Northern Appalachian-Acadian Ecoregion, mainly for occurrences of salt marsh, freshwater wetlands, and coastal shores and wetlands identified in the Northern Appalachian-Acadian Ecoregional Plan (NAAP)¹. In total, PEI contains 5.7% of coastal ecosystems and 2% of freshwater wetlands of the total portfolio of sites. A notable example is Hog Island, a 445-hectare barrier beach that supports Piping Plover, Common Tern (*Sterna hirundo*), Beach Pinweed, and Broom Crowberry (*Corema conradii*, Anderson et al., 2006). The NA also contains the Black Pond Migratory Bird Sanctuary, the Malpeque Bay Ramsar Wetland of International Significance, sixteen Important Bird Areas, and the Basin Head Marine Protected Area (Figure 2).

The 130 ha Black Pond Migratory Bird Sanctuary is an exceptional example of a barrier-beach pond ecosystem. A sand beach 1 km wide separates the 50 ha Black Pond from the sea. Black Pond itself is a shallow freshwater lake filled with dense beds of pondweed and bordered by spike rushes and scattered stands of cattail and bulrushes. The surrounding countryside is lowland with small White Spruce woodlots and agricultural fields, providing one of the most important waterfowl production and migration habitats in eastern PEI (Environment Canada, 2014).

The Malpeque Bay is a Ramsar wetland of international importance. This 24,400-ha site is comprised of salt marsh, shallow estuarine flats, saline ponds, sandy beaches and dunes, off-shore islands, and open water. Malpeque Bay is an important nursery area for finfish and shellfish within the NA, and has very high levels of waterfowl use during spring and fall migration. Several pairs of the nationally endangered Piping Plover nest

¹ The Northern Appalachian-Acadian Plan (NAAP) is a comprehensive analysis of the ecology and conservation status of the Northern Appalachian-Acadian Ecoregion. Using the best available ecological, biological, and geophysical data obtained from partners and expert local and regional knowledge, the NAAP summarizes the current state of conservation in the region and provides a framework for further conservation action (Anderson et al. 2006). Based on evaluation of the size, condition, and landscape context of representative ecosystem occurrences, the NAAP identified a high concentration of "ecoregionally critical occurrences" of ecosystems within the PEI bioregion.

at over-wash sites on the outer beach, and shorebirds are generally abundant. The bay contains nine off-shore islands, some of which are nesting sites for colonial nesting seabirds.

There are sixteen Important Bird Areas (IBA) within the NA (Table 5). Bedeque Bay and Cascumpec Bay often contains large numbers of staging Canada Geese (*Branta canadensis*), and occasionally Brant (*Branta bernicla*). During the late summer and early fall, a variety of shorebirds, including Black-bellied Plover (*Pluvialis squatarola*), Willet (*Tringa semipalmata*), and Red Knot make use of the mudflats surrounding the bay (Important Bird Areas Canada, 2015a). The barrier beaches of the Canavoy and Adjacent Beaches area provide nesting habitat for Piping Plover (Important Bird Areas Canada, 2015b). Additionally, Piping Plovers have regularly nested on the sand hills over the last decade. This site is also home to Osprey (*Pandion haliaetus*), a Great Blue Heron colony, and have supported a colony of breeding Common Terns in the past (Important Bird Areas Canada, 2015c).

There are 17 globally significant species (G1-G3G4) identified within the Bioregion, five of which are federally listed species at risk. An additional 30 federally (COSEWIC) listed species are also found in the Bioregion (Table 2). Thirteen critical species identified within the NAAP occur within the PEI Bioregion (Anderson et al. 2006), five of which were previously identified as COSEWIC listed species.

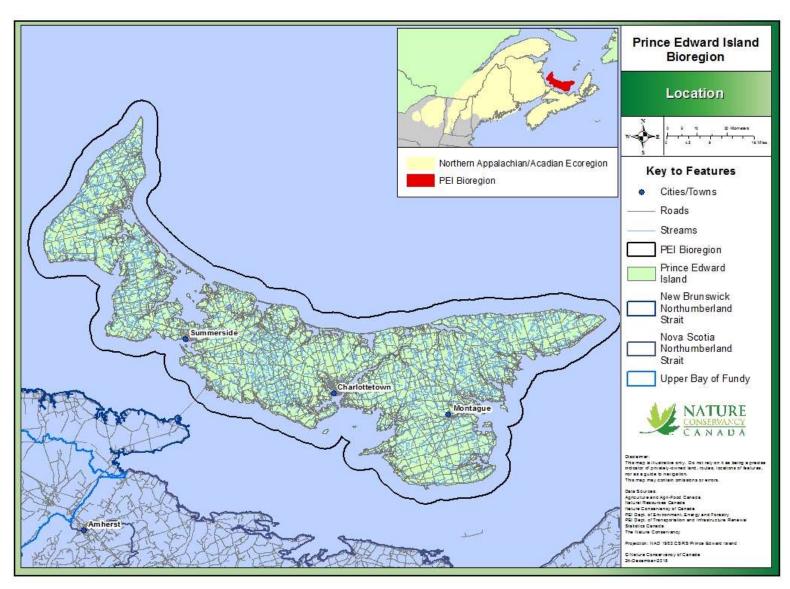


Figure 1. Location and boundary of the PEI Bioregion

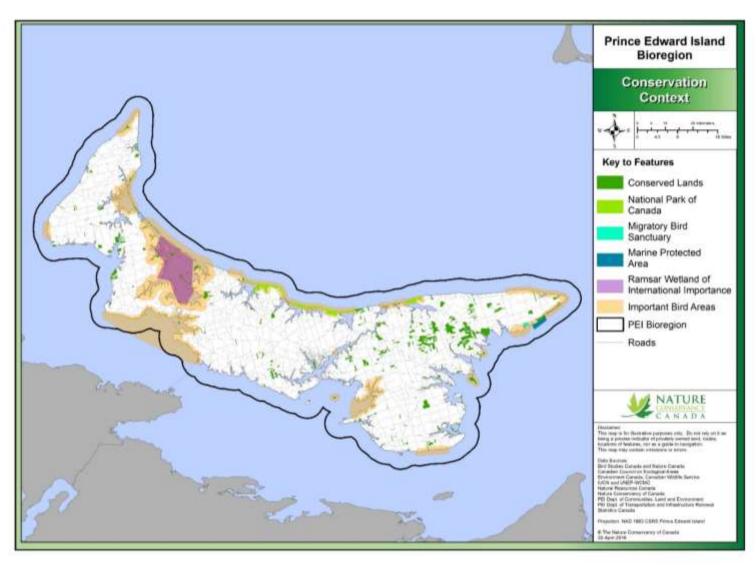


Figure 2. Designated and Conserved Lands in the PEI Bioregion.

B. Ecological Context

i. Ecological Systems & Vegetation Communities

Beaches and Sand Dunes

Beaches are accumulations of unconsolidated marine deposited sand, cobble, or stone on a shore, or in active transit along it, whereas dunes are transient mounds of loose, windblown sand, sometimes stabilized by vegetation (Anderson *et al.* 2006). Beaches and dunes are ecologically linked but form distinct habitats, the former being periodically inundated and the latter dry and distinguished by vegetation adapted to constant sand burial. **Beaches and dunes are a prominent feature along the bioregion's coa**stline; along open coasts (i.e. not including estuaries) 31% of the shore line is composed of sand dune (Davies, 2011).

Beaches and dunes are influenced by tides, salt, sediment structure, currents, wind, temperature, ice cover and scouring (Butler et al., 1996a). They are closely linked to surf zones and coastal dunes through storage, transport and exchange of sand. Therefore impacts to beaches have consequences for adjacent habitats (Defeo et al., 2009).

Although dune vegetation generally shows evidence of human disturbance, the unique environment offered by sand dunes and associated wetlands provide habitat for a comparatively large number of locally rare species (Catto et al., 2002). Characteristic beach and dune vegetation includes Marram Grass (*Ammophila breviligulata*) and American Sea Rocket (*Cakile edentula*). Beaches and dunes serve as feeding areas for shorebirds and support several species at risk including Common Tern and Piping Plover. They are also home to rare species such as Beach Pinweed and Broom Crowberry (Anderson et al., 2006).

Coastal Islands

Coastal Islands in the bioregion were identified in the 1972 International Biological Program² as important for conservation. They are characterized by highly diverse ecosystems, and a great number of functions are performed over a relatively small area (Bijlsma et al., 1995). Islands are especially important habitat for ground-nesting seabirds, as they serve as refuges from natural predators such as rats, gulls, foxes and other mammals, as well as human disturbance (Nordström and Korpimäki, 2004; Russell et al., 2006). However, these seabirds remain vulnerable to predators such as the Eastern Coyote (*Canis latrans*) that can reach islands by crossing on the ice during winter months (R.Curley, personal communication). Isolation may be a crucial factor affecting nest site selection for birds breeding on islands (Nordström and Korpimäki, 2004). The seclusion offered by forested coastal islands make them the only sites utilized for nesting by Great Blue Heron within the bioregion (Griffin, 2009). Approximately one-third of the 19 offshore islands within the NA support or have supported Double-crested Cormorant (*Phalacrocorax auritus*) colonies, and islands within Malpeque Bay are known to support Red Oak, Canada Yew (*Taxus canadensis*), and several rare plant species (R. Curley, personal communication).

Salt Marshes and Estuaries

² The International Biological Program was an effort to investigate large scale ecological studies between 1964-1974; specifically, "the effect on biological communities of changes in the natural environment, and on the conservation and growth of natural resources for human benefit" (National Academy of Sciences, 2017).

Salt marshes are among the most abundant and fertile coastal habitats on earth, and provide more ecosystem services to coastal populations than any other environment (Gedan et al., 2009). Saltmarshes are important landscape features for many bird species in the northeast during all stages of their annual life cycle (i.e.

migration, breeding, and wintering; Hanson and Shriver, 2006). Species that rely on salt marshes for breeding include Willet and Nelson's Sparrow (*Ammodramus nelsoni*, Shriver et al., 2004; Warren et al., 2002). Along with freshwater wetlands, salt marshes are considered one of the most vulnerable and disturbed habitat types in North America. Many salt marshes have been modified by drainage ditching in the eastern United States, and agricultural diking in the Maritime provinces (Greenlaw and Woolfenden, 2007). Within PEI, many birds nest in and around the marshes, and rely to varying degrees on insects produced in the marsh for food (Giberson and Burgess, 1995, as cited in Giberson et al., 2001).

The PEI land use inventory layer indicates there is over 7,591 ha of salt and brackish marsh in the bioregion, all of which are identified as critical in the NAAP (Anderson et al. 2006). The largest individual salt marsh occurs in the upper reaches of the Percival River, and the Hillsborough River (along with its tributaries) has the greatest extent of saltmarsh in the bioregion (Curley, 2007).

Freshwater Wetlands

In PEI, freshwater wetlands refer to marshes, swamps, bogs, fens, flats and shallow open water that is saturated long enough to promote wetland or aquatic biological processes indicated by poorly drained soil, water-tolerant vegetation, and biological activities adapted to a wet environment (A Wetland Conservation Policy for PEI, 2007).

Wetland classes and subclasses for PEI are defined by the 2010 provincial land use layer, and are as follows: Bog – where the accumulation of sphagnum moss determines the nature of the plant community (a class that includes fens); Deep Marsh

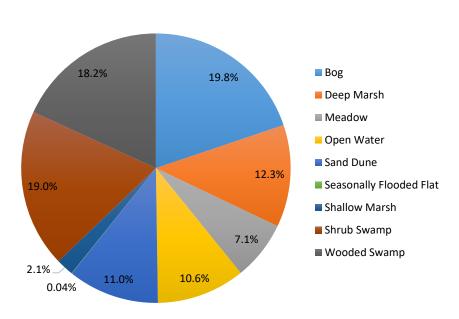


Figure 3. Composition of freshwater wetlands within the PEI Bioregion according to the provincial wetland classification.

– which has an average water depth between 6 inches and 3 feet during the growing season; Meadow, which is dominated by emergent vegetation with up to 6 inches of surface water during late autumn, winter and early spring (commonly associated with agricultural land where periodic grazing or mowing keeps shrubs from establishing); Open Water – which has an average water depth of 1 to 3 metres and is associated with many other wetland classes; Seasonally Flooded Flat – which are river floodplains where flooding to a depth of 12 or more inches occurs annually during late fall, winter or spring; Shallow Marsh – which are dominated by emergent vegetation with an average water depth less than 6 inches during the growing season; Shrub Swamp – which is dominated by shrubs and where the soil surface is seasonally or permanently flooded with

as much as 12 inches of water; Wooded Swamp – which is dominated by trees growing in a muck soil that can be seasonally flooded with up to 1 foot of water.

According to the 2010 PEI land use layer, over 31,889 ha of freshwater wetlands occur within the bioregion, of which 2,870 have been identified as ecoregionally critical in the NAAP (size >= 20 ha). The inventory identifies 9 freshwater wetland types, the majority of which are forest- and shrub-dominated wetlands and bogs. Two coastal bogs within the bioregion have Black Crowberry (*Empetrum nigrum*), a provincially uncommon bog plant (Griffin, 2009), as well as several other species that are not common in mineral soil ecosystems, such as pitcher plants (*Sarracenia* spp.), bladderworts (*Utricularia* spp.) and sundews (*Drosera* spp.; Daigle and Gautreau-Daigle, 2001).

Rivers, Streams, and Riparian Ecosystems

Rivers and streams are naturally formed watercourses that drain into a larger body of water (a lake, or ocean). There are no true rivers on PEI; most well-known 'rivers' on PEI (Hillsborough, Montague, Mill Rivers) are actually estuaries, as freshwater and saltwater are mixed for a large portion of the water channel (Water on PEI, 1996). PEI streams are small and shallow; they vary in width from 5cm to 10m, and depth from 5cm to 2m. Anything wider or deeper is considered an estuary (Fish & Wildlife, 2015). Groundwater flows upward through fractured bedrock and begins to flow downstream through a gradually defined stream bed. The portion of a stream's flow that comes from groundwater is called its 'base flow'. In PEI, 60-70% of water in streams comes from groundwater; the remainder comes from rain or runoff (Fish & Wildlife, 2015). There are no natural lakes and few natural ponds in the bioregion; most are barrier beach ponds along the north shore (Fish & Wildlife, 2015).

Riparian systems refer to aquatic ecosystems, their adjacent uplands and the interface between the two. As such, these systems are considered ecotones, where boundaries exhibit a gradient between permanent water and seasonally flooded zones, and further extend into streamside terrestrial communities (Gregory et al. 1991). They encompass sharp gradients of environmental factors, ecological processes, and plant communities. The minimum required non-development riparian buffer on PEI is 15 m, although research has suggested that a minimum 30 m buffer is required for successful trapping of both sediment and contaminants within the province (Dunn et al., 2011; Environment Canada, 2013a). A few communities within the bioregion are implementing a 60 m riparian buffer (e.g. Morell River, North Lake, and Priest Pond watersheds).

Vegetation associated with streams is significant to the maintenance of healthy water, fish, wildlife, and forest resources (Knopf et al., 1988). Riparian vegetation provides a buffer of isolation from upland activities on the terrestrial nearshore and aquatic ecosystems (Lee et al., 2004). In addition to protecting streams from contamination, buffers contribute to stream bank stabilization, increase biodiversity of aquatic ecosystems by creating favourable habitat conditions, and increase the aesthetic value of the land (Eastern Canada Soil and Water Conservation Centre, 1995). Natural riparian corridors are the most diverse, dynamic, and complex terrestrial habitats due to the diversity of landforms, communities and environments that comprise them (Naiman et al., 1993).

Acadian Forest Mosaic

The forests in the PEI bioregion are a part of the Acadian forest mosaic. This forest type, one of the ten forest types occurring in Canada, is found almost exclusively within the Maritimes, the remainder of which is found in limited parts of northern New England and southern Quebec. The forests of PEI underwent a significant transformation during European Settlement; much of the original forest has been lost due to conversion to arable lands. By the early 1900's, approximately 30% of the bioregion was covered in forest. By 1990, this

number had grown to 48% following wide scale abandonment of agricultural land throughout the 20th century, and the 2010 state of the forest reports that 43.9% of the province's landscape is currently forested. This value includes natural forest, plantations, and regenerating harvests (State of the forest report, 2010).

Sobey (2004) indicated 5 general forest types present on PEI: upland hardwood forest, Black Spruce forest, wet rich woodlands, White Spruce woodlands and disturbed forest. The deciduous upland forests of PEI are predominant across central PEI and scattered across the eastern and southeastern ends of the island, and largely consist of Sugar Maple, American Beech, and Yellow Birch. Black Spruce forests and wet rich woodlands are more associated with western PEI and isolated areas of eastern PEI. Rich wet forests are geographically segregated from the upland stands and consist of Red Maple (*Acer rubrum*), Black Spruce (*Picea mariana*), and Eastern White Cedar (*Thuja occidentalis*; Sobey and Glen, 2004). The former three forest types are thought to be examples of historical forest stands, which exist today in a similar geographic distribution, whereas White Spruce woods and disturbed forest have developed as a direct result of settlement (Sobey, 2004). Additionally, dwarf conifers are prominent on upland flats and valley bottoms in the west and along the windswept north shore of the bioregion, and Black Spruce and Eastern Larch (*Larix laricina*) are common on wetlands. Eastern White Pine (*Pinus strobus*) can also be found on coarse-textured soils (Ecological Stratification Working Group, 1996).

The intense settlement period and the small size of the bioregion has resulted in the extirpation of seven native mammal species: Woodland Caribou (*Rangifer tarandus*), Grey Wolf (*Canis lupus*), Atlantic Walrus (*Odobenus rosmarus rosmarus*), Northern River Otter (*Lontra canadensis*), Pine Marten (*Martes americana*), Canada Lynx (*Lynx canadensis*), and Canada Black Bear (*Ursus americanus*) (Sobey, 2007). Striped skunk (*Mephitis mephitis*) and North American Raccoon (*Procyon lotor*) were introduced to supplement the fur trade (Fish and Wildlife, 2012). **PEI's forests support provincial**ly rare bird species like Pileated Woodpecker (*Dryocopus pileatus*), Black-backed Woodpecker (*Picoides arcticus*), American Three-toed Woodpecker (*Picoides dorsalis*), and White-breasted Nuthatch (Sitta carolinensis), as well as small mammals like American Water Shrew (*Sorex palustris*) and American Pygmy Shrew (*Sorex hoyl*). Intensive inventories of lichen species have recently been completed in some of PEI's mature forests stands, demonstrating a wide diversity and several rare species including *Leconora strobilina and Pseudocyphellaria perpetua*. To date, the most lichendiverse site on PEI is located on NCC property near Percival River (McMullin, 2014; McMullin et al., 2012).

Through analysis of the historic size ranges of documented natural disturbance events, along with the area requirements of forest-interior breeding species in the region, Anderson et al. (2006) determined that a 10,000-ha minimum-sized block of Acadian forest would be able to withstand any natural disturbance (hurricanes, fire, ice storms) while maintaining all of its natural ecological processes. No block of this size exists on PEI today. The two largest remaining forest corridors in the Bioregion occur in the area surrounding the Percival River in Prince County, and the Eastern Kings forest in Kings County (Griffin, 2009).

Agro-ecosystems

Grasslands are open, herbaceous habitats dominated by assemblages of grasses and forbs. Prior to European settlement, natural grasslands were likely uncommon within the Bioregion, and historically have been associated with various types of agricultural lands (e.g., hayfields, pasture lands), which may serve as surrogate habitat for grassland-associated wildlife. These cultivated and managed areas, particularly those near water, are used by a broad variety of species and can be areas of relatively high biological diversity (Environment Canada 2013). There are a number of federally listed and BCR 14 priority bird species within the Bioregion that are strongly associated with this habitat type and require grasslands for nesting and foraging habitat, especially agricultural hayfields in eastern North America (Environment Canada 2013). Several of these grassland-associated species are exhibiting major continent-wide declines, including the Bobolink (*Dolichonyx oryzivorus*), Savannah Sparrow (*Passerculus sandwichensis*), Short-eared Owl (*Asio flammeus*),

Rusty Blackbird (*Euphagus carolinus*), Barn Swallow (*Hirundo rustica*), and Common Nighthawk (*Chordeiles minor*) (Environment Canada 2013; NABCI 2012).

According to the provincial land use layer, approximately 42% of the bioregion is either in current agricultural use (38%) or is abandoned agricultural land (4%). Agriculture is the primary industry in PEI, with fields occasionally being abandoned as farmers retire or move. Species such as Bobolink, Savannah Sparrow, and Nelson's sparrow commonly nest in hayfields in the region (Nocera et al., 2005). Agricultural practices were initially responsible for range expansions of most grassland bird species in eastern North America. These were largely forested landscapes pre-settlement, so large increases in habitat for grassland birds followed the clearing of land by settlers (Bollinger et al., 1990; Downes et al., 2011; Herkert, 1991). This is also the case for PEI, which has been described as being entirely forested prior to settlement, with the exception of salt marshes and freshwater wetlands (Hatvany, 2001). Today, the primary cause of declines in grassland birds is related to declines in habitat supply and quality, primarily due to the intensification of agriculture (McCracken, 2005) and farmland abandonment (e.g. Agriculture and Forestry, 2013).

ii. Dominant Ecological Processes

Climate

PEI is generally milder than the mainland due to the Gulf of St. Lawrence (Govt of PEI, 2014), although significant variation in temperature and precipitation occurs due to the proximity to the coast. The mean annual temperature is approximately 5.5°C, with a mean summer temperature of 15°C and a mean winter temperature of -3.5°C. The mean annual precipitation ranges between 900-1150 mm (Ecological Stratification Working Group, 1996). The average temperature in winter (January) is -7 degrees Celsius; the warmest months are July and August, with a July average of 19 degrees Celsius.

Geology

PEI is part of the Maritime Plain, which is a broad, triangular shaped basin that is submerged almost entirely by the Gulf of St Lawrence. Underneath the plain are late Paleozoic sedimentary rocks, which emerged to form portions of New Brunswick, Nova Scotia, all of PEI, and the Magdalen Islands. The beds of PEI are separated from the Maritime Plain portions of New Brunswick and Nova Scotia by the Northumberland Strait (MacDougall et al., 1981).

Approximately 75% of the province is less than 45m above sea level. The island's relief is gently undulating, except in two areas in the central and southeastern portions of the province. The bedrock of PEI is largely derived from stream sediments laid down from the erosion of the Appalachian Mountains to the west. The major lithology in PEI is silt and claystone (30%), sandstone (with varying coarse/fine granularities – 60%) and mud-pellet conglomerates (10%). Till deposits are relatively thin and bedrock is often within 1m of the soil surface (MacDougall et al., 1981).

Soils in Canada are organized based on their own unique taxonomic system: there are 10 orders, 34 great groups, 232 sub-groups, and a large number of families and soil series (several thousand) (The Canadian system of Soil Classification, 1998). In PEI there are 47 dominant series across the province (MacDougall et al., 1988). Soils in Canada are also classified based on their suitability and capability in agriculture. There are 8 classes (where 1 is ideal, 7 is poor, and 0 is organic and not placed in capability classes).

Soil formation is a complex process that is dependent on a number of physical environmental factors. Without proper management, soil use in agriculture and other industries can significantly degrade the quality of the soil, which can further impact the surrounding natural landscapes. Soil erosion via wind or water is a natural process, but it is greatly accelerated in landscapes that are used for transportation, agriculture, and forestry. The removal of vegetative cover and increased exposure to winds often impacts the top (and most productive) layer of soil (Agri Canada, 2014).

Hydrology

Freshwater wetlands, rivers, streams, and riparian zones are some of the most diverse and complex habitats on earth (Naiman et al., 1993). Within the bioregion, very few natural lakes and ponds exist; most are anthropogenic in origin. The few natural ponds that do exist are generally barachois ponds located along the northern shores of the bioregion (Fish & Wildlife, 2015). However, streams are scattered throughout, and these generally originate from groundwater coming up through fractured bedrock (Fish & Wildlife, 2015).

Agricultural run-off often results in severe sedimentation and nutrient loading in nearby rivers and lakes, which severely impacts the aquatic life within a watershed. This is especially the case in PEI, which regularly experiences fish kills and anoxic events from nutrient build up and excess sedimentation in the aquatic environment.

Natural Disturbance Dynamics

Coastal regions in PEI are highly dynamic. Exposure to the sea (waves), sediment type, and climate are all factors that influence coastal erosion, defined as the landward movement of the shoreline. Coastlines facing the Gulf of St Lawrence are especially volatile, with wave action up to 2m tall, whereas sheltered coasts, estuaries, and lagoons undergo much lower levels of erosion (Ollerhead and Davidson-Arnott, 2011). The average calculated erosion rate (based on measurements taken between 1968-2010) is 28cm/year (Webster, 2012).

The silt and sand found on most beaches and shorelines on PEI were formed from the suspension and deposition of sediment after the recession of the glaciers over 10,000 years ago. Mainland beaches (i.e. not barrier beach systems) with a large amount of deposition generally have an associated dune system built up by wind and waves and held in place by pioneer plant species. Mainland beaches are typically the result of longshore transport of sand (Ollerhead and Davidson-Arnott, 2011).

In barrier beach systems, where there is a lagoon or an estuary separating the system from the mainland, significant storm events cause over-wash of sediments from the foredune into the estuary, which overtime causes the migration of the barrier beach inland towards the mainland (Ollerhead and Davidson-Arnott, 2011). Unless storm impact is significant or the beaches have been anthropogenically influenced, import and export of sediments caused by natural disturbances are generally equivalent and land lost by erosion will accrete in a different area (Ollerhead and Davidson-Arnott, 2011).

Pre-agricultural disturbances along the north shores of PEI included tree uprooting (wind events) and forest fires. Winds were powerful enough to uproot both young and aged trees; uprooting structures up to 2m in size have been discovered on some sites. Group uprooting evidence was also noted, creating gap disturbances up to 10-14m in diameter (Ponomarenko and Ponomarenko, 2002). Today, very little self-sustaining, old growth forest remains on the Island, and this type of natural disturbance has become rare as a result (Ponomarenko and Ponomarenko, 2002). Pre-agricultural forest fires also occurred along PEI's north shore; aging estimates of charcoal found in soil place fire events mostly between the period of 900-1200 AD.

In the area studied (PEI National Park), the last fire prior to land clearance occurred approximately 900-1000 years ago (Ponomarenko and Ponomarenko, 2002).

iii. Significant Species

The following is a discussion of particular species that have been identified as significant in the Bioregion. Species are considered "significant" if the habitats within the Bioregion are particularly relevant to them, or if the species are considered of conservation concern.

Appendix C and D each provide a list of significant species within the PEI Bioregion with their associated coarse and fine filter habitats, respectively. These lists include all federally or provincially listed species at risk, provincially- (S1 or S2) or globally- (G1-G3G4) rare or uncommon element occurrence records from the Atlantic Canada Conservation Data Centre (ACCDC), as well as all Bird Conservation Region (BCR) 14 and Marine Biogeographic Unit (MBU) 11 priority bird species that occur with regularity in the Bioregion (Environment Canada, 2013). For a complete glossary of definitions for Biodiversity and Conservation Ranks, see Appendix B.

Table 2 - Nationally assessed and listed species at risk in the PEI Bioregion, listed alphabetically by common name within their respective taxonomic group

Common Name	Scientific Name	COSEWIC ¹	SARA ²	
Invertebrates				
Gypsy Cuckoo Bumble Bee	Bombus bohemicus	Endangered		
Monarch	Danaus plexippus	Special Concern	Special Concern	
Yellow-banded Bumble Bee	Bombus terricola	Special Concern		
Fishes	-	1		
American Eel	Anguilla rostrata	Threatened		
Atlantic Salmon	Salmo salar (Gaspe-Southern Gulf of St. Lawrence population)	Special Concern		
Smooth Skate	Malacoraja senta (Laurentian-Scotian population)	Special Concern		
Striped Bass Morone saxatilis (Southern Gulf of S Lawrence population)		Special Concern		
Thorny Skate	Amblyraja radiata	Special Concern		
Birds	•			
Bank Swallow	Riparia riparia	Threatened		
Barn Swallow	Hirundo rustica	Threatened		
Barrow's Goldeneye	arrow's Goldeneye <i>Bucephala islandica</i> (Eastern population)		Special Concern	
Bobolink	Dolichonyx oryzivorus	Threatened		
Canada Warbler Cardellina canadensis		Threatened	Threatened	
Common Nighthawk	Common Nighthawk Chordeiles minor		Threatened	
Eastern Wood-pewee	stern Wood-pewee Contopus virens			
Eskimo Curlew	Numenius borealis	Endangered	Endangered	
Olive-sided Flycatcher	Contopus cooperi	Threatened	Threatened	
Piping Plover melodus subspecies	ver melodus Charadrius melodus melodus		Endangered	

Red Knot rufa subspecies	Calidris canutus rufa	Endangered	Endangered	
Red-necked Phalarope	Phalaropus lobatus	Special Concern		
Rusty Blackbird	Euphagus carolinus	Special Concern	Special Concern	
Short-eared Owl	Asio flammeus	Special Concern	Special Concern	
Mammals	·			
Atlantic Walrus	Odobenus rosmarus rosmarus	Special Concern	Extirpated	
Little Brown Myotis	Myotis lucifugus	Endangered	Endangered	
Northern Myotis	Myotis septentrionalis	Endangered	Endangered	
Vascular Plants	·			
Beach Pinweed	Lechea maritima	Special Concern	Special Concern	
Gulf of St. Lawrence Aster	Symphyotrichum laurentianum	Threatened Threatened		

¹Committee on the Status of Endangered Wildlife in Canada is a committee of independent experts that assess the national status of wild Canadian species suspected of being at risk of extinction or extirpation in Canada.

²Species at Risk Act (2002) is the Federal legislation designed to prevent wildlife species, subspecies, and distinct populations from becoming extirpated or extinct, to provide for the recovery of extirpated, endangered, or threatened species, and to ensure that species of special concern do not become endangered or threatened

Environment Canada Priority Bird Species:

In 2013, Environment Canada completed a strategy for Bird Conservation Region 14: PEI (BCR 14 PEI) and Marine Biogeographic Unit 12 (MBU 12 PEI). This strategy, one of a suite for each bird conservation region across Canada, is designed to serve as a framework for implementing bird conservation of each region's priority bird species (Environment Canada, 2013). The strategy identifies "priority species" that regularly occur in the region that are vulnerable due to their population size, distribution, population trend, abundance, or susceptibility to threats. Some widely distributed and abundant "stewardship" species are also included because they typify the national or regional avifauna, and/or because they have a large proportion of their range and/or continental population in the region. Species of management concern are included when they are at or exceed their desired population, require ongoing management due to their socio-economic importance as game species, or because of their impacts on other species or habitats.

In BCR 14 PEI, there are 52 priority species. These include 31 species of land birds, nine species of shorebirds, six species of waterbirds, and six species of waterfowl. Fourteen percent of the priority species are formally protected under the federal Species at Risk Act, most of which are land birds. In MBU 12 PEI, there are 30 priority species. These include 13 species of shorebirds, seven species of waterbirds, and 10 species of waterfowl. There are four MBU 12 priority species that are protected under the federal Species at Risk Act. As in BCR 14 PEI, the most frequent reason for considering shorebirds and waterbirds as priority species in MBU 12 PEI is because of national or continental concerns, whereas waterfowl were primarily added to the list of priority species when designated as a "key waterfowl species" in the PEI-EHJV Implementation Plan (2008), or ranked "high" or "highest" in terms of conservation/monitoring needs under the North American Waterfowl Management Plan (NAWMP) (Table 3; Environment Canada, 2013).

Table 3 - Priority bird species in Bird Conservation Region 14 in PEI and Marine Biogeographic Unit 12.

Common Name	Scientific Name	Bird Group	COSEWIC1	SARA ²	BCR 14 – PE	MBU 12 -PE	Population Objective
American Redstart	Setophaga ruticilla	Landbird			Υ		Maintain current
Bald Eagle	Haliaeetus leucocephalus	Landbird			Υ		Maintain current
Bank Swallow	Riparia riparia	Landbird			Υ		Increase 50%
Barn Swallow	Hirundo rustica	Landbird	TH		Υ		Increase 50%
Bay-breasted Warbler	Dendroica castanea	Landbird			Υ		Increase 100%
Belted Kingfisher	Megaceryle alcyon	Landbird			Υ		Assess/ Maintain
Black-billed Cuckoo	Coccyzus erythropthalmus	Landbird			Υ		Assess/ Maintain
Black-throated Green Warbler	Dendroica virens	Landbird			Υ		Maintain current
Bobolink	Dolichonyx oryzivorus	Landbird	TH		Υ		Increase 50%
Boreal Chickadee	Poecile hudsonica	Landbird			Υ		Assess/ Maintain
Brown-headed Cowbird	Molothrus ater	Landbird			Υ		Increase 100%
Canada Warbler	Wilsonia canadensis	Landbird	TH	TH	Υ		Increase 50%Footnote †
Cape May Warbler	Dendroica tigrina	Landbird			Υ		Increase 50%
Common Nighthawk	Chordeiles minor	Landbird	TH	TH	Υ		Increase 100%Footnote†
Eastern Kingbird	Tyrannus tyrannus	Landbird			Υ		Increase 100%
Eastern Wood-Pewee	Contopus virens	Landbird			Υ		Increase 50%
Evening Grosbeak	Coccothraustes vespertinus	Landbird			Υ		Increase 100%
Gray Jay	Perisoreus canadensis	Landbird			Υ		Assess/ Maintain
Mourning Warbler	Oporornis philadelphia	Landbird			Υ		Maintain current
Nelson's Sparrow	Ammodramus nelsoni	Landbird			Υ		Maintain current
Northern Parula	Parula americana	Landbird			Υ		Maintain current
Olive-sided Flycatcher	Contopus cooperi	Landbird	TH	TH	Υ		Increase 50%Footnote †
Osprey	Pandion haliaetus	Landbird			Υ		Maintain current
Rose-breasted Grosbeak	Pheucticus Iudovicianus	Landbird			Υ		Maintain current

Common Name	Scientific Name	Bird Group	COSEWIC1	SARA ²	BCR 14 – PE	MBU 12 -PE	Population Objective
Ruffed Grouse	Bonasa umbellus	Landbird			Υ		Increase 50%
Rusty Blackbird	Euphagus carolinus	Landbird	SC	SC	Υ		Increase 100%Footnote†
Sharp-shinned Hawk	Accipiter striatus	Landbird			Υ		Maintain current
Short-eared Owl	Asio flammeus	Landbird	SC	SC	Υ		Assess/ MaintainFootnote †
Tennessee Warbler	Vermivora peregrina	Landbird			Υ		Increase 100%
Veery	Catharus fuscescens	Landbird			Υ		Assess/ Maintain
White-throated Sparrow	Zonotrichia albicollis	Landbird			Υ		Maintain current
American Golden-Plover	Pluvialis dominica	Shorebird			Υ		Assess/ Maintain
American Woodcock	Scolopax minor	Shorebird			Υ		Increase 50%
Black-bellied Plover	Pluvialis squatarola	Shorebird				Υ	Assess/ Maintain
Dunlin	Calidris alpina	Shorebird				Υ	Assess/ Maintain
Hudsonian Godwit	Limosa haemastica	Shorebird				Υ	Assess/ Maintain
Killdeer	Charadrius vociferus	Shorebird			Υ		Assess/ Maintain
Least Sandpiper	Calidris minutilla	Shorebird				Υ	Assess/ Maintain
Lesser Yellowlegs	Tringa flavipes	Shorebird			Υ	Υ	Assess/ Maintain
Piping Plover (melodus)	Charadrius melodus melodus	Shorebird	EN	EN	Υ	Υ	Recovery objective
Purple Sandpiper	Calidris maritima	Shorebird				Υ	Assess/ Maintain
Red Knot (rufa)	Calidris canutus rufa	Shorebird	EN	EN		Υ	Assess/ MaintainFootnote †
Sanderling	Calidris alba	Shorebird				Υ	Assess/ Maintain
Semipalmated Sandpiper	Calidris pusilla	Shorebird				Υ	Assess/ Maintain
Solitary Sandpiper	Tringa solitaria	Shorebird			Υ	Υ	Assess/ Maintain
Spotted Sandpiper	Actitis macularius	Shorebird			Υ		Assess/ Maintain
Whimbrel	Numenius phaeopus hudsonicus	Shorebird			Υ	Υ	Assess/ Maintain
Willet	Tringa semipalmata	Shorebird				Υ	Assess/ Maintain
Wilson's Snipe	Gallinago delicata	Shorebird			Υ		Assess/ Maintain
American Bittern	Botaurus lentiginosus	Waterbird			Υ		Assess/ Maintain

Common Name	Scientific Name	Bird Group	COSEWIC	SARA ²	BCR 14 – PE	MBU 12 -PE	Population Objective
Bonaparte's Gull	Chroicocephalus philadelphia	Waterbird				Υ	Assess/ Maintain
Common Loon	Gavia immer	Waterbird			Υ	Υ	Assess/ Maintain
Common Tern	Sterna hirundo	Waterbird			Υ	Υ	Assess/ Maintain
Great Cormorant	Phalacrocorax carbo	Waterbird				Υ	Assess/ Maintain
Horned Grebe	Podiceps auritus	Waterbird	EN,SC	EN		Υ	Assess/ Maintain
Pied-billed Grebe	Podilymbus podiceps	Waterbird			Υ	Υ	Assess/ Maintain
Red-throated Loon	Gavia stellata	Waterbird				Υ	Assess/ Maintain
Sora	Porzana carolina	Waterbird			Υ		Assess/ Maintain
Virginia Rail	Rallus limicola	Waterbird			Υ		Assess/ Maintain
American Black Duck	Anas rubripes	Waterfowl			Υ	Υ	Increase 50% (BCR 14) (MBU 12)
Barrow's Goldeneye (Eastern)	Bucephala islandica	Waterfowl	SC	SC	Υ	Υ	Assess/ Maintain
Black Scoter	Melanitta nigra	Waterfowl				Υ	Assess/ Maintain
Canada Goose (North Atlantic)	Branta canadensis	Waterfowl			Υ	Υ	Maintain current
Common Goldeneye	Bucephala clangula	Waterfowl				Υ	Assess/ Maintain
Green-winged Teal	Anas crecca	Waterfowl			Υ	Υ	Increase 50%
Long-tailed Duck	Clangula hyemalis	Waterfowl				Υ	Assess/ Maintain
Mallard	Anas platyrhynchos	Waterfowl			Y	Υ	Decrease (BCR 14) Maintain current (MBU 12)
Ring-necked Duck	Aythya collaris	Waterfowl			Υ		Increase 50%
Surf Scoter	Melanitta perspicillata	Waterfowl				Υ	Assess/ Maintain
White-winged Scoter	Melanitta fusca	Waterfowl				Υ	Assess/ Maintain

¹Species assessed by the Committee on the Status of Endangered Wildlife in Canada; EN = Endangered, TH = Threatened, SC = Special Concern. ²Species listed on Schedule 1 under the Species at Risk Act; EN = Endangered, TH = Threatened, SC = Special Concern.

iv. Protected Areas and Conservation Lands

According to the International Union for Conservation of Nature (IUCN), a protected area is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values" (Dudley 2008). The PEI Bioregion is represented by an existing network of protected areas and conservation lands that are managed primarily for biodiversity (Table 4).

The Black Pond Migratory Bird Sanctuary is an exceptional example of a barrier-beach pond ecosystem. A sand beach 1 km wide separates the 50 ha pond from the sea. Black Pond itself is a shallow freshwater lake filled with dense beds of pondweed and bordered by spike rushes and scattered stands of cattail and bulrushes. The surrounding countryside is lowland with small white spruce woodlots and agricultural fields, providing one of the most important waterfowl production and migration habitats in eastern PEI (Environment Canada, 2014). The Malpeque Bay is a Ramsar wetland of international importance comprised of salt marsh, shallow estuarine water and flats, saline ponds, sandy beaches and dunes, off-shore islands, and open water. Malpeque Bay is an important nursery area for finfish and shellfish within the Bioregion, and has very high levels of waterfowl use during spring and fall migration. The bay contains nine off-shore islands, some of which are nesting sites for colonial nesting seabirds. The Basin Head Marine Protected Area (MPA) is a small estuarine lagoon inhabited by a rich diversity of marine plants, invertebrates, fish, mammals, and birds, surrounded by an extensive sand dune system to the south. This MPA was designated with the purpose of conserving a unique species of Irish Moss (*Chondrus crispus*) that exists nowhere else in the world (Fisheries and Oceans Canada, 2009).

Table 4 – List of protected areas in the PEI Forest and Coast Bioregion.

Land ownership	Conservation status	Area (ha)	Proportion of the NA (%)
Government of Canada	National Park of Canada	3,321	0.58
Government of Canada	Migratory Bird Sanctuary	119	0.02
Government of PEI	Eastern Habitat Joint Venture Agreement*	689	0.12
Government of PEI	Provincial Natural Areas	6,294	1.11
Government of PEI	Provincial Parks	862	0.15
Private and/or Government of PEI	Wildlife Management Areas	7,760	1.36
Private	Privately Owned Natural Areas	940	0.17
Island Nature Trust	Privately Owned Natural Areas	1,542	0.27
Nature Conservancy of Canada (current as of February 2018)	Privately Owned Natural Areas	571	0.08
PEI Wildlife Federation	Privately Owned Natural Areas	159	0.03
Ducks Unlimited Canada	Privately Owned Natural Areas	253	0.04
TOTAL:		22,384	3.93

^{*}Note: some areas owned by land trusts have EHJV agreements on them, so this number may not be entirely accurate.

Important Bird Areas (IBAs) are discrete sites that support specific groups of birds, such as threatened birds, large groups of birds, and birds restricted by range or by habitat (Important Bird Areas Canada, No Date).

There are 16 IBAs (Table 5) in the bioregion, which contain species of national, continental, and global significance. These areas support threatened or congregatory species, as well as concentrations of waterfowl, wading bird, colonial waterbirds and seabirds. They have no legal protection in PEI.

Table 5 - Important Bird Areas located within the PEI Bioregion.

IBA	Site	IBA Criteria	Size (ha)
PE011	Bedeque Bay	Continentally Significant: Congregatory Species	36,118
PE007	Boughton Island	Continentally Significant: Congregatory Species	1,537
PE015	Canavoy & Adjacent Beaches	Nationally Significant: Threatened Species	3,669
PE012	Cape Tryon	Globally Significant: Congregatory Species	2,113
PE003	Cascumpec Bay/Alberton Harbour	Globally Significant: Congregatory Species	8,910
PE002	Chepstow	Globally Significant: Congregatory Species	2,799
PE004	Durell Point	Globally Significant: Congregatory Species	653
PE016	East Point	Globally Significant: Congregatory Species	9,103
PE018	Glenfinnan Island	Nationally Significant: Congregatory Species, Wading Bird Concentrations	299
PE008	Governors Island	Continentally Significant: Congregatory Species	693
PE005	High Bank	Globally Significant: Congregatory Species	3,339
PE001	Malpeque Bay	Globally Significant: Congregatory Species, Waterfowl Concentrations, Nationally Significant: Threatened Species, Colonial Waterbird/Seabird Concentrations	55,857
PE010	Norway	Globally Significant: Congregatory Species	3,345
PE014	Orwell Bay	Continentally Significant: Congregatory Species	9,191
PE013	PEI National Park	Globally Significant: Congregatory Species, Continentally Significant: Congregatory Species, Nationally Significant: Threatened Species	11,120
PE009	West Cape	Globally Significant: Congregatory Species	1,748

PEI National Park (PEINP) represents the Maritime Plain Natural Region within the National Parks System. The park provides excellent representation of the geology and coastal features of the region, and protects the biodiversity, ecological processes, and physical features that are characteristic of the Bioregion. Landscapes protected within PEINP include coastal beaches and dunes, sandstone headlands, saltmarshes, freshwater and brackish ponds, small streams, and upland till habitats that support a range of vegetation types in various stages of succession. The ecosystems of the park provide a key protected area for a variety of plant and animal species. These include six species at risk, notably the piping plover and the Gulf of St. Lawrence aster, both of which are listed under the federal Species at Risk Act.

There are seventeen Wildlife Management Areas (WMA), which are provincially-significant environmental areas. These areas, managed by PEI's Department of Communities, Lands and Environment (Fish & Wildlife sector), are maintained for the protection, management, and conservation of wildlife and its habitat (PEI Communities, Lands, and Environment, 2013). Approximately 7,260 ha of land falls within public WMAs, some of which are also co-owned with private individuals.

The PEI Natural Areas Protection Act is a designation that can be applied to either private land (with a land trust as a co-signer with the landowner, a conservation covenant) or public land. A designated natural protected area is protected and managed for its ecological features under a prescribed management plan,

although traditional, low impact uses are typically allowed. There are 2945.4 ha of land that are protected through a private natural area designation. This number includes INT with 1580.5 ha of land, NCC with 661.9 ha of land, private individuals with 596.8 ha of land, and the PEI Wildlife Federation with 106.2 ha of land. A total of 6078.5 ha of land is protected through a public natural area designation.

Within the Bioregion, there are 23 provincial parks managed by the PEI Department of Economic Development & Tourism. While biodiversity conservation is not the primary objective of provincial parks and protected beaches, these areas do offer legal protection and contribute to overall conservation within the Bioregion.

The Nature Conservancy of Canada (NCC) is a national non-profit charity that has secured approximately 474 ha of coastal and inland habitats in the Bioregion. The Island Nature Trust (INT) is a provincial non-profit charity that has secured 1,542 ha of inland and coastal habitat across the Bioregion. Both the NCC and INT work with private landowners to conserve ecologically significant habitat within PEI through securement and conservation covenants. INT's staff and interested volunteers also monitor and count nesting Piping Plover in collaboration with the Canadian Wildlife Service, and work with farmers to promote practices that protect grassland birds and aerial insectivores. The PEI Wildlife Federation, a small organization dedicated to conserving wildlife and wildlife habitat, has conserved 159 ha in the Bioregion. Partners in the PEI Eastern Habitat Joint Venture (PEI EHJV) have secured and manage approximately 689 ha of prime coastal and inland wetlands in the Bioregion separately through the North American Waterfowl Management Plan (NAWMP 1986), providing important nesting, staging, and wintering habitat for resident and migratory birds, and other wetland-dependent species.

C. Socioeconomics

Social Considerations

PEI was first inhabited by indigenous people, as evident from archaeological records of Mi'kmaq populations dating back 10,000 years (Keenlyside, 2002). Jacques Cartier claimed PEI for the King of France in 1534, and seasonal fishing camps were utilized by French fishermen on PEI beginning in 1718-1719. A short-lived settlement attempt was begun in 1716, but European settlement did not begin in earnest until 1720, with the arrival of French military personnel setting up a military outpost in the Port-la-Joye area, as well as Compte de Saint Pierre's 200 settlers. French settlement was slow; by the time Britain claimed PEI at the end of the seven years' war in 1764, they had only cleared approximately 12,000 acres in isolated areas across the island. By 1753, the population had grown to 2,663 people (Sieur de la Roque, 1752 Census), and during this time, as they had for the previous millennia, the Mi'kmaq continued to live and hunt on PEI year-round, retreating to the inland forests during the winter and setting up camp by the coast during the summers (MacDonald, 2010). By 1827, the population had grown to 23,000, and by 1841 it had more than doubled to 47,000 people. Immigration had largely ceased by the 1850s and population growth stabilized (MacDonald, 1999).

Agriculture and fisheries have always played an important role in PEI's economy. The government of Canada began its agricultural census in 1921. The results for PEI showed there were 13,701 farms in operation, covering 1,216,483 acres of land (approximately 87%), with an average farm size of 89 acres. In the most recent census (2011) the number of farms decreased to 1,495, covering 594,324 acres of land (approximately 43%), with an average farm size of 398 acres. Recognizing the dramatic loss of forest the province had experienced, the province of PEI implemented several programs during the 20th century to try and mitigate the loss of forested lands, including the Agricultural Rehabilitation Development Act of 1962, where the

province acquired private land through negotiation with willing landowners and through tax sales with the intent of replanting agricultural land or allowing them to revert back to forest. Between this and the out-migration of many Islanders during the war years, forested land was up to 700,000 acres (47%) by 1971 (MacDonald, 2001).

Despite the efforts to restore forested lands, the move to commercial agriculture from small household farms continues to impact the natural habitats of PEI. Today, approximately 43% of PEI's landscape is considered agricultural land, but the larger size of farms, increased pesticide/fertilizer use, and loss of hedgerows has significantly impacted the health of both land and water in the province. While commercial agriculture and fisheries continue to contribute significantly to the economy of PEI, tourism and recreation are becoming an increasingly important component of the province's socioeconomic status. Tourism has grown in PEI since the 1870's, when the United States' economy was strong and families had disposable incomes for traveling. In the 1980s, the provincial government and tourism operations began to recognize the increased impact of the industry on the province's natural beauty, as summer visitors continued to build in coastal areas and traveled through fragile dune ecosystems (Campbell, no date b).

Current legislation protects development of the dunes, indicating that subdivisions and cottages must be built a minimum of 60 feet from the inland boundary of the dune. Despite this, several cottage subdivisions are located within this buffer, as grandfathered subdivisions are permitted, and demand for coastal viewscapes remains. Organizations who own property with beach and dune frontage often install signage indicating the fragility of the dunes, in an attempt to stall traffic across dunes, with varying levels of success. Tourism numbers continue to increase over time, measured through occupancy rates in accommodations and travellers via the Charlottetown Airport, The Wood Islands Ferry, and the Confederation Bridge (Tourism Indicators, 2015, and 2015 stats review). Conservation organizations may face significant challenges in the growth of the industry as it continues to promote the island's natural beauty.

As of July 1st, 2015, **PEI's** population was estimated to be 146,447 (Table 6), which represents a 0.2% annual growth rate (PEI Department of Finance, 2015). Population is projected to increase by 7% by 2026, and by 10% by 2055 (PEI Department of Finance, 2016). Based on existing census data, population growth is expected to primarly expand in urban centres (Charlottetown and Summerside), and decrease in rural areas (Stats Canada, 2011). The two First Nations on PEI (Lennox Island First Nation and Abegweit First Nation) are actively involved in the conservation of PEI. Lennox Island is the location of several climate change and sea level rise studies, as it is predicted to be severely impacted by sea-level rise. Abegweit First Nation recently established a conservation society and run a fish hatchery for Atlantic Salmon and Brook trout, as part of a partnership with the Province of PEI to restore historical populations of these recreationally and culturally significant species.

Table 6 - Counties and population in the PEI Bioregion

County	2015 Population
Prince	44,246
Queens	84,678
Kings	17,523
Total	146,447

Economic Considerations

PEI's economy continues to be dependent on natural resources, with an increase in innovative trades such as the aerospace industry, bioscience, and information technology (Province of PEI, 2014). Agriculture remains one of the dominant industries in PEI, with a concentration on potatoes, wheat, and livestock (e.g. cattle, hogs, fowl), and the highest concentration of agricultural land occurs within Prince and Queens Counties. Agriculture (i.e. crops and livestock) contributes approximately 4.1% towards the gross domestic product (PEI Stats Review, 2013). This is the second highest industry within the goods sector of PEI, second only to manufacturing. Potatoes are the most prominent crop, with 36,219 ha (89,500 acres) planted in 2015; and values ranging from \$203-257 million per year in recent years (Agriculture factsheet, 2015).

In 2015, 82,558 ha (205,000 acres) of land was planted with wheat, oats, barley, mixed grain, and oilseeds, with a farm receipt value of \$37 million (Agriculture factsheet, 2015). Fruits and vegetables, livestock, dairy and egg products also contribute to agriculture within the province (Agriculture factsheet, 2015). In total, approximately 240,340 ha (594,000 acres) were cleared for agriculture in PEI (Agriculture factsheet, 2015).

The fisheries and aquaculture industry has increasingly become an important component of PEI's economy. In 2013, PEI accounted for 79% of Canada's mussel production and 30% of Canada's oyster production (DFO, 2015). Other key species in the aquaculture and commercial fisheries industry include lobster (total 2014 production value of \$113 million), groundfish, pelagic fish (primarily tuna), and salmonids. The total 2014 production value of aquaculture in PEI was \$113 million (Stats Canada, 2015).

The sawmill and forestry industry in PEI was small but productive until the 2008 economic downturn in the United States. In 2007, 530,000 cubic meters of forest product (including sawlogs, pulpwood, veneer, and other miscellaneous products) were produced; in 2013, this number fell to 355,000 cubic meters (PEI Agriculture and Forestry, 2013).

PEI has seven windfarms located across the province (Table 7). Construction of the first wind farms occurred in 2002 and 2003 (MEA, 2016). The province's wind energy strategy was released in 2008, with the intent to have at least 30% of PEI's energy needs met by wind power (Island Wind Energy strategy, 2008).

Table 7 - Windmill farms and companies in PEI

Name	Location	Year	Owner
		Commissioned	
North Cape Wind Farm	North Cape	2003	PEI Energy Corporation
Eastern Point Wind Farm	East Point	2007	PEI Energy Corporation
Aeolus Wind Farm	North Cape	2002	Aeolus Wind PEI
Norway Wind Farm	Norway	2007	Suez Renewable Energy NA
Summerside Wind Farm	Summerside	2009	City of Summerside
West Cape Wind Farm	West Cape	2009	Suez Renewable Energy NA
Hermanville/Clearspring Wind Farm	Hermanville	2014	PEI Energy Corporation

PEI is highly promoted as a tourism destination for Canadian and international travellers. After the ship building trade dwindled and trade with the United States became restricted after joining the Canadian Confederation, PEI began to seek alternate sources of revenue. The industry has had a significant impact on the environment, with a growing average of 10 tourists per resident. Primary vacation destinations on PEI include long sandy beaches and coastal regions, and as a result, cottage developments and hotels are located close to coastal drives and beach access (Campbell, no date b).

2. PRIORITY HABITAT TYPES & THREATS

A. Priority Habitat Types

Priority habitat types are specific ecosystems, or habitats that are chosen to represent and encompass the full suite of biodiversity in the project area. They are the basis for setting goals, carrying out conservation activities, and measuring conservation effectiveness. A complete suite of ecosystems, in theory, will ensure the conservation of all native biodiversity within the project area (Conservation Measures Partnership, 2013).

Priority habitats within the bioregion were identified by reviewing NCC's PEI Natural Area Conservation Plan, literature review, and consultation with partners organizations. To refine the priority habitats, interest groups were consulted during a meeting held on October 7th, 2014. Invitees included local experts and partners external to the planning team such as Canadian Wildlife Service, the City of Charlottetown, the PEI Department of Environment, Labour and Justice, the PEI Department of Forest, Fish and Wildlife, Ducks Unlimited Canada, Island Nature Trust, Nature PEI, Parks Canada, and the PEI Watershed Alliance. Additional partners meetings were held on June 4, 2015 and October 20, 2015 to get feedback from partners on priority habitat health assessments, threat rankings, and to identify strategies and conservation actions to abate threats. Attendees included representatives from Parks Canada, Atlantic Canada Conservation Data Centre, University of Prince Edward Island, Canadian Wildlife Service, Bedeque Bay Environmental Management Association, PEI Department of Communities, Land and Environment (Forests, Fish and Wildlife Division), Nature PEI, Island Nature Trust, West River Watershed Group, Mi'kmaq Confederacy of PEI, the City of Charlottetown (Parks and Recreation Department), PEI Invasive Species Council, Ducks Unlimited Canada and Nature Conservancy of Canada (Atlantic Region).

The final suite of priority habitat types for the PEI Bioregion are:

- 1) Beaches and Sand Dunes
- 2) Coastal Islands
- 3) Salt Marshes and Estuaries
- 4) Freshwater Wetlands
- 5) Rivers, Streams, and Riparian Areas
- 6) Acadian Forest Mosaic
- 7) Agroecosystems

For each of the priority habitat types, efforts were made to assess their ecological integrity using 'key ecological attributes' (KEA) and indicators within the framework of the Conservation Area Planning workbook (Low 2003) using background information collected from the Bioregion, a review of literature, and expert opinion. For the purpose of this Habitat Conservation Strategy, the Canada National Parks Act (2000) definition of ecological integrity was adopted, which states that ecological integrity is "...a condition that is determined to be characteristic of its natural region and likely to persist, including abiotic components and the composition and abundance of native species and biological communities, rates of change and supporting processes." Ecosystems with the greatest ecological integrity can better withstand or recover from natural and anthropogenic disturbances, and have the highest likelihood of retaining their integrity over time. The KEAs are important for both assessing the current state of priority habitat types, as well as to monitor changes in their ecological integrity over time. Identifying appropriate KEAs and determining the range of

acceptable variation for their indicators of ecological integrity is designed to be adaptable as information changes and improves over time.

The ecological integrity of the priority habitats for conservation was assessed based on their landscape context, condition, and size. Landscape context includes consideration of two factors: (1) the ecological processes that maintain the priority habitat types, and (2) their landscape connectivity. Condition involves an assessment of the composition, structure, and biotic interactions that characterize the priority habitat. Size is a measure of the area or abundance of the priority habitat type. Habitat conservation priorities were ranked for at least one measure of size, landscape context or condition if possible as 'Poor', 'Fair', 'Good' or 'Very Good', as described in Table 8.

While some aquatic and marine species have been included in the significant species table, a thorough and complete review of the marine environment is beyond the scope of this Habitat Conservation Strategy development process, although it is recognized as a critical ecosystem that provides habitat for many species.

Table 8 - Description of the assessment ranks of ecological integrity of the biodiversity targets for the PEI Bioregion, based off of the viability rating scale developed by The Nature Conservancy (2007).

Rank	Description
Very Good	Ecological Integrity Optimal: The structure, species composition, and key ecological processes and functions of the conservation priority habitat are intact and unimpaired by anthropogenic stresses. Ecosystems are functioning at a level comparable with the natural or historic range of variation for that ecosystem, and its capacity for self-renewal is maintained. The conservation priority habitat requires little or no management.
Good	Ecological Integrity is Good: The structure, species composition, and key ecological processes and functions of the conservation priority habitat are somewhat impaired by anthropogenic stresses. Ecosystems are functioning within a range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and may require some management.
Fair	Ecological Integrity is Degraded: The structure, species composition, and key ecological processes and functions of the conservation priority habitat are impaired by anthropogenic stresses. Ecosystems are functioning below the range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and require management, without which the conservation priority habitat will be vulnerable to serious degradation.
Poor	Imminent Loss of Ecological Integrity: The structure, species composition, and key ecological processes and functions of the conservation priority habitat are seriously degraded by anthropogenic stresses. Ecosystems are functioning well below the range of acceptable variation compared with the natural or historic range of variation for that ecosystem, and require significant management and/or restoration. Allowing the conservation priority habitat to remain in this condition for an extended period will make successful restoration highly improbable.
Unknown	Research Need: The conservation priority habitat is known to occur, but information on this assessment criterion is currently unknown.
N/A	Not Applicable: This criterion is not significant for assessing the ecological integrity of the conservation priority habitat.

Priority Habitat: Beaches and Sand Dunes

Habitat Definition Beaches and Sand Dunes: Beaches are defined as thick accumulations of unconsolidated water-borne, well sorted sand and pebbles deposited on a shore, or in active transit along it (Figure 4). Sand

dunes are transient mounds of loose, windblown sand, sometimes stabilized by vegetation (Anderson et al. 2006). In PEI, extensive beaches are found along the entire coastline of the bioregion. Sandy beaches are predominant along the northern shores, while red sandstone cliffs edge its southern exposure. Within the NAAP, beaches were considered critical if they were >8 ha in size, found in relatively intact landscapes and corroborated by an expert or element occurrence to confirm its viability (Anderson et al., 2006). Of the 3,587 ha (8,863 acres) of beaches and dunes identified within the land use inventory in the NAAP, approximately 443 ha (1,095 acres) of critical beach and dune habitat were identified (Anderson et al., 2006). Many experts have stated that all beaches and dunes on PEI are significant.

Habitat/Species Type Beaches & Sand Dunes: Marine intertidal – Sandy shoreline and/or beaches, sand bars, spits, etc; Marine coastal/supratidal – seas cliffs and rocky offshore islands; Marine coastal/supratidal – coastal sand dunes

Ecological Justification Beaches & Sand Dunes: Beaches and dunes are significant ecosystems as they provide habitat for a number of locally ecologically significant species such as Beach Pinweed, Gulf of Saint Lawrence Aster and the Piping Plover (Catto et al., 2002). There are also many plant species adapted to growing in harsh dune conditions and therefore have very specialized habitat requirements (Anderson et al., 2006). Conservation of beach and sand dune habitat within the Bioregion will contribute to the conservation of 62 significant species.

Landscape Context Assessment of Beaches and Sand Dunes: Very Good

The north shore of PEI consists of approximately 200 km of barrier islands, beaches, and spits backed by broad, shallow estuaries and lagoons, with outcrops of sandstone forming low-relief headlands (Forbes et al., 2004). When considering a 275m buffer around land classified as sand dune, 80% of this area was under natural cover (i.e. classified as natural forest, wetland, or marine environments).

Condition Assessment of Beaches and Sand Dunes: Not assessed

Beach and dune systems are well formed in PEI, especially along the northern shores. Although tourism has played a role in **PEI's** economy since pre-1900's, beach and dune recreation began to grow in popularity with the opening of the national park in 1939, which encompasses much of the province's north shore (Campbell, no date). PEI National Park is one of Canada's most visited National Parks and although Parks Canada takes steps to educate tourists on the importance of maintaining the health and integrity of the beach and dune systems, visitor use remains a prominent threat to the health of beaches and dunes (Parks Canada, 2011). However, a metric to determine the current condition of beaches and dunes was not available.

Size Assessment of Beaches and Sand Dunes: Good

Beaches cover almost 3,619 km of coastline within the Northern Appalachian Acadian ecoregion, although contiguous examples are small. Approximately 67% of the 2,745 beach/dune occurrences are less than 4 ha (10 acres), and approximately 82% are less than 8 ha (20 acres). For beach and sand dune ecosystems, evidence suggests that occurrences greater than 8 ha are adequate to ensure that occurrences can serve as a coarse filter for characteristic beach breeding species such as Piping Plover (Anderson et al., 2006). The mean size of sand dunes within the NA is 6.9 ha. In 2000, 3,488 ha of land was classified as sand dune, while in 2010, 3,498 ha of land was classified as sand dune. This represents a 0.29% increase in total area over this time period.

Overall Assessment of Beaches and Sand Dunes: Very Good

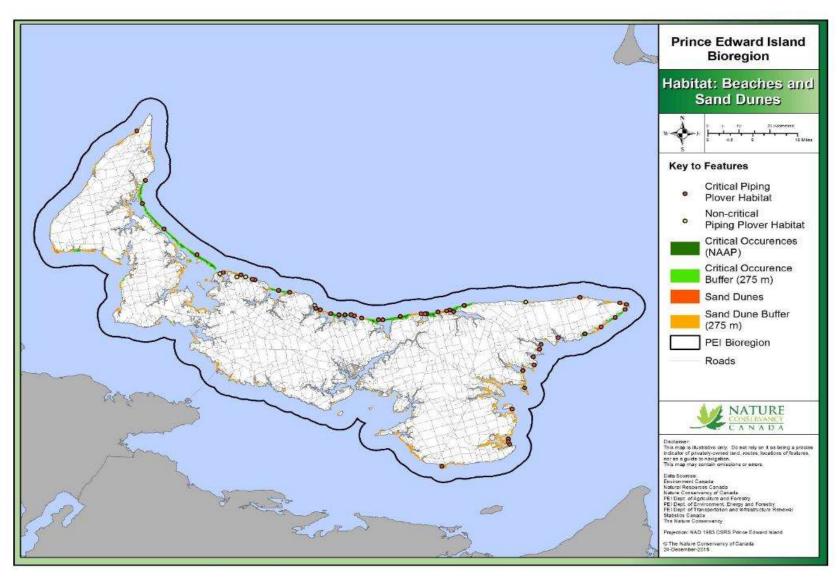


Figure 4 - Beaches, Dunes and Cliffs in the PEI Bioregion

Priority Habitat: Coastal Islands

Habitat Description Coastal Islands: An island is a land mass completely surrounded by water and isolated from the mainland at least during high tide (Figure 5). During low water, the island may be attached to the mainland (Butler et al. 1996b). There are 19 offshore islands within the bioregion, of which 10 are protected for conservation. Coastal Islands are delineated from the provincial land use layer.

Habitat/Species Type Coastal Islands: Marine Coastal/Supratidal – Seas cliffs and rocky offshore islands

Ecological Justification Coastal Islands: Islands serve as isolated habitat away from predators and human disturbance for ground nesting seabirds and colonial nesting birds (Nordström and Korpimäki, 2004; Russell et al., 2006). Species that benefit from coastal islands include Great Blue Heron, Double-Crested Cormorant, Common Tern, Arctic Tern (*Sterna paradisaea*), Herring Gull (*Larus argentatus*), Great Black-backed Gull (*Larus marinus*), and Ring-billed Gull (*Larus delawarensis*). Conservation of coastal islands within the Bioregion will contribute to the conservation of 12 significant species.

Landscape Context Assessment of Coastal Islands: Not assessed

Most coastal islands in PEI have some history of human development but have been largely abandoned as a homestead location. Relative to islands in Nova Scotia and New Brunswick, coastal islands in PEI are small, remote, and subject to erosion and extreme weather, making them less attractive as market luxuries. Current provincial legislation also affords some protection to coastal islands, including prohibition of subdivision and large scale building; each coastal island can only host one cottage and associated utilities. Two of the 19 islands in the bioregion are federally owned; the rest are under private ownership. Ten of the 19 islands in the bioregion are currently protected by conservation organizations in the region, which does not include the protected areas on St. Peter's Island, the Conway Sandhills, and Big Courtin Island.

Condition Assessment of Coastal Islands: Very Good

Nineteen of the coastal islands within the NA are afforded some protection from subdivision and development under the Planning Act Subdivision and Development Regulations (R.S.P.E.I., 1988). Although some islands have already been subdivided, they are largely undeveloped. Species richness within coastal islands is mainly correlated with habitat diversity, and may be further structured by anthropogenic activities (Luna-Jorquera et al., 2012). Within these 19 coastal islands, the mean proportion of land classified as forest or wetland was 96.5%. No clearcuts or plantations were present. The remaining land was classified as Non-evident (sub-use: abandoned), and was present on St. Peters, Governors, Gordons, and Boughton Islands.

Size Assessment of Coastal Islands: N/A

The theory of island biogeography predicts that species diversity is determined by extinction and colonization processes, which in turn depend on island size and distance from the mainland (MacArthur and Wilson, 1963). More recently however, species richness has been shown to only be weakly related to island area (Luna-Jorquera et al., 2012; Triantis et al., 2006). Broadly speaking, islands are attractive to many migratory species (Russell et al., 2006), and size may not necessarily be a relevant indicator of habitat quality within the bioregion. The average (mean) size of PEI's offshore islands is 94 ha (233 acres).

Overall Assessment of Coastal Islands in the PEI Bioregion: Very Good

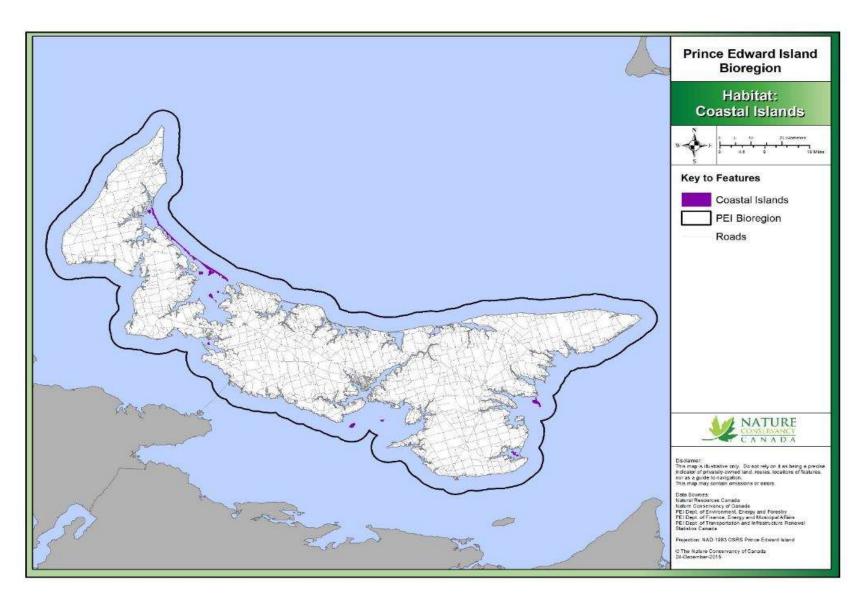


Figure 5 - Coastal Islands in the PEI Bioregion

Priority Habitat: Salt Marshes and Estuaries

Habitat Definition Salt Marshes and Estuaries: Salt marshes are flat, poorly drained areas subject to periodic inundation by salt water with a thick mat of grassy salt-tolerant plants. Specialized vegetation includes the dominant *Spartina* grasses which have evolved mechanisms to resist desiccation, and maintain salt balance in this extreme setting (Anderson et al., 2006). Critical occurrences of salt marsh identified in the NAAP are defined as size ≥60 acres (24 ha), or part of a complex over 100 acres (40 ha; Anderson et al. 2006). A 275m buffer around salt marshes is considered important to protect ecological function and integrity of the marsh, and provides nesting habitat for wildlife (Figure 6; CWS, OMNR and OME, 1998).

Habitat/Species Type Salt Marshes and Estuaries: Marine Intertidal – Salt Marsh (Emergent Grasses)

Ecological Justification Salt Marsh and Estuaries: Salt marshes, like freshwater wetlands, are biologically rich and productive ecosystems that provide a source of organic matter and nutrients for fish and invertebrates in adjacent marine habitats (Boorman, 2003). They provide more services per unit area than any other ecosystem worldwide, including storm buffer and protection, water filtration, carbon sequestration, and as nurseries for commercially- and recreationally harvested fin- and shellfish (Gedan, 2009). Species that rely on salt marshes for breeding include Willet and **Nelson's Sparrow**; Shriver et al., 2004; Warren et al., 2002). Conservation of salt marsh and estuary habitat within the Bioregion will contribute to the conservation of 92 significant species.

Landscape Context Assessment of Salt Marshes and Estuaries: Good

Salt marshes are influenced by an array of local factors that control their development, including tidal characteristics, surface drainage, sediment accretion, freshwater inflow, salinity, nutrient concentrations, and marsh topography. Human activities potentially threaten the viability of salt marsh systems on local, regional, and global scales, such as through physical alteration and immediate loss of habitat (construction, excavation), or longer-term indirect impacts associated with these disturbances (Kennish, 2001). Previous studies in the province have demonstrated that the presence of a forested perimeter, shrub habitat, and open water are representative of undisturbed wetlands in the region (Stevens et al., 2002; 2003). Additionally, conservation practices should consider land surrounding salt marshes, which may transition into marshland over time due to migration (Webster and Daniel, 2014). When considering a 275 m buffer around land classified as salt marsh, 55.8% was classified as being under natural cover (i.e. natural forest, wetland, or marine environment).

Condition Assessment of Salt Marshes and Estuaries: Not assessed

Little is known about the geographical extent of historical use of salt marshes in PEI. Although there is archaeological evidence of Acadian Dykes in Point Prim, Bedeque, Tryon, Malpeque Bay, Wellington, and along the Hillsborough River, their impact on salt marshes has not been quantitatively assessed. The PEI Wetland Conservation Policy currently practices a "no net loss" policy towards wetlands (including salt marshes) but both localized filling and authorized permits citing exceptions to the policy may still be a concern.

Size Assessment of Salt Marshes and Estuaries: Good

Anderson et al. (2006) determined the minimum area size requirements for characteristic breeding species of salt marshes to be 20.2 ha (50 acres), or part of a complex over 100 acres. However, salt marshes within PEI are naturally small compared to other regions (Griffin, 2009); there are approximately 1,344 brackish or salt marshes within the bioregion, with an average size in of 5.7 ha. In 2000, 6,988 ha of land was classified as brackish or salt marsh. In 2010, this value increased to 7,592 ha. This represents a 8.6% increase in total brackish and saltmarsh extent over this time period.

Overall Assessment of Salt Marshes and Estuaries: Good

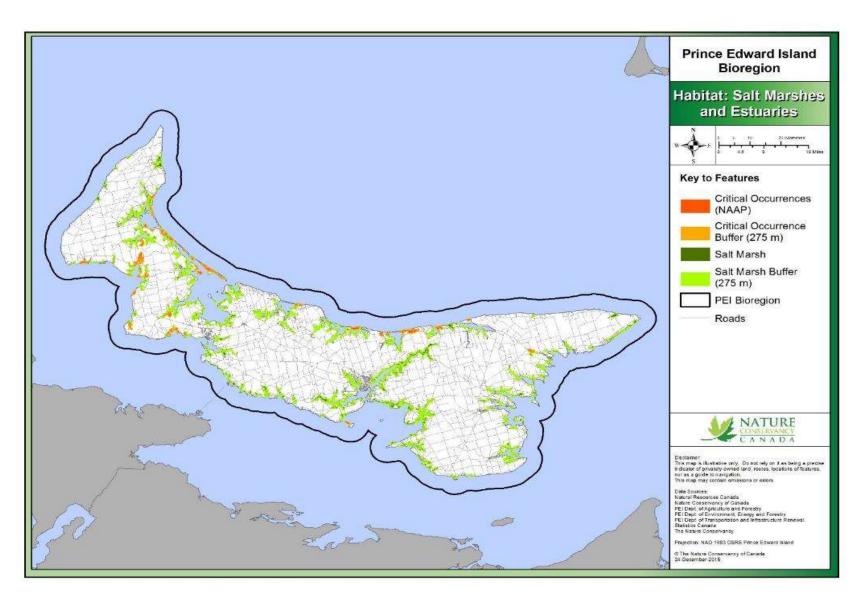


Figure 6 - Salt Marsh in the PEI Bioregion

Priority Habitat: Freshwater Wetlands

Habitat Definition Freshwater Wetlands: Wetlands are saturated with water long enough to promote wetland or aquatic biological processes, which are indicated by poorly drained soil, water-tolerant vegetation and biological activities adapted to a wet environment (PEI Wetland Conservation Policy, 2007).

Temperate freshwater wetlands include a large variety of habitat types ranging from alluvial wetlands that are closely connected to river channels, to isolated depressions that are largely driven by groundwater and are not connected to other aquatic systems (Brinson and Malvárez, 2002). Freshwater wetlands are spatially delineated from the PEI land use inventory layer. Critical occurrences were identified as: size > 20 ha (wetland complex) and LCl³ < 20 (Anderson et al., 2006).

Ecological Justification Freshwater Wetlands: The ecological services provided by wetlands are well documented, and include benefits such as recreation, flood control, groundwater discharge, biodiversity, inherent values, and life support values (i.e. carbon uptake and storage; King et al., 2000). Due to the variety of different types of wetlands, they tend to be home to a diverse array of wildlife. Conservation of freshwater wetlands within the Bioregion will contribute to the conservation of 408 significant species, including Pickerel Frog (*Lithobates palustris*), American Coot (*Fulica americana*), and Grass-leaved Arrowhead (*Sagittaria graminea*).

Habitat/Species Type Freshwater wetlands: Wetlands (inland); Wetlands – Shrub Dominated Wetlands; Wetlands – Bogs, Swamps, Fens, Peatlands; Wetlands – Permanent Freshwater Marshes/Pools (under 8 ha); Wetlands – Seasonal/Intermittent Freshwater Marshes/Pools (under 8 ha).

Landscape Context Assessment of Freshwater Wetlands: Fair

Wetland isolation may lead to increased susceptibility to pollution, habitat destruction, or changes in water levels (Stevens et al., 2002). Previous studies in the province have reported that the presence of a forested perimeter, shrub habitat, and open water are representative of undisturbed natural emergent wetlands in the region, and these characteristics were positively correlated with the number of frog species present. Furthermore, numbers of species present in wetlands were found to be positively correlated with proximity to freshwater rivers and streams (Stevens et al., 2002; 2003). In agricultural landscapes, low-lying wetlands can accumulate nutrient and sediment runoff from nearby agricultural fields which can contribute to accelerated rates of wetland succession (Stevens et al., 2003). When considering a 275 m buffer around land classified as freshwater wetlands, 46.2% of landuse was classified as natural forest, wetland, or marine.

Condition Assessment of Freshwater Wetlands: Not assessed

PEI has a wetland conservation policy in place that aims towards "no net loss" of wetlands, where assessments of wetland function, value, area, location, time frame, wetland loss and wetland compensation will be considered by a committee, including representatives from the Province of PEI, Federal Canada, and Ducks Unlimited (PEI Wetland Conservation Policy, 2007). However, out of 20 Watercourse Alteration Permits requesting the infill of wetlands submitted between 1996-2000, 11 were approved on the basis of "public interest". In only one case was there a voluntary effort to compensate for the loss of wetland (PEI Wetland Conservation Policy, 2007). Other threats include knowledge gaps concerning invasive aquatic species (Purple Loosestrife, Common Reed) and nutrient loading from agricultural runoff (Verhoeven, 2006).

Size Assessment of Freshwater Wetlands: Good

³ Landscape Context Index (LCI) is a measure that refers to relative amount of development, agriculture, quarries, roads and other fragmenting features directly surrounding ecosystem occurrences. It provides an estimate of isolation of occurrence as well as potential future encroachment on the occurrence. See Anderson et al. (2006) for more details.

Wetlands over 20.2 ha (50 acres) in size are believed to be sufficient to ensure that these habitats serve as a coarse filter for characteristic wetland species within the natural area (Anderson et al., 2006). The average size of wetlands within the NA as of 2010 is 3.51 ha. However, despite their size, small wetlands are more abundant than larger wetlands within the landscape, and play an important role in reducing isolation among patches of wetland habitat (Gibbs, 1993). In 2000, 25,732 ha of land was classified as freshwater wetland, while 28,392 ha of land was classified as freshwater wetland in 2010. This represents a 9.4% increase in total wetland extent over this time period.

Overall Assessment of Freshwater Wetlands: Good

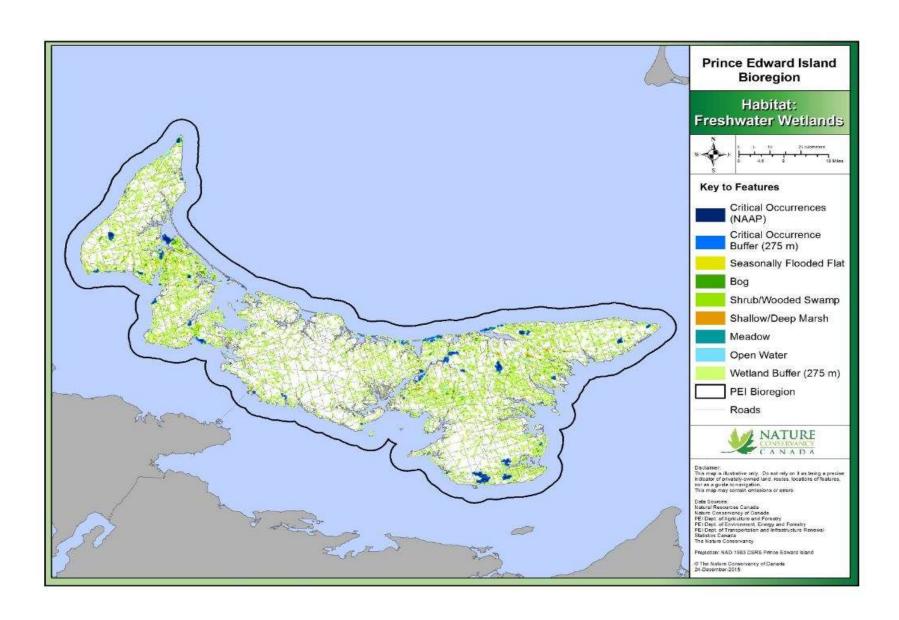


Figure 7 – Freshwater Wetlands in the PEI Bioregion

Priority Habitat: Rivers, Streams, and Riparian Areas

Habitat Definition Rivers, Streams, and Riparian Areas: Streams can be defined as a more or less permanent body of water moving towards a position of lower energy. Riparian zones are areas close to the stream or river, where the environment is directly and distinctly influenced by the water body (Bren, 1993). Riparian zones are not easily delineated, but are comprised of mosaics of landforms, communities, and environments within the larger landscape (Gregory et al., 1991). The riparian corridor encompasses the stream channel and that portion of the terrestrial landscape from the high-water mark towards the uplands, where vegetation may be influenced by elevated water tables or flooding, and by the ability of soils to hold water (Naiman et al., 1993).

Habitat/Species Type Riparian and Aquatic Systems: Riparian Areas; rivers, streams, creeks' Freshwater lakes' wetlands – permanent rivers' streams, creeks (includes waterfalls); wetlands – seasonal/intermittent/irregular rivers, streams, creeks

Ecological Justification Rivers, Streams, and Riparian Areas: Natural riparian corridors are the most diverse, dynamic, and complex terrestrial habitats due to the diversity of landforms, communities and environments that comprise them (Naiman et al., 1993). Riparian buffers provide isolation of upland activities from terrestrial nearshore and aquatic areas (Lee et al., 2004). In addition to protecting streams from contamination, buffers contribute to stream bank stabilization and increase biodiversity of aquatic ecosystems by creating favourable habitat conditions (Eastern Canada Soil and Water Conservation Centre, 1995). Terrestrial riparian systems within the Bioregion contribute to the conservation of 316 significant species.

Landscape Context of Rivers, Streams, and Riparian Areas: Fair

Rivers and streams within the bioregion are heavily impacted by agriculture practices. Crops are commonly grown with intensive fertilizer and pesticide applications that leach into watercourses, and with cultivation techniques that leave fields bare and erosion-prone during part of the year (Cairns et al., 2012). Maintaining watersheds with 30% natural cover equates to a high-risk approach that may only support marginally healthy aquatic systems, while natural cover of 50% or more equates to a low-risk approach that is likely to support healthy aquatic systems (Environment Canada, 2013a). The mean natural forest cover per watershed was 32.1%. A total of 40 out of 241 watersheds (16.6%) had natural forest cover comprising greater than or equal to 50% of the watershed area.

Condition Assessment of Rivers, Streams, and Riparian Areas: Fair

Within a 60m riparian buffer, it is believed 85-90% of natural cover is required to reduce runoff into aquatic systems (A. Lush, M. Harris, personal communication). When considering a 60 m riparian buffer surrounding all streams, only 24 out of 226 watersheds (11%) had natural forest or wetland habitat comprising greater than 85% of the 60 m riparian area. The mean proportion of riparian area at the watershed scale that was classified as natural forest or wetland was 65.9%.

Size Assessment of Rivers, Streams, and Riparian Areas: Not assessed

In total, PEI has 5,063 km of streams according to the provincial stream database. With a 60m riparian buffer, this represents a total area of 78,868 ha of riparian habitat. Ideally, riparian zones would be better delineated using topography, elevation and geological considerations rather than an administrative width. Due to the coarse scale of the NAAP analysis, riparian zones were not modelled in PEI. Future work should look at filling this information gap.

Overall Assessment of Rivers, Streams and Riparian Areas in the PEI Bioregion: Fair

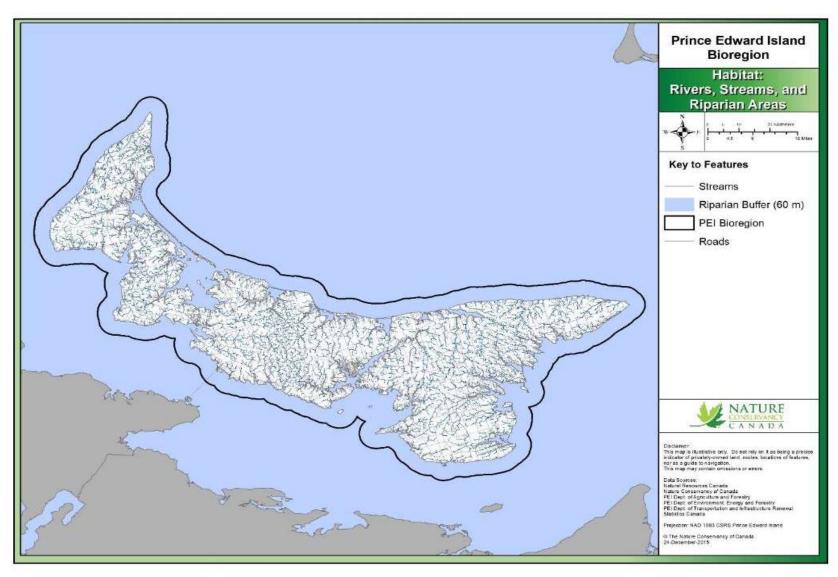


Figure 8 – Rivers, Streams and Riparian Areas in the PEI Bioregion

Priority Habitat: Acadian Forest Mosaic

Habitat Definition: The Acadian forest is found in the Maritime Provinces, northeastern New England States and parts of eastern Quebec. It is defined as a transitional forest between two larger forest ecosystems: the temperate forest of the south, and the boreal forest in the north (Simpson, 2008). Acadian forest is characterized by 32 tree species, many of which are long-lived, shade tolerant trees and are found in an uneven age class structure. Stands with multiple canopies primarily regenerate through small openings created by single tree senesce (Fish & Wildlife, 2014). Forests in PEI have undergone the most extreme changes since European Settlement (Loo & Ives, 2003); stands are highly fragmented and primarily contain pioneer species that are adapted to thrive in disturbed areas.

Habitat/Species Type Acadian Forest Mosaic: Forest; Forest-Temperate

Ecological Justification: Before European settlement, PEI was almost entirely forested. Agricultural activities reduced forested lands to a low of 30% in the early 1900's. Few representative old growth forest patches remain in PEI. Conservation of forested ecosystems within the Bioregion will contribute towards the conservation of 335 significant species, including provincially rare species like Pileated Woodpecker, Hobblebush (*Viburnum lantanoides*), and White Adder's-mouth (*Malaxis brachypoda*). Forests are underrepresented in PEI's protected areas network (Griffin, 2009). Intensive inventories of lichen species in PEI's old growth forests have demonstrated a wide biodiversity and several rare species occur within the bioregion (McMullin, 2014; McMullin et al., 2012).

Landscape Context Assessment of Acadian Forest Mosaic: Fair

It is suggested that 30% forest cover at the watershed scale is the minimum forest cover threshold to support healthy levels of forest flora and fauna. This equates to a high-risk approach that may only support less than half of the potential species richness, and marginally healthy aquatic systems. A forest cover of 40% equates to a medium-risk approach, while 50% (or more) forest cover equates to a low-risk approach that is likely to support most native species, and healthy aquatic systems (Environment Canada, 2013a). The mean natural forest cover per watershed was 32.1%. A total of 40 out of 241 watersheds (16.6%) had natural forest cover comprising greater than or equal to 50% of the watershed area.

Condition Assessment of Acadian Forest Mosaic: Not Assessed

Since the early 1700's, European settlement across PEI has greatly simplified the species composition and age distribution of the Acadian forest. The heavy reliance on agriculture for industry in province and history of field abandonment during economic downturn has transformed PEI's forest into a network of early successional species (Fish & Wildlife, 2014; Ives & Loo, 2003). There are several examples of mature forest that remain in protected conservation areas. It is generally accepted what little old growth forest remains in PEI it is extremely fragmented.

Size Assessment of Acadian Forest Mosaic: Poor

The most precautionary approach to conserve interior habitat within upland Acadian forests on PEI would be to ensure at least 10% of the area in watersheds is 160 m or greater from the forest edge (MacQuarrie and Lacroix, 2003; Environment Canada, 2013a). The mean natural interior forest cover per watershed was 2.7%. A total of 11 out of 241 watersheds (4.6%) had natural forest cover comprising greater than or equal to 10% of the watershed area.

Overall Assessment of Acadian Forest Mosaic: Fair

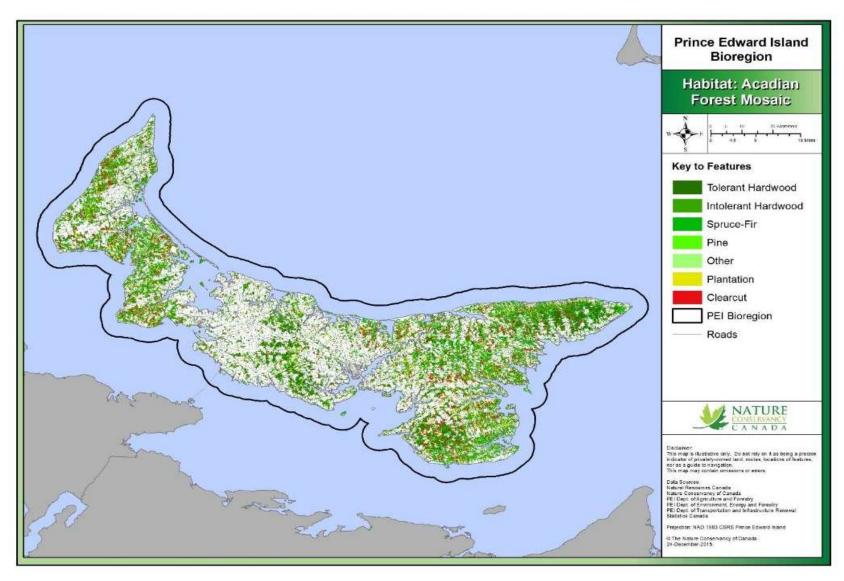


Figure 9 – Acadian Forest Mosaic in the PEI Bioregion

Priority Habitat: Agroecosystems

Habitat Definition Agroecosystems: Agricultural landscapes consist of cultivated lands, hay fields, and grazing lands in a mosaic of riparian zones, wetlands, and forest. These landscapes may provide some or all of the life history needs for several grassland species. (e.g. breeding, feeding, wintering, staging, and cover; Javorek et al., 2007). Some wildlife species are able to thrive where native habitat has been replaced by agricultural habitat, while others become restricted to the remnants of natural or semi-natural habitats remaining in the agricultural landscape (Neave et al., 2000). While agricultural land can offer a variety of habitat requirements to wildlife, some types are superior to others; previous work has shown that wildlife use of habitat for breeding, feeding, and cover on agricultural land in Canada is disproportionate to availability. (Javorek et al., 2007; Neave et al., 2000).

Habitat/Species Type Agroecosystems: Grassland - temperate

Ecological justification Agroecosystems: Agroecosystems differ from natural ecosystems because they are managed for production purposes. However, agroecosystems can provide benefits to wildlife relative to other developed landscapes. These can include shelter in the form of trees and shrubs, grass and water, a ready supply of food, close proximity to natural landscapes, and less human pressure compared to urban areas (Neave et al., 2000). Hedgerows, fencerows, and windbreaks can provide shelter, food, and breeding sites for many wildlife species. They can also serve as valuable travel corridors that allow animals to move between habitats. In turn, wildlife provide many benefits to farmers, including crop pollination, breakdown of organic matter which provide nutrients for crops, contaminant degradation, and agricultural pest control (Jeswiet & Hermsen, 2015).

Landscape Context Assessment of Agroecosystems: Not assessed

The assessment team was not able to determine the landscape context of agroecosystems as it is unclear what proportion of the agricultural landscape is suitable for grassland bird species. Minimum patch size and configuration of suitable patches would be important considerations when assessing this attribute. For example, the reported minimum patch size for Bobolink is 10 ha. As well, Bobolink have been found to use much smaller patch sizes on PEI. Ideal Bobolink habitat includes older hayfields (8+ years) that are cut annually outside of the breeding season. They will also commonly use old abandoned fields, and smaller patches of grassland surrounded by fragmented landscapes provided better habitat than small patches of grassland surrounded by forest (McCracken et al., 2013).

Condition Assessment of Agroecosystems: Not assessed

Although agricultural fields are not optimal breeding habitats, a small group of bird species including grassland specialists, are able to productively utilize certain crops. The total amount of summer fallow (cultivated grassland) declined by 48% between 1951 and 2001 (Statistics Canada, 2005), and species that use these habitats, such as Bobolinks are in decline throughout their range. However, data specific to PEI is not available, so a condition assessment cannot be made.

Size Assessment of Agroecosystems: Not assessed

One of the most prominent features in the landscape of the Bioregion is agricultural land. Approximately 38-42% of the province is classified as agriculture (Figure 10; Agriculture and Forestry, 2013). However, it is difficult to assess the size viability of agroecosystems within the bioregion as we do not currently have a good understanding of the total area and distribution of agriculture land that provides quality habitat for grassland dependant species.

Overall Assessment of Agroecosystems in the PEI Bioregion: Not Assessed

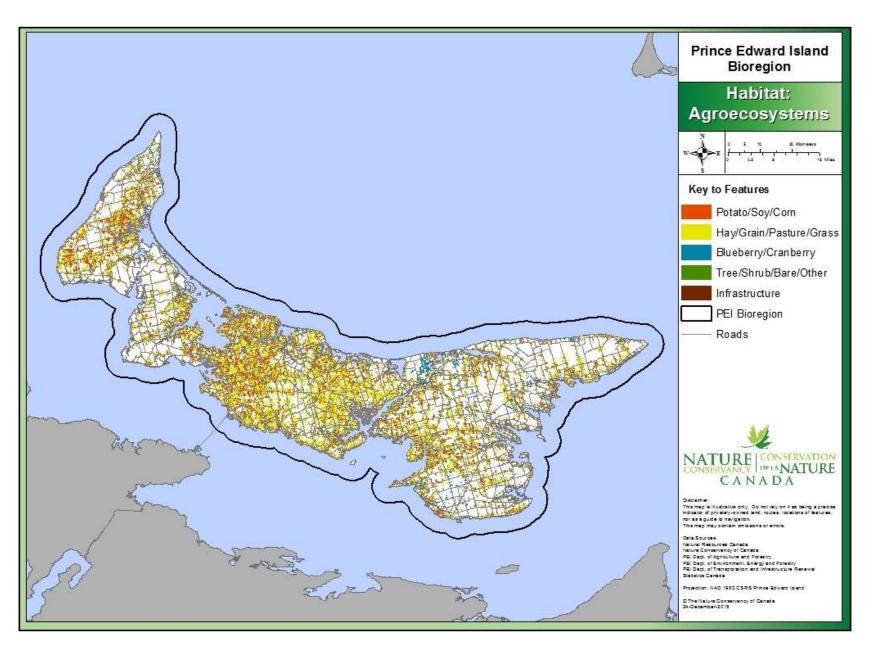


Figure 10 – Agroecosystems in the PEI Bioregion

Table 9 - Assessment of the Habitat Conservation Priorities for the PEI Bioregion:

		Overall			
Biodiversity Habitat	Landscape Context	Condition	Size	Assessment	
Beaches & Sand dunes	Very Good	Not assessed	Good	Very Good	
Coastal Islands	Not assessed	Very good	N/A	Very Good	
Salt marshes & Estuaries	Good	Not assessed	Good	Good	
Freshwater Wetlands	Fair	Not assessed	Good	Good	
Riparian and Aquatic Systems	Fair	Fair	Not assessed	Fair	
Acadian Forest Mosaic	Fair	Not assessed	Poor	Fair	
Agroecosystems	Not assessed	Not assessed	Not assessed	Not assessed	
Overall Biodiversity H	Good				

B. Threats

i. Current Threats

Direct threats are generally defined as human activities that immediately degrade a priority habitat (e.g. road construction, introduction of invasive species, etc.), but they can also be natural phenomena altered by human activities (e.g. increases in extreme storm events) or in rare cases, natural phenomena whose effect is increased by other human activities (e.g. wolf predation affecting a caribou herd already in decline). It is important to prioritize the direct threats that affect priority habitat types in order to concentrate activities where they are most needed (Conservation Measures Partnership, 2013).

Threats to priority habitats were identified by reviewing the first generation of the PEI Natural Area Conservation Plan and current literature, as well as consulting local experts and partners during partner meetings in October 2014, June 2015, and October 2015. The list of threats and their respective description and status are described below, and summarized in Tables 10a and 10b.

1.1.1 Housing, Cottage, and Recreational Development (Threat Status: Medium)

Draining of marshes was initiated by the Acadians over 300 years ago. Wetlands were initially drained and infilled for agriculture, and more recently for urbanization and shoreline cottage development (Environment, Energy and Forestry, 2007). Population density in PEI is the highest in Canada at 24 individuals per km², compared to 17.3 individuals per km² in Nova Scotia and 10.3 individuals per km² in New Brunswick (Locke et al., 2007). Housing and cottage development is popular along the shoreline within the Bioregion, despite high risk of erosion or flooding (Forbes et al., 2004). Over 54,000 properties (174,983 ha) lie within 500 m of the coast. These properties account for 32% of PEI's total land area (Finance, Energy and Municipal Affairs, 2016).

The Subdivision and Development Regulations of the Planning Act of PEI state that the nearest exterior portion of a building or structure shall be located no closer than (a) 22.9 metres (75 feet), or 60 times the annual rate of erosion, whichever is greater, to a beach, measured from the top of the bank; (b) 30.5 metres (100 feet) to a migrating primary or secondary sand dune, measured from the inland boundary of the dune; (c) 22.9 metres (75 feet) to the inland boundary of a wetland or watercourse (R.S.P.E.I., 1988). There are homes currently present in the bioregion that do not meet these minimum setback distances.

The Human Footprint Index developed by Wildlife Conservation Society Canada is a useful indicator of human development within the Northern Appalachian-Acadian ecoregion. This index measures the extent and relative intensity of human influence on terrestrial ecosystems using the best available datasets on human settlement (population density, dwelling density, urban areas), access (roads, rail lines), landscape transformation (landuse/landcover, dams, mines, watersheds), and electrical power infrastructure (utility corridors). The Human Footprint score ranges between 0 and 100, where 0 represents minimum human influence and 100 represents maximum human influence at that location (Figure 11). The average HFI score for the PEI bioregion is 39.7.

2.1.1 Annual and Perennial Non-timber Crops (Threat Status: Medium)

One of the most prominent features in the landscape of the Bioregion is agricultural land. Approximately 38-42% of land within the province is classified as agriculture (Figure 12; Agriculture and Forestry, 2013). This is far more than the neighbouring provinces of Nova Scotia (8%) and New Brunswick (5%; Locke et al., 2007). From the period of 2000 to 2010, there was a net loss of 4,616 ha of forested land due to conversion to agriculture. Although this equates to 1.8% of total forest occurrence, agriculture accounted for the largest conversion from forest. The majority of this land use conversion was due to establishment or expansion of new blueberry fields (Agriculture and Forestry, 2013).

Within the bioregion, 17 priority bird species (33%) utilize cultivated or managed lands. The highest ranked threat to priority bird species is early haying during the breeding season, which can lead to the destruction of nests and cause mortality of adults and young birds (especially Bobolink and Nelson's Sparrow; Environment Canada, 2013b). Bobolink will not nest in row crops, or heavily grazed fields (McCracken et al., 2013).

3.3.1 Wind Energy (Threat Status: Low)

Of the existing alternative energy sources, wind-powered turbines that generate electricity are beginning to achieve the economy of scale, making them even more practical than ever before. However, construction of wind-powered turbines (i.e. "wind farms") has the potential to impact wildlife populations if their placement is not carefully considered (Kuvlesky et al., 2007). Bird populations are particularly vulnerable; reported instances of habitat loss, collision mortality, displacement, disturbance and impeded movement between feeding, roosting, breeding, and moulting areas all have potentially adverse impacts (Stewart et al., 2007). Wind turbine operations can influence bird populations through noise and activity of operations which have the potential to disturb local breeding and/or foraging birds, causing a decrease in nesting success and contributing to increased mortality. Wind farms can also directly contribute to bird mortality through collisions with wind turbines and guy wires, exacerbated by light attraction (Kingsley and Whittam, 2001). There are currently seven wind farms within the Bioregion, with approximately 104 wind turbines (Figure 13). The operational life span of wind turbines on PEI is 25 years, beyond which infrastructure will need to be replaced or decommissioned (AMEC Environment and Infrastructure, 2013).

4.1.1 Road Fragmentation (Threat Status: High)

Road density is representative of habitat availability, quality, and fragmentation, and provides a good indicator of the ecological integrity of protected areas and their potential to prevent species extirpations (Crowley and Brooks, 2010). The species richness of wetland plants, amphibians/reptiles, and birds are negatively correlated with road density within 2 km of wetlands (Findlay and Houlahan, 1997). For species that are sensitive to human activities such as birds and mammals, road density is often the most accurate predictor of habitat suitability. Existing road-less areas and areas of low road density are important refuges for

sensitive wildlife species (Beazley et al., 2004). Additionally, roads may act as barriers to wildlife movement, and create potential opportunities for the spread of invasive species (Forman and Alexander, 1998). There are a total of 6,786 km of roads within the Bioregion, with an average road density of 1.0 km per square kilometer (Figure 14). This is a 40% increase over the suggested maximum road density of 0.6 km per square kilometer (Betts and Forbes, 2005) without significantly impacting wildlife.

There are over 1,000 stream crossings in the Department of Transportation and Infrastructure Renewal stream crossings database, however these does not include pipe culverts and smaller structures (D. MacDonald, personal communication). PEI has thousands of older culverts, the replacement of which will take several decades (Harris et al., 2012). Streams may be altered for considerable distances both upstream and downstream of stream crossings, resulting in altered flow rates, pool-riffle sequences, and scour, which typically reduces habitat-forming debris and aquatic organisms (Forman and Alexander, 1998). There is concern that roads may also act as barriers to natural salt marsh migration associated with sea-level rise (Webster and Daniel, 2014).

5.3.1 Wood Harvest (Threat Status: Low)

The single largest impact to forests was the extensive land clearing for agriculture in the 19th century, which resulted in removal of approximately 70% of the forest. As a result, the forest within the Bioregion can generally be described as young, with an average age of approximately 55-60 years, and very few stands older than 100 years (Agriculture and Forestry, 2013; Loo and Ives, 2003). In contrast, the pre-settlement forest is estimated to have been over 200 years old (McAskill, 1987). Remnant upland hardwood stands in this province are acknowledged as heavily modified descendants of the pre-colonial forest (Sobey and Glen, 2004). It is recognized that there are likely no forests on PEI that have escaped human disturbance (University of PEI, 1982 as cited in MacQuarrie and Lacroix, 2003). Where land has never been cleared, the best trees have been removed for generations, leaving a generally degraded forest, both in terms of species and genetic quality. Forest that has been harvested and abandoned tends to grow up in White Spruce, which decline and break up after 50-60 years (Loo and Ives, 2003).

Forestry practices on PEI have led to the dispersion of forest openings and scattered clearcuts in various regions of the province. Forest stands are generally present either as small woodlots surrounded by farmland, or as larger connected parcels at the back of farms (Sobey and Glen, 2004). Human activities have created a mosaic of fragmented forests and agricultural and pasture lands, as well as a large amount of edge habitat (Silva, 2001). Accurately predicting the condition of the forest of PEI is difficult, although it is clear that as the sustained harvesting increases, there is a trade off in future forest condition. The amount of area classified as harvested/regenerating increased from 8.2% in 2000 to 10.2% in 2010 (i.e. forest classified as clear-cut harvest area within the previous 10 years; Figure 15; Agriculture and Forestry, 2013). Assuming this trend continues, it is expected that this value will increase to 12.2% in the next decade.

6.1.1 Tourism and Recreation (Threat Status: Low)

With the increasing use of beaches and sand dunes by tourists, human foot traffic has become a major erosive agent in the dune areas of PEI (Catto et al., 2002). Approximately 22% of sand dunes occur within high traffic areas such as PEI National Park (20%) and various provincial parks (2%; Figure 16). In general, it can be assumed that the rate of recovery is inversely proportional to the intensity of impact. The highly mobile sediments of beaches and dunes make it difficult for vegetation to establish. As a result, recovery can take 40-60 years (Matthew et al., 2010). ATV use in wetlands is prevalent in the Bioregion despite prohibitive laws and other deterrents. New trails can quickly develop after just a few passes of an ATV. Furthermore, remote island

sites can be accessed by ATVs during the winter by crossing on the ice (COSEWIC, 2014). Other threats include dogs off-leash, beach access to aquaculture leases, and disturbances to roost and nesting sites (Environment Canada, 2013b).

7.2.1 Stream Crossings (Threat Status: Medium)

PEI has a predominance of first and second order streams (Langill and Zamora, 2002). As a result, there is a large number of locations where public and private roads cross streams (Figure 17; Guignion, 2009). Culverts are the primary stream crossing structures in the Maritime Provinces. Culvert installations may consist of a variety of structures, including corrugated metal pipes, box culverts, and natural bottom arches (Langill and Zamora, 2002). When culverts are improperly designed or installed, they are potential barriers to fish migration, notably to upstream salmon movement (Cairns et al., 2012). However, due to cost restraints, corrugated metal pipe culverts are frequently installed instead of bridges or open-bottom culverts (Gibson et al., 2005; Price et al., 2010).

The most common problems associated with culverts are excessive water velocities due to undersized structures, or vertical barriers to fish passage. However, other problems may relate to depth of water during high, moderate, or low flows; flow in relation to annual hydrographic and seasonal time of fish passage; icing and debris accumulation; and the size and species of fish passage through the structure (Diebel et al., 2014; Fisheries and Oceans Canada, 2015; Langill and Zamora, 2002). In addition to impacting fish communities directly, the improper installation of culverts can affect aquatic resources through the destruction of fish habitat at the installation footprint, alteration of natural stream alignment, and disruption of adjacent fish habitat (Langill and Zamora, 2002).

Ensuring that different habitats remain connected for the free migration of fish at each life stage and season is critical in maintaining healthy populations (Guignion, 2009; Langill and Zamora, 2002). Barriers such as culverts can dramatically impact the proportion of the catchment accessible to migratory fish. This may reduce or fragment species distributions, which may result in dwindling populations that are increasingly genetically isolated and at greater risk of extinction (Kemp and O'Hanley, 2010). The effect of any particular barrier on fish populations depends both on its location within the stream network, and its position relative to other barriers. Those that remove small headwater tributary streams from a river network may have a disproportionate impact on potential salmonid spawning habitat (Diebel et al., 2014; Kemp and O'Hanley, 2010). Barriers are not restricted to passable or impassible states, but have a range of "passability". Partial or temporal barriers can block the movements of a proportion of the community that are weaker swimmers or at early life-stages, and reduce access at certain times such as during high or low flows (Diebel et al., 2014; Kemp and O'Hanley, 2010). Even if only a small fraction of road crossings are barriers, they can collectively represent a significant influence on landscape-scale patterns of longitudinal stream connectivity.

A survey in the West River watershed in 2009 revealed that only 19% of culverts were passable to all native fish species of all ages, while 50% were only partially passable, and 31% were completely blocked. (Harris et al., 2012). Enhancing passability of road crossings is likely to be more economically feasible than removing dams or installing fish-passage structures, and could be more socially acceptable given that dams often provide multiple public benefits. Furthermore, road crossings have a shorter replacement cycle than dams, offering more frequent opportunities for fish-friendly improvements to be made (Januchowski-Hartley et al., 2013).

7.3.1 Coastal Armouring (Threat Status: Low)

Worldwide, a majority of sandy beaches are classified as eroding. Response to threats from beach erosion and shoreline retreat have relied heavily on coastal armoring (e.g. Charlier et al., 2005). Increased residential and recreational development along the coast are likely to lead toward increased armoring, particularly in the face of the effects of climate change. Loss of habitat from coastal armoring is associated with significant impacts

on beach width, macroinvertebrate abundance, as well as species richness and abundance of shorebirds and other seabirds which utilize sandy beaches (Dugan et al., 2008).

Davies (2011) visually identified all shore protection features within PEI from aerial imagery. A total of 161 km of shoreline armouring was identified, representing approximately 5% of the total shoreline length. This value is believed to be an under-estimate due to the common use of sandstone as armouring, which is difficult to differentiate from local bedrock. This author estimates the actual length of shore protection may be as much as 320 km (i.e. 10%).

8.1.1 Invasive Species (Threat Status: Medium)

In 2004, the World Conservation Union published a booklet identifying 100 of the "world's worst invasive alien species". Approximately 13 of these species are currently present in PEI (PEI Invasive Species Council, no date a). The PEI Invasive Species Council website lists 64 species of plants with distributions listed as localized to widespread, and immediacy ranging from potential risk to immediate threat. There are also nine plant species listed as not currently present, but have the potential to be introduced (PEI Invasive Species Council, 2013).

In particular, plant species of concern in the bioregion include Glossy Buckthorn (Frangula alnus), Garlic Mustard (Alliaria petiolata), Oriental Bittersweet (Celastrus orbiculatus), Japanese Knotweed (Fallopia japonica), and Giant Hogweed (Heracleum mantegazzianum). Glossy Buckthorn tolerates a wide range of habitats from wetlands to woodland edges, old fields, ditches and grassy areas. Distribution is mostly by sexual reproduction with seeds often being spread by birds into more pristine locations where it can replace the entire shrub layer (PEI Invasive Species Council, no date b). Garlic Mustard tolerates shade and grows in rich moist areas. This species is commonly found invading woodlands, and can out-compete native flowering woodland plants (PEI Invasive Species Council, no date c). Oriental Bittersweet is a shade tolerant wood vine that grows in forests, woodland edges, grasslands, roadsides, and fencerows (Credit Valley Conservation, no date). Although there is only one known escaped population within the Bioregion, it already covers more than an acre of forest (J. Waddell, personal communication). Japanese Knotweed is one of the Global Invasive Species Database's 100 worst invaders, and currently widespread on PEI. It grows in a wide variety of habitats and tolerates a wide range of adverse conditions such as deep shade, high temperatures, salinity, and drought. It grows in dense thickets that shade out neighbouring species and spreads readily via underground rhizomes. Once established, it generally takes great persistence and several years to eradicate (PEI Invasive Species Council, no date d). Giant Hogweed is generally found along roadsides, in ditches, along streambanks and in disturbed waste areas, however there is only one confirmed site within the province (PEI Invasive Species Council, no date e).

There are a number of invasive insects and diseases affecting trees and shrubs within the Bioregion. These include Japanese Beetle (*Popillia japonica*), European Gypsy Moth (*Lymantria dispar*), European Larch Canker (*Lachnellula willkommii*), Viburnum Leaf Beetle (*Pyrrhalta viburni*), Dutch Elm Disease (*Ophiostoma ulmi*), and Balsam Wooly Adelgid (*Adelges piceae*). Of these, Dutch Elm Disease and the Viburnum Leaf Beetle are currently considered to have a substantial impact on biodiversity (D. Carmichael, personal communication). Although not currently present within the Bioregion, there are a number of pests inside and outside of the Maritime provinces that have the potential to invade the Bioregion. These include Scleroderris Canker (*Gremmeniella abietina*), Brown Spruce Longhorn Beetle (*Tetropium fuscum*), Butternut Canker (*Ophiognomonia clavigignenti-juglandacearum*), Emerald Ash Borer (*Agrilus planipennis*), Asian Longhorn Beetle (*Anoplophora glabripennis*), Hemlock Wooly Adelgid (*Adelges tsugae*), Asian Gypsy Moth (*Lymantria* sp.), Pine Shoot Beetle (*Tomicus piniperda*), Ramorum (or Sudden Oak Death; *Phytophthora ramorum*), and Sirex Wood Wasp (*Sirex noctilio*). There is a widespread population of male European Gypsy Moths in Charlottetown and Summerside as of 2014, and it is expected that the entire province will be considered completely infested over the next few years (D. Carmichael, personal communication).

Since 1997, there have been seven new aquatic invasive species that have been identified within the Bioregion. These include the Violet Tunicate (*Botrylloides violaceus*), Vase Tunicate (*Ciona intestinalis*), Golden Star Tunicate (*Botryllus schlosser*), Clubbed Tunicate (*Styela clava*), Oyster Drill (*Urosalpinx cinerea*), Oyster Thief (*Codium fragile*), and the European Green Crab (*Carcinus maenas*, Figure 18; Fisheries, Aquaculture and Rural Development, 2008). The rate of dispersal of the European Green Crab throughout the Northumberland Strait and PEI has been rapid, with range expansions exceeding 100 km/year in some cases (Klassen and Locke, 2007).

9.3.1 Agricultural Effluents (Threat Status: Medium)

Between 1962 and 2011 there have been 51 documented fish kills on PEI that were either proven or suspected to have been caused by pesticides (Agriculture and Forestry, 2014). Fish as well as insects, amphibians, and other aquatic creatures can experience significant mortality downstream from these events (Agriculture and Forestry, 2014). Additionally, low-lying wetlands can accumulate nutrient and sediment runoff from nearby agricultural fields, which can contribute to accelerated rates of wetland succession (Stevens et al., 2003). Current pressures from large scale farming operations and commercial developments continue to degrade both the quantity and quality of freshwater wetlands (Environment, Energy and Forestry, 2007). Within 275 m of all wetlands in the Bioregion, approximately 28% of the area consists of agricultural land. Within Bird Conservation Region 14 PEI, 17 species or 33% of priority bird species utilized cultivated or managed lands within the Bioregion. The most frequently identified threat is contamination from pesticide spraying, which can either directly affect bird survival, or that of their food source (Environment Canada, 2013b).

9.4.1 Aquaculture Related Garbage and Solid Waste (Threat Status: Low)

The aquaculture industry on PEI primarily involves the culture of mussels, oysters, and salmonids (Agriculture and Fisheries, 2016). There are no marine waters leased for finfish culture on PEI; all finfish culture operations are land based (N. MacNair, personal communication). Current shellfish aquaculture activity in PEI is limited to bays and estuaries, and is approaching full capacity with current management techniques, available technology, and the demand for multiple water users (MacEwen et al., 2008). As of 2009, mussel leases occupied approximately 42 km² (4,200 ha) of coastal and estuarine water (Cranford et al., 2009), although there are currently 77 km² (7,700 ha) of valid lease contracts in the province (Figure 19).

Anthropogenic marine debris will float at the sea surface and consequently may be transported away from its original source. During this time it may cause substantial ecological harm due to ingestion or entanglement by marine biota including (but not limited to) petrels, shearwaters, shorebirds, gulls, whales, dolphins, seals, fish, and crustaceans (Laist, 1997). Furthermore, floating debris could potentially transport invasive species to distant areas where these species did not previously occur (Thiel et al., 2013). For example, invasive tunicates are closely associated with aquaculture equipment within the province (Locke et al., 2007). There are currently valid aquaculture leases in close proximity to most coastal islands within the Bioregion, with the exception of Governor's Island and Holman Island. Styrofoam buoys used in aquaculture can easily become detached, and drift away to nearby shorelines. Buoys are easily broken down in the marine environment, and generate significant Styrofoam debris (Lee et al., 2015). During a 2015 shoreline beach clean-up, over 15 metric tonnes of material with a volume exceeding 200 cubic metres, at eight estuaries supporting mussel aquaculture (PEI Aquaculture Alliance, 2015).

ii. Emerging Threats

11.1.1 Coastal Erosion and Sea-level Rise (Threat Status: Medium)

The largest area of high sensitivity coastline in Canada includes PEI, New Brunswick, and Nova Scotia. Climate change will bring with it higher tidal fluctuations, as well as increased storm surges and erosion along

shorelines (Environment, Labour and Justice, 2014). Furthermore, accelerated sea-level rise may promote increased erosion by allowing waves to break further up the beach profile (Shaw et al., 1998a,b). Additional factors contributing to erosion on the Island include increased use of the coast for recreational and residential purposes, as well as limited offshore winter ice cover (Catto et al., 2002).

The coastline of PEI is characterized by easily erodible sedimentary rock, composed mostly of sandstones and claystones. The average shoreline erosion rate varies from 0.5 m/year on the south and east shores, to as much as 1.5 m/year on the north and west shores due to the high degree of exposure to storm conditions (Environment, Labour and Justice, 2014). The average rate of coastline change measured for every meter of the entire Island from 1968 to 2010 is 28 cm/year (Figure 20; A. Fenech, personal communication). Dune-backed shorelines are highly mobile and may retreat rapidly, but subsequently recover. However, the shoreface, near-shore bar complexes, and beaches in much of the study area are sand-limited. Individual large storms can cause local rapid erosion from which recovery may take decades if the impacts are sufficiently large. Sections of the coast formed in low sandstone or till over sandstone cliffs exhibit slow but persistent retreat at rates < 1 m/year (Forbes et al., 2004).

Charlottetown tide-gauge records show mean relative sea-level rise of 3.2 mm/year since 1911. A further rise of 0.7 m is projected over the next 100 years (Forbes et al., 2004). As sea-level rise continues to accelerate, there is concern that the rate of sea-level rise will outpace the rate of accretion, and salt marshes will drown (Gedan et al., 2009). The mean rate of erosion of marshes is generally lower compared to bluffs, cliffs and dunes (e.g. O'Carroll, 2010).

Table 10a – Summary of Threats to the PEI Bioregion

Threats⁴ Across Habitats	Beaches and Dunes	Coastal Islands	Salt marshes	Freshwa ter Wetland s	Rivers, Streams, and Riparian areas	Acadian Forest Mosaic	Agro- ecosyste ms	Overall Threat Rank
1.1.1. Housing, Cottage and Rural Development	Medium	Medium	Medium	Medium	Medium	-	-	Medium
2.1.1 Agricultural Land Practices	-	-	Medium	Medium	High	Low	Medium	Medium
3.3.1 Wind Energy Development	-	-	-	Low	-	Low	-	Low
4.1.1 Road Fragmentation	-	-	High	High	High	High	Medium	High
5.3.1 Wood Harvest	-	-	-	-	Low	Medium	-	Low
6.1.1 Tourism and Recreation	Medium	-	Low	Low	-	-	-	Low
7.2.1 Culverts and Stream Crossings	-	-	High	-	High	-	-	High
7.3.1 Coastal Armouring	Low	-	Low	-	-	-	-	Low

⁴ Threat nomenclature is based on the IUCN classification of direct threats (IUCN-CMP 2012).

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8.1.1 Invasive non- native or alien species	Not specified	Not specified	Medium	Not specified	Not specified	Not specified	-	Low
9.3.1 Agricultural Effluents	-	-	-	Medium	Medium	-	-	Medium
9.4.1 Aquaculture related garbage and solid waste	Low	Low	Low	-	Low	-	-	Low
11.1.1 Coastal Erosion	Medium	High	Medium	-	-	-	-	Medium
Threat Status for Habitats and Project	Medium	Medium	High	Medium	High	Medium	Medium	High

Table 10b - Description of the threat ranks towards the conservation priority habitat types for the PEI Bioregion

Very High	The threat is likely to <i>destroy or eliminate</i> the priority habitat type
High	The threat is likely to <i>seriously degrade</i> the priority habitat type
Medium	The threat is likely to <i>moderately degrade</i> the priority habitat type
Low	The threat is likely to <i>only slightly impair</i> the priority habitat type
-	The threat's impact on priority habitat type is negligible
Unknown	The threat's impact on priority habitat type is <i>unknown</i>

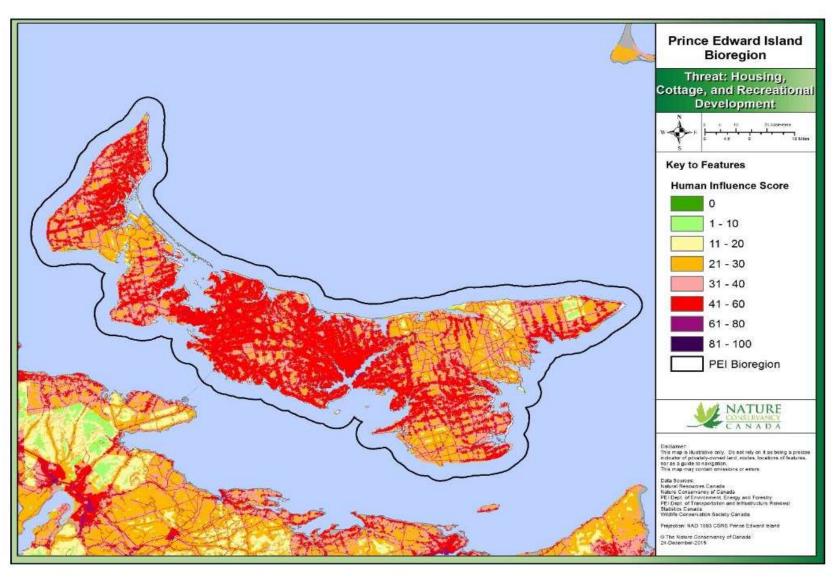


Figure 11 – Human Footprint Index of the PEI Bioregion

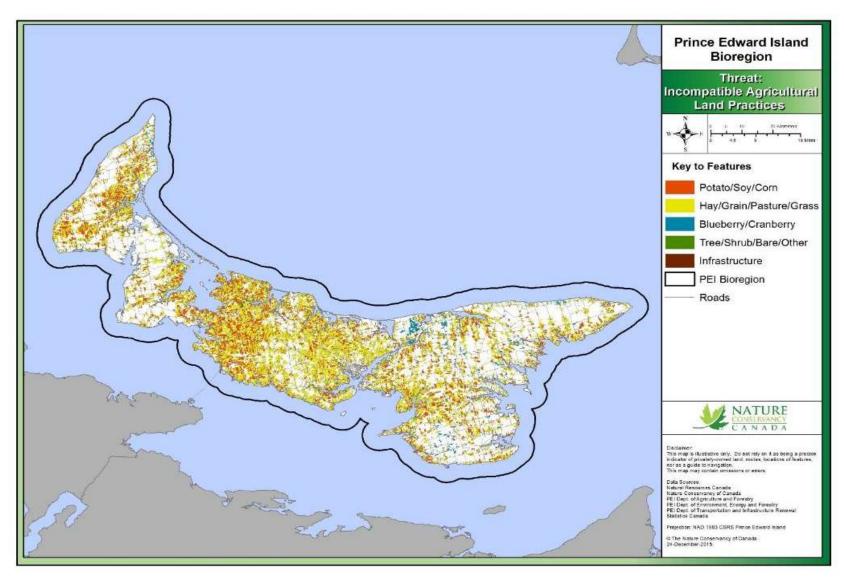


Figure 12 – Incompatible Agricultural Land Practices for the PEI Bioregion

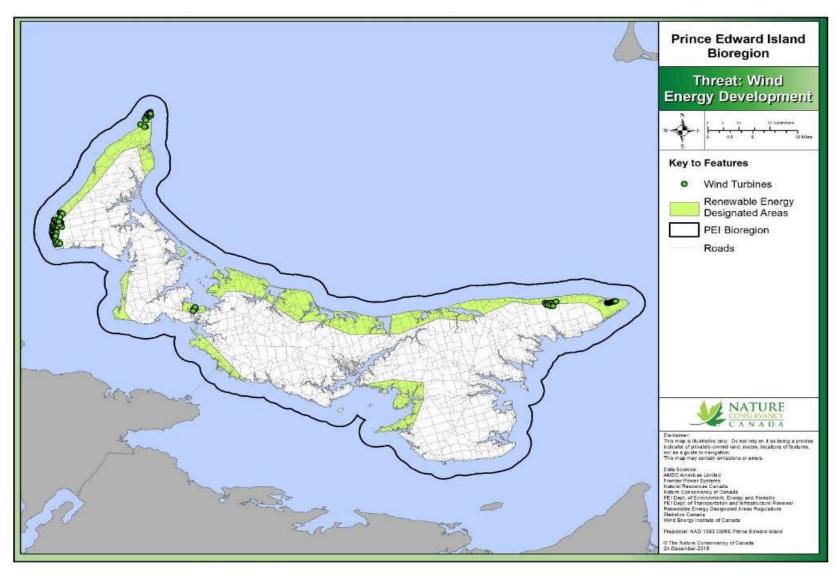


Figure 13 – Wind Energy Development in the PEI Bioregion

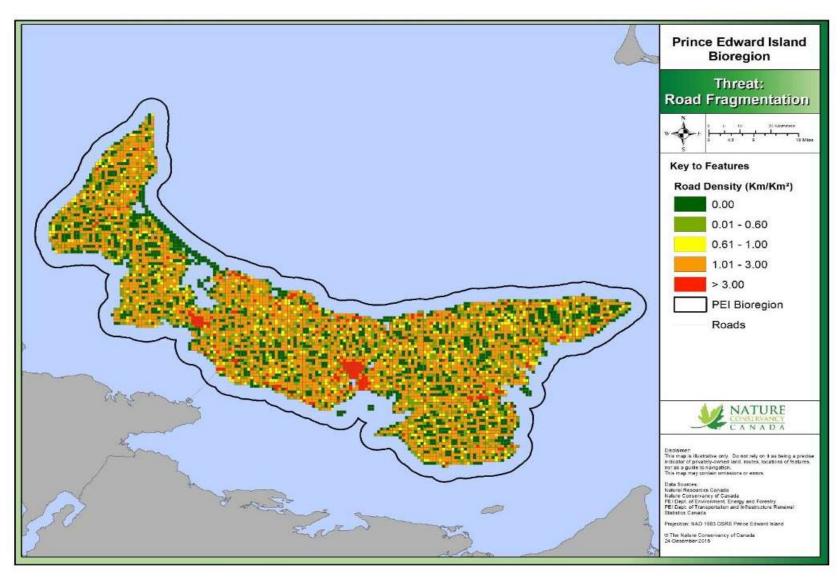


Figure 14 – Road Fragmentation across the PEI Bioregion

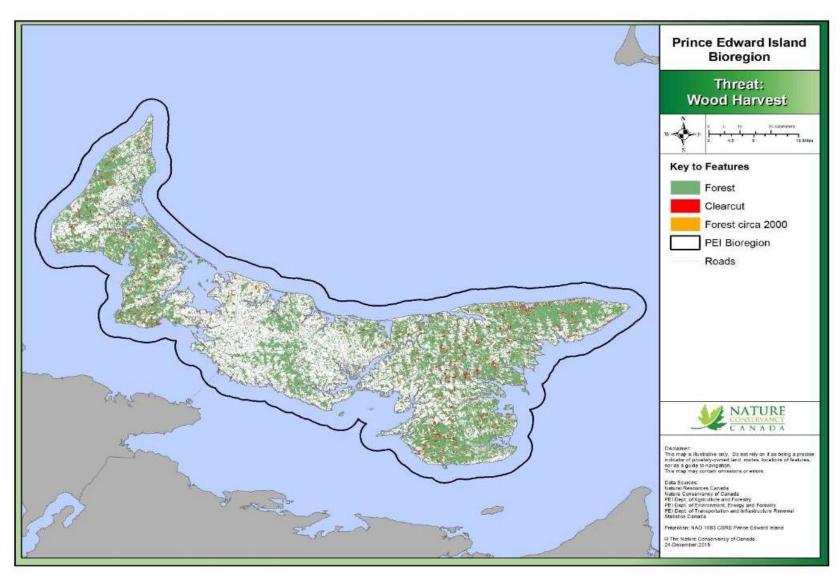


Figure 15 – Wood Harvest in the PEI Bioregion

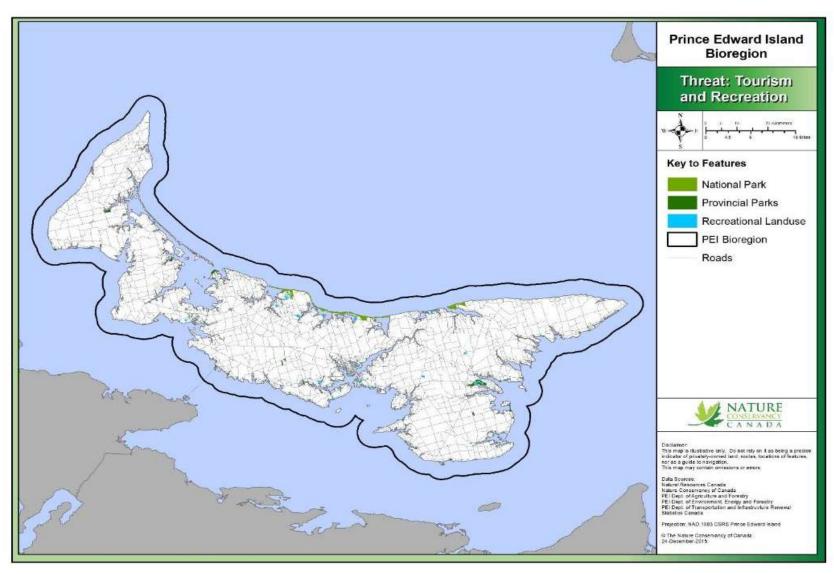


Figure 16 – Tourism and Recreation in the PEI Bioregion

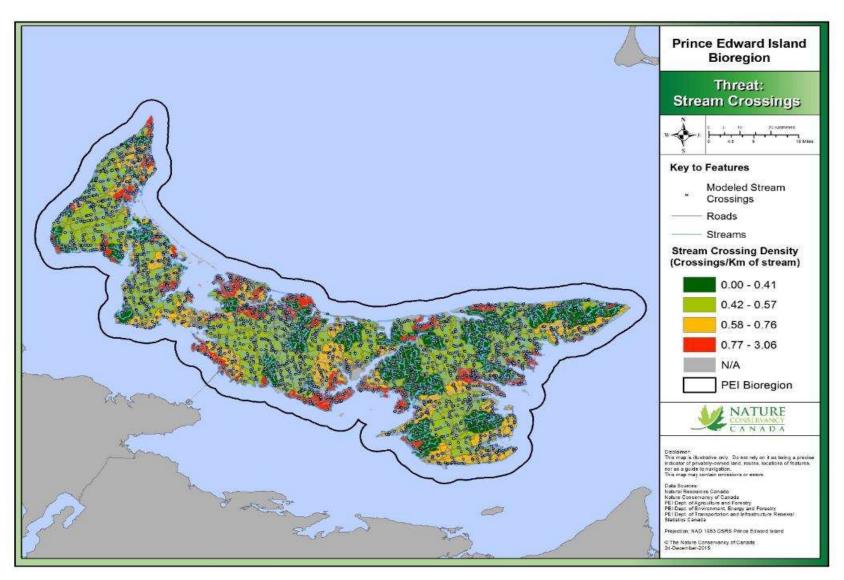


Figure 17 – Stream Crossings in the PEI Bioregion

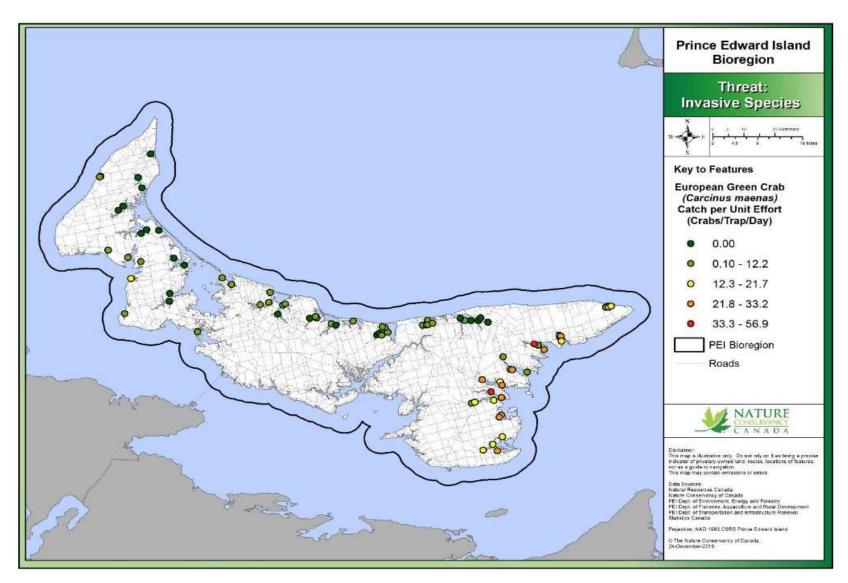


Figure 18 – Distribution of European Green Crab in PEI Bioregion

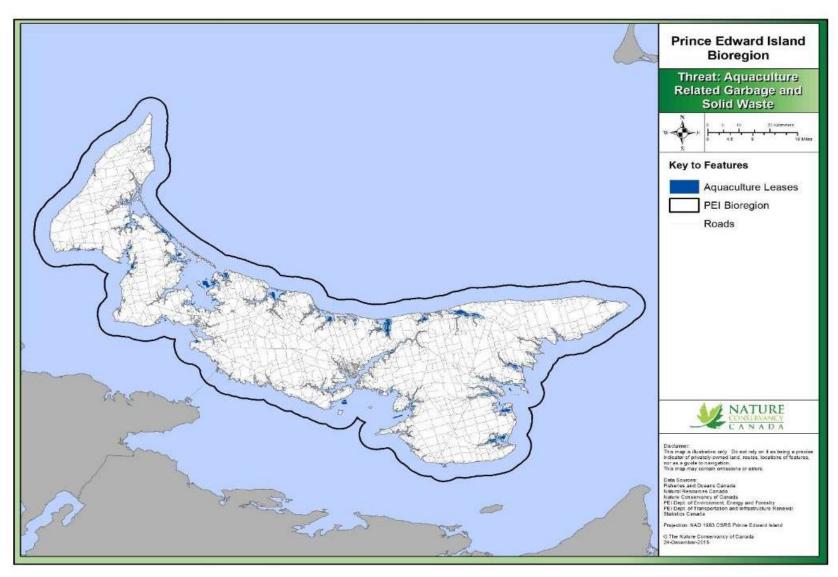


Figure 19 – Aquaculture leases in the PEI Bioregion

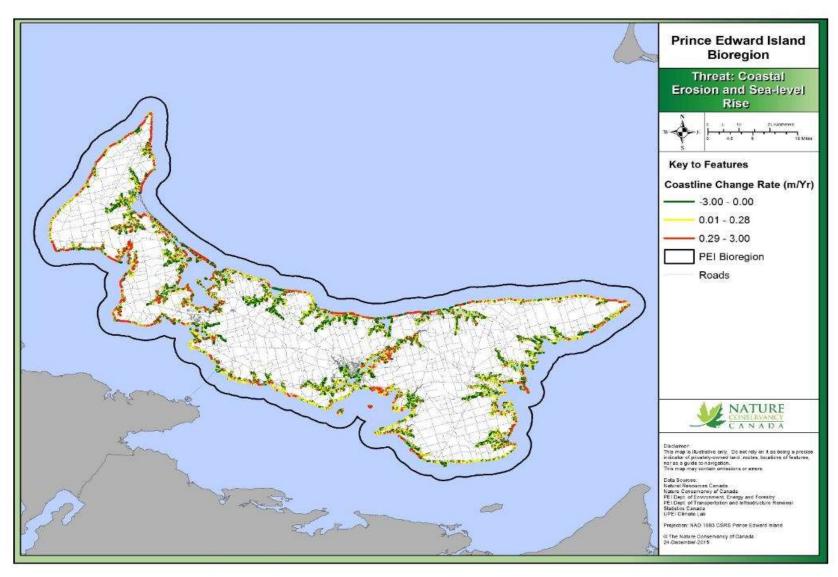


Figure 20 – Coastal Erosion in the PEI Bioregion

C. Biodiversity Composite Maps

Spatial data were gathered for each priority species from various sources. For some species, multiple sources of spatial data exist, so the most complete or appropriate dataset was chosen (see Appendix H). A single layer of information was derived for each species based on the most appropriate data available. A detailed description of the methodology used to create the species layers can be found in Appendix G, and the full list of priority species, their conservation status, habitat association and data source can be found in Appendix C. Species occurrence data are for the most part temporally and/or spatially incomplete. As such, the maps can be expected to reflect bias due to uneven intensity of survey effort. Such bias expectedly is pronounced in maps of species for which detections are rare (e.g., difficult to detect species, rare species), surveys are opportunistic and unevenly distributed, or require an intensity that precludes complete coverage, leading to uneven effort. Centre.

Species maps are generated at the scale of the bioregion, and all species receive equal weighting in species composite maps (see below). An overall biodiversity composite, including the full suite of terrestrial and aquatic species identified as priorities, was generated for the bioregion (Figure 24), as well as partial composites representing different sub-suites of priority species (Figures 25-37). Specific data and detailed methodology used to generate each of the various composite maps are presented in Appendix H.

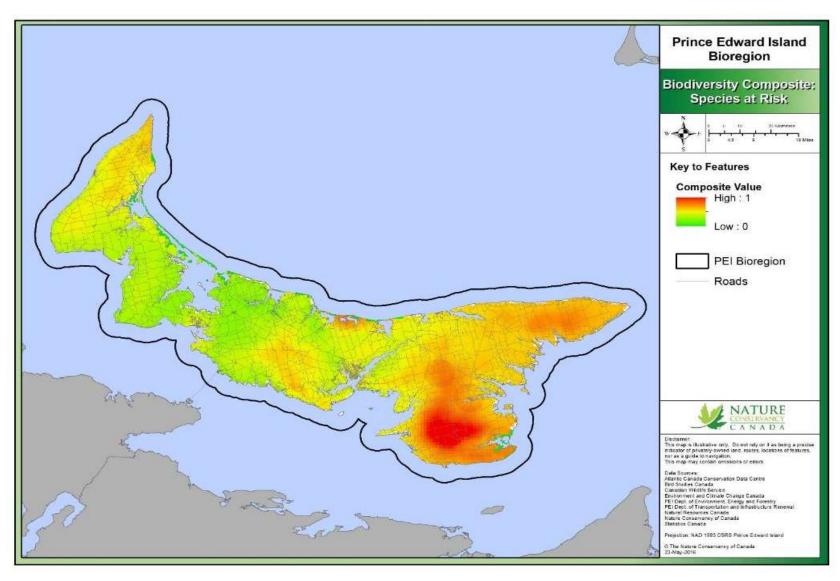


Figure 21 - Species composite for the full list of species-at-risk in the PEI Bioregion

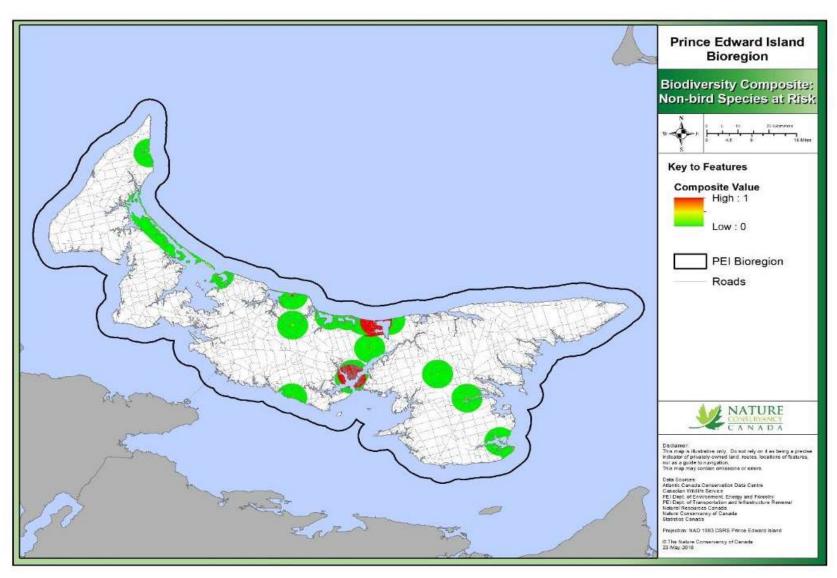


Figure 22 - Species composite for the full list of species-at-risk (non-birds) in the PEI Bioregion

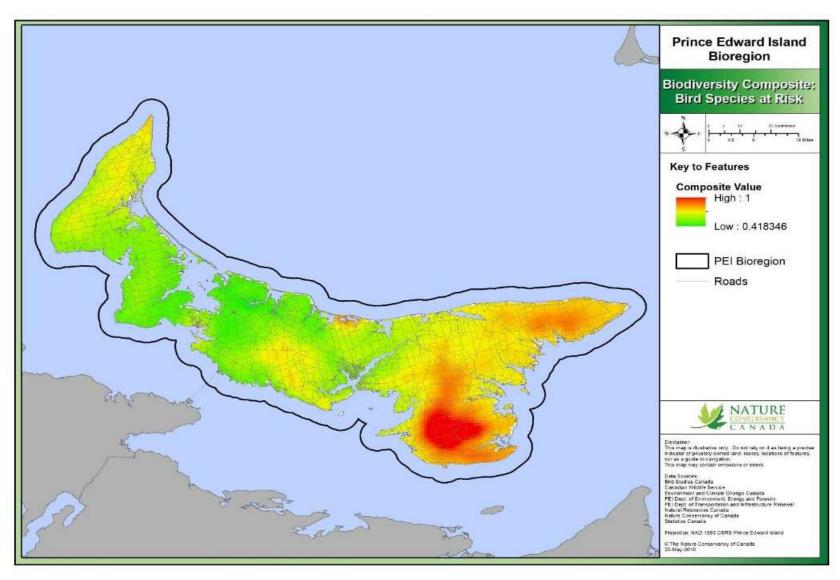


Figure 23 - Species composite for the full list of species-at-risk (birds) in the PEI Bioregion

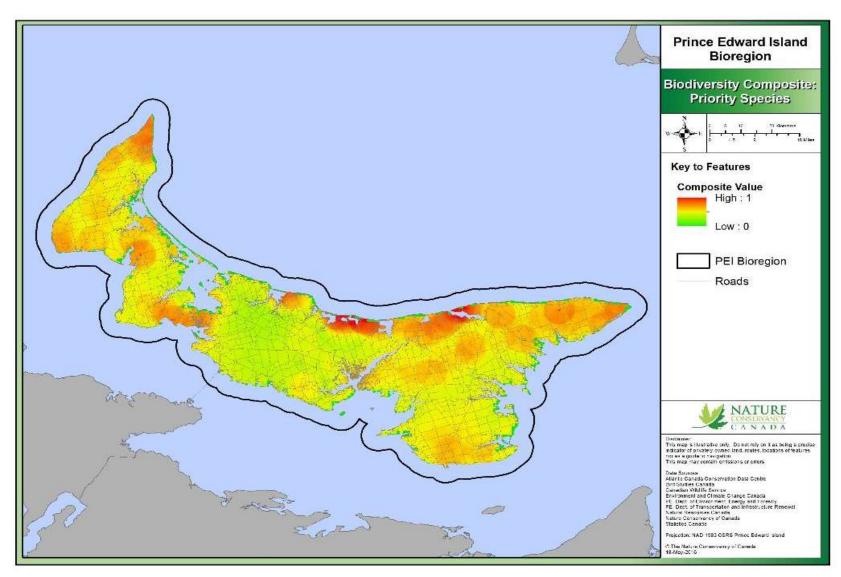


Figure 24 - Species composite for the full list of Priority Species in the PEI Bioregion

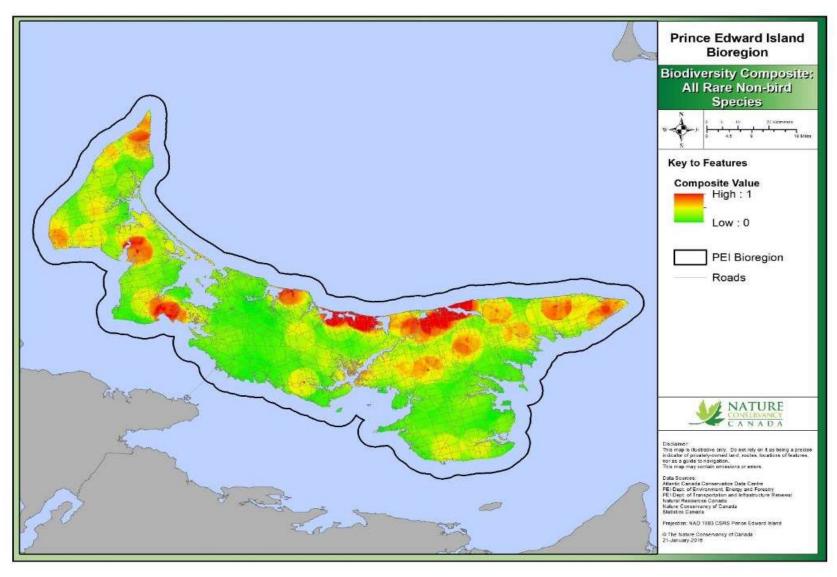


Figure 25 - Species composite for the full list of rare and priority significant species (non-bird) in the PEI Bioregion

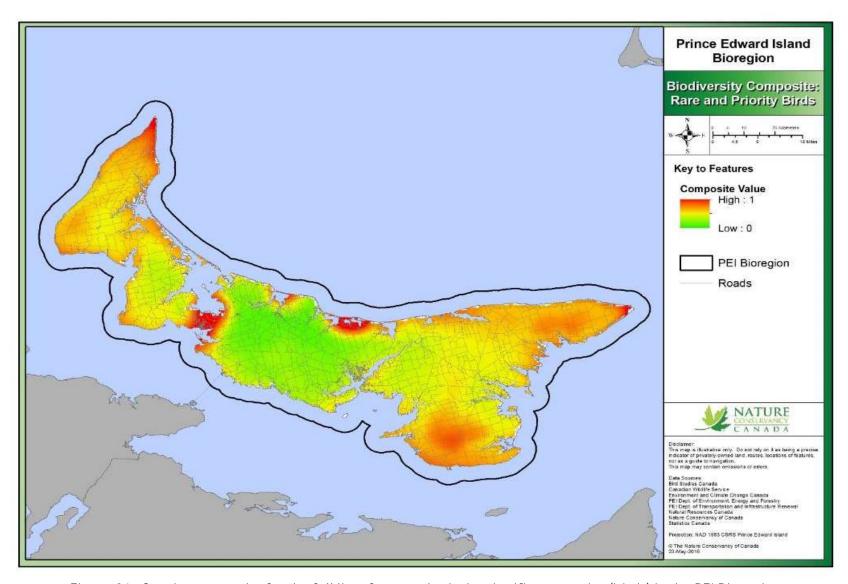


Figure 26 - Species composite for the full list of rare and priority significant species (birds) in the PEI Bioregion

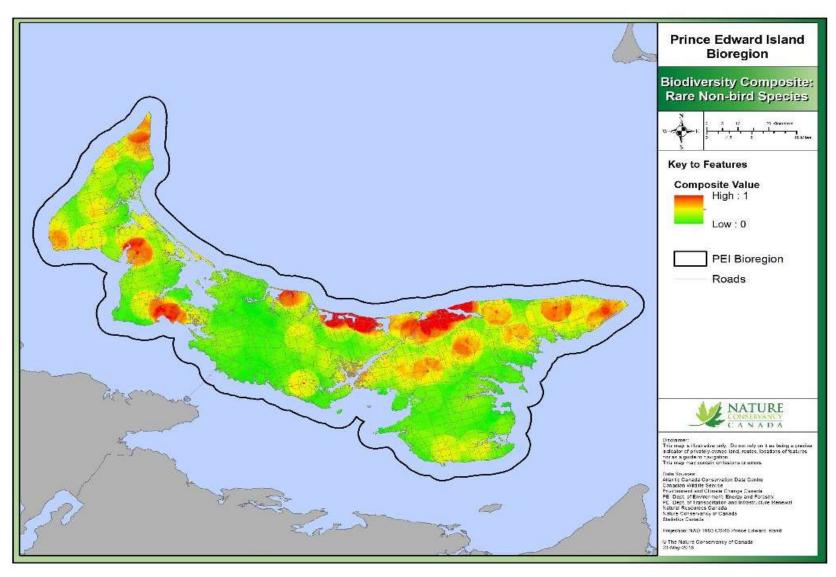


Figure 27 - Species composite for the full list of rare significant species (non-birds) in the PEI Bioregion

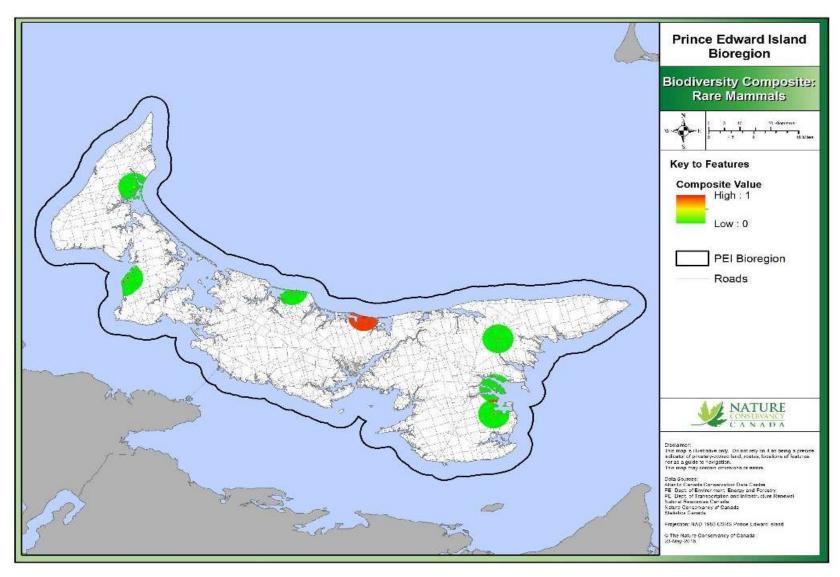


Figure 28 - Species composite for the full list of rare and priority significant species (mammals) in the PEI Bioregion

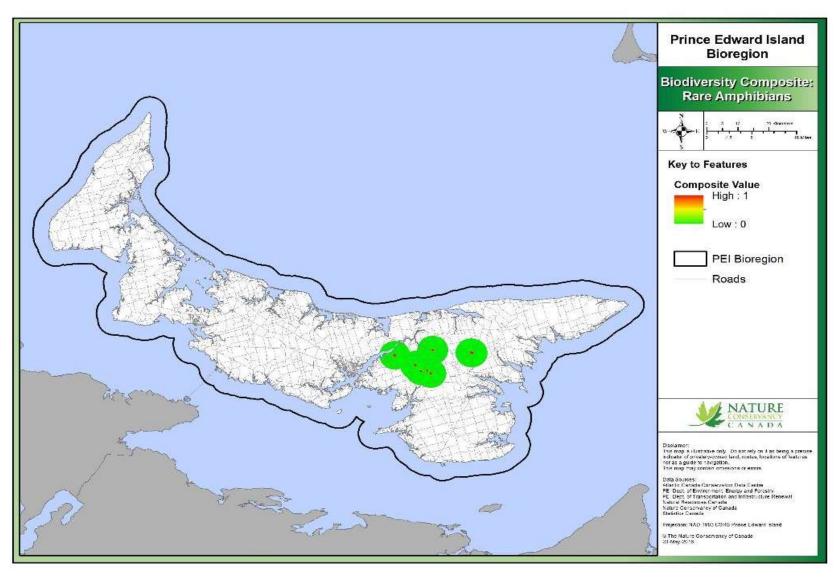


Figure 29 - Species composite for the full list of rare and priority significant species (Amphibians) in the PEI Bioregion

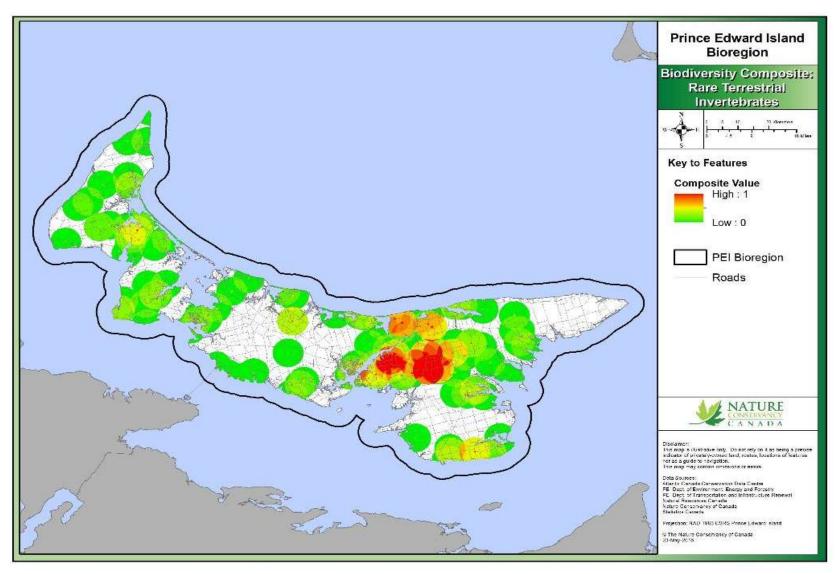


Figure 30 - Species composite for the full list of rare and priority significant species (Terrestrial invertebrates) in the PEI Bioregion

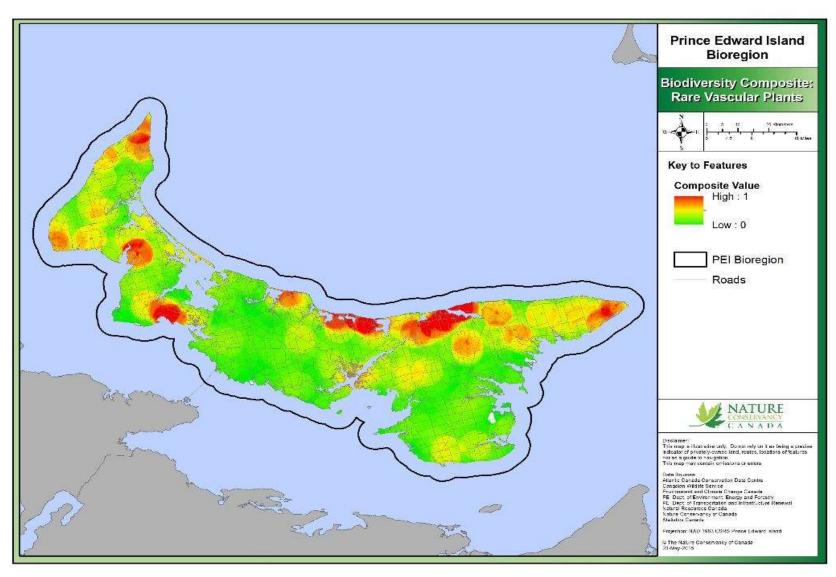


Figure 31 - Species composite for the full list of rare and priority significant species (Vascular Plants) in the PEI Bioregion

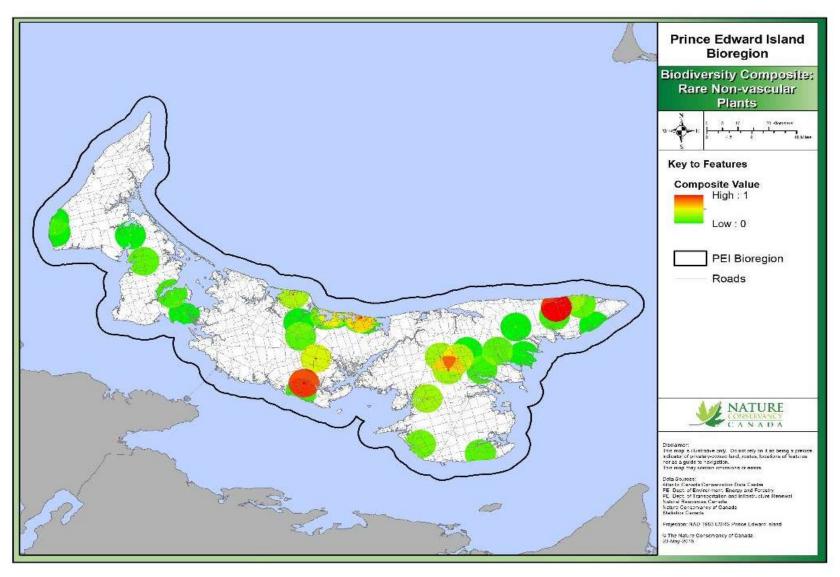


Figure 32 - Species composite for the full list of rare and priority significant species (Non-vascular Plants) in the PEI Bioregion

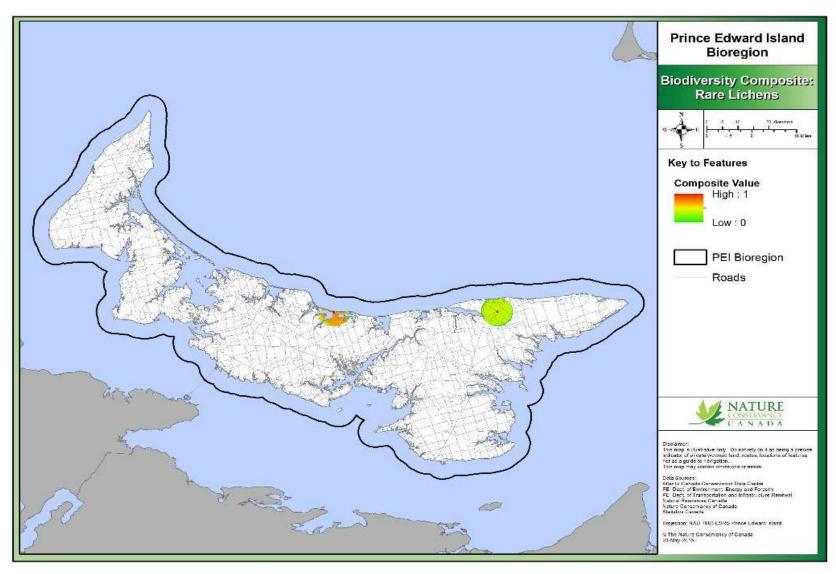


Figure 33 - Species composite for the full list of rare and priority significant species (Fungi and Lichen) in the PEI Bioregion

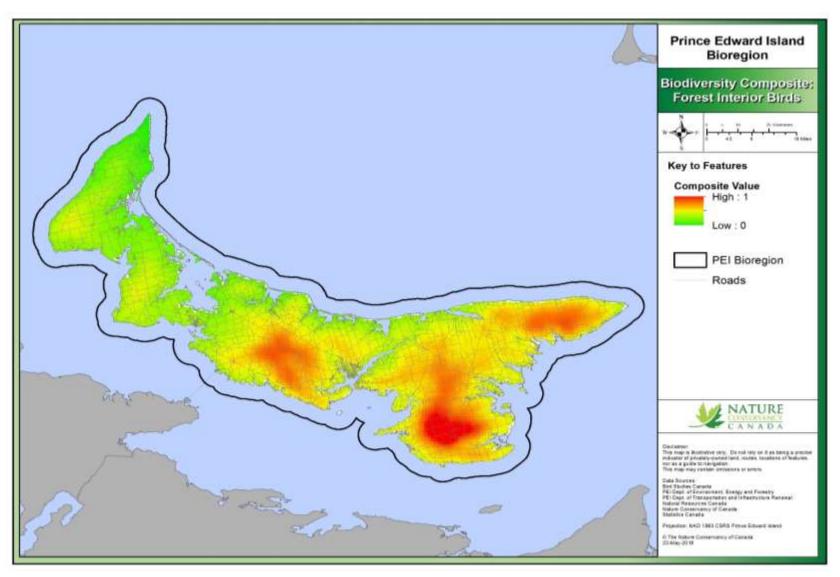


Figure 34 - Species composite for the full list of rare and priority significant species (Other - forest interior birds) in the PEI Bioregion

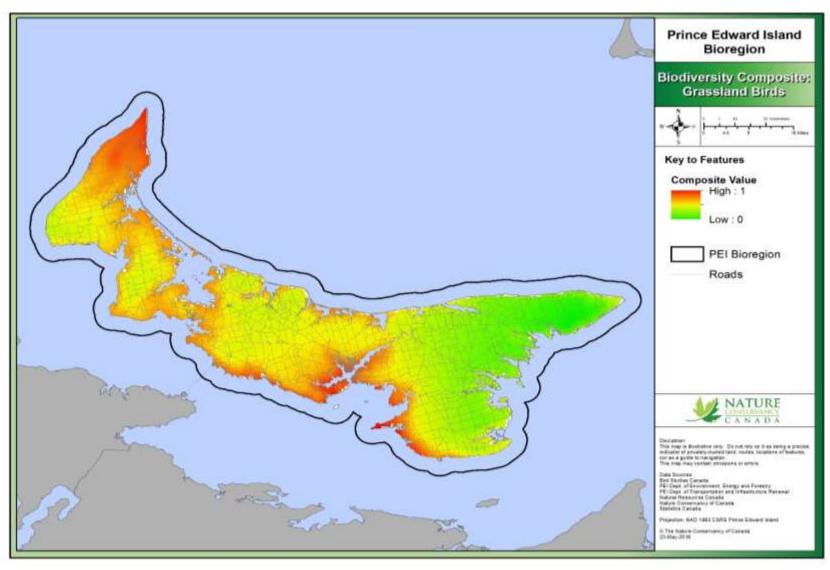


Figure 35 - Species composite for the full list of rare and priority significant species (Other - grassland birds) in the PEI Bioregion

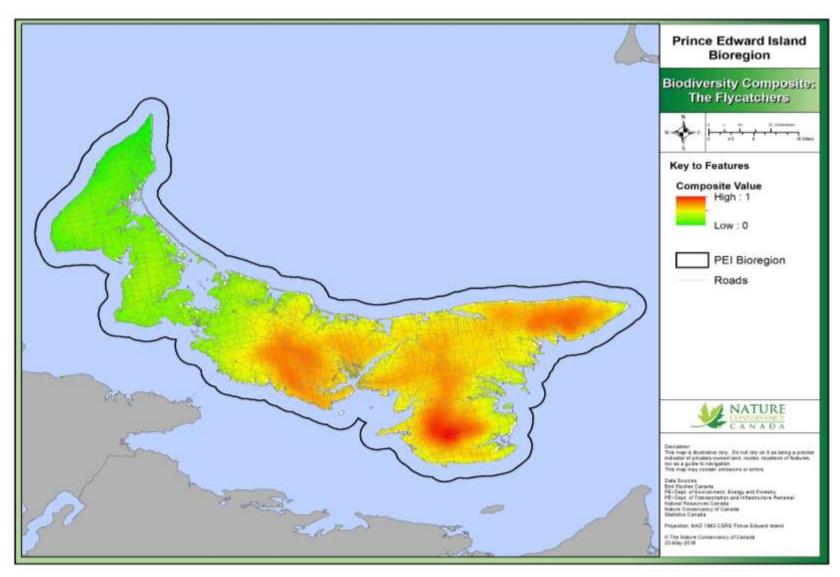


Figure 36 - Species composite for the full list of rare and priority significant species (Other - flycatchers) in the PEI Bioregion

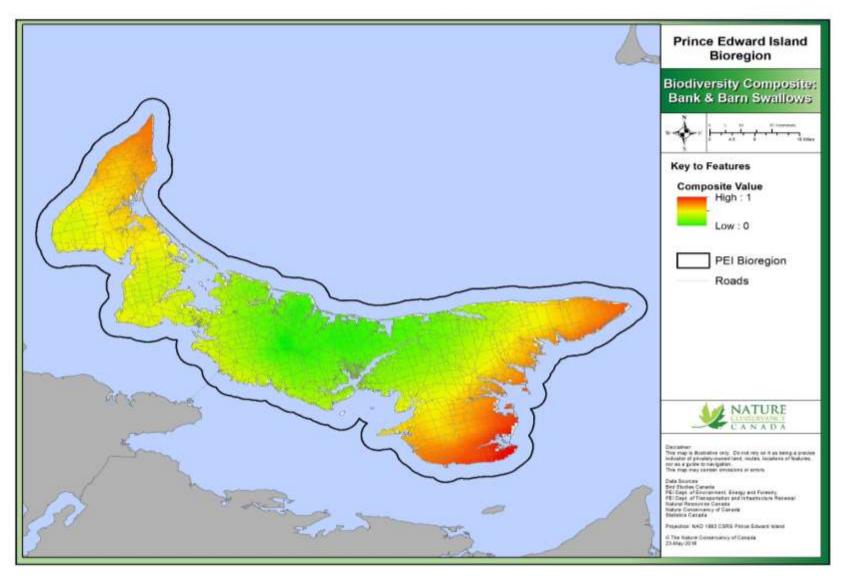


Figure 37 - Species composite for the full list of rare and priority significant species (Other – bank and barn swallows) in the PEI Bioregion

D. Conservation Value Index

As part of this Habitat Conservation Strategy, methodologies were developed to define a Conservation Value Index to identify areas within the PEI Bioregion that have high conservation value, including significant species and priority habitats. The goal is to achieve the best possible impact of collective conservation actions in the bioregion in those areas that are the most critical for the defined habitat conservation priorities and significant species, while minimizing their associated threats.

The Conservation Value Index has two components: (1) a score based on attributes of the defined habitat conservation priorities, which includes consideration of the uniqueness, representivity, and size of individual patches of defined habitats (see Appendix E for a detailed description of the methodology), and (2) a score based on a kernel density estimation of the likelihood of occurrence of significant species within the Bioregion (see Appendix F for a detailed description of the methodology). The two scores were combined to yield the Conservation Value Index for the PEI Bioregion, which is presented in Figure 38. Table 11 presents a summary of the results of the analysis.

Survey information, conservation status and habitat dependency differs across the broad range of priority species included in calculating the overall Conservation Value Index. To address this issue, composite maps were also calculated for a number of subsets of the full list of significant species (Figures 22-29).

Table 11 - Summary results of the conservation action prioritization in the PEI Bioregion.

Priority Ranking	Break Values/Scores	# of land units (legal parcels)	Acres	Hectares	% of Bioregion
Very High	0.55-1.00	6,429	415,246	168,044	30.21%
High	0.33-0.54	11,220	451,775	182,827	32.86%
Moderate	0.13-0.32	15,396	358,192	144,955	26.06%
Low	0.00-0.12	65,421	149,449	60,480	10.87%
Total	N/A	98,466	1,374,662	556,306	100%

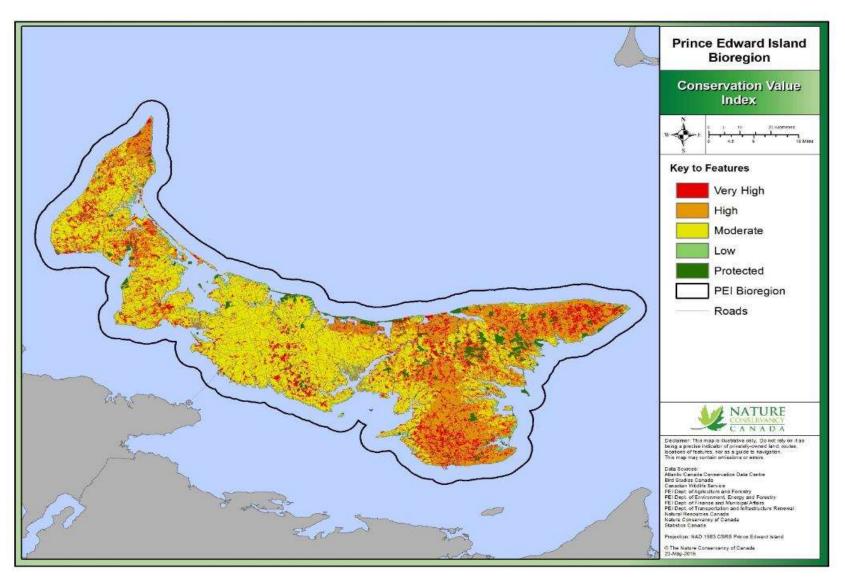


Figure 38 – Conservation Value Index for the PEI Bioregion

3. CONSERVATION STRATEGY

This Habitat Conservation Strategy has been developed by partners and collaborators interested in the conservation of PEI's natural biodiversity. The purpose of this strategy is to identify the species and ecosystems of conservation priority for the PEI Bioregion, their spatial location, and the actions that conservation organizations plan to undertake to achieve their conservation and stewardship.

A. Vision

The biodiversity of the PEI Bioregion is thriving, there is a good understanding of species distribution across the province, and species-at-risk populations are stabilizing. Thanks to a collaborative effort between conservation partners, there are large and intact areas of habitat across the bioregion, where representative ecosystems are able to age towards a mature state without risk of development. Conservation education and outreach compliment conventional land securement in areas where habitat corridors are not possible. Scientific research projects are undertaken by reputable institutions to increase knowledge around species conservation and invasive species distribution. Positive relationships exist between agriculture and conservation, where land and natural resources are used sustainably. There is a sense of community and pride in the natural heritage of PEI; residents have been actively involved in locally-driven conservation and stewardship success.

B. Goals

The conservation goals that have been identified to guide the development of the PEI Habitat Conservation Strategy are:

- 1. To improve forest habitat quality across the bioregion, primarily through restoring connectivity of forest habitat, and secondarily through protection of mature Acadian forest communities.
- 2. Maintain suitable habitat for shorebirds, waterfowl, and colonial nesting birds throughout the bioregion by securing strategic coastal areas and coastal islands
- 3. To work towards a no-net-loss of wetland (including buffer) to maintain critical function of freshwater wetlands across the bioregion.
- 4. To restore and maintain stream, river, and riparian area connectivity across the bioregion by working collaboratively with partners.
- 5. Help maintain agroecosystems for the benefit of the species-at-risk that utilize them.

C. Key Conservation Opportunities and Constraints

Fundraising on PEI can be a significant challenge. The base population of the province is small and there are 585 registered charities vying for support. Compared to other provinces, there is a significantly smaller population of individuals capable of making large gifts, and most fundraising initiatives within the province are grass-root campaigns.

A rising awareness around the importance of sustainability in agriculture and commercial fisheries has generated some attention towards conservation efforts. However, they are more concentrated

towards finding sustainable solutions to maintain trade more so than taking potentially arable land out of commission. The University of Prince Edward Island recently began a School of Sustainable Design Engineering, which may be a potential future partnership to begin tackling large-scale conservation problems with engineering solutions (especially where land securement is not a feasible solution). Improving culvert and dam structure to allow for restoration of natural hydrology is one such example.

The land base of PEI is predominantly in private ownership, with approximately 10% being owned by the province. This presents an opportunity for private land acquisition, especially since so little of the province is currently under protection (conservation lands equal 3.6% of the land base). Land conservation opportunity varies per county: in Prince and Kings Counties, land acquisition opportunities are greater because of lower population densities, and higher landscape intactness. As of July 2015, Queens County contains 58% of the province's population, has largely been converted to agricultural land and is the home of the province's largest city. It also represents habitat types most in danger of development, and the province's highest land prices outside of coastal regions. In areas where agriculture is a predominant feature, land securement may not be the most feasible solution to conservation. This is an opportunity to research other conservation methodologies to decide what works best for the communities within the landscapes.

Coastal land value in PEI varies. Most of the north shore is publicly owned, except for portions of the western barrier beaches (i.e. Cascumpec and Conway Sandhills). Development of primary, secondary, and tertiary sand dunes is prohibited, but there are many examples of grandfathered subdivisions and lots. Landowners who own existing natural coastal habitat today expect that fair market value of their property has remained high despite prohibition of dune development. Parcel size of most cottage lots is small, further limiting coastal conservation land opportunities.

Conservation partners worked together to create a list of other opportunities outside of traditional land securement, which is compiled below.

Education & Awareness opportunities:

- Awareness and education events on specific conservation targets:
 - o demonstrating the importance and benefits of stream connectivity
 - o Different and more sustainable ways of farming
 - o Raising public awareness of the impact of road fragmentation on wildlife
 - "leave no trace" principles
 - Encourage woodlot owners towards restoration of forests post-harvest, and maintenance of patch sizes
 - o Raise awareness about the lack of longevity and effectiveness of traditional armoring practices
 - Education and awareness around invasive species and how to identify them (especially plants)
 - o Education for tourists and use groups on appropriate use of the site
 - Promotion of planting and propagating native species
- Promote existing tools more effectively; i.e. tools provided by the Atlantic Climate Adaptations Solutions Association (ACASA), Alternative Land Use Service (ALUS)
- Reach out to indirect partners like the real estate market, and municipality groups, to educate them about land in PEI and encourage them to recognize land conservation opportunities (i.e. swampy land, bogs, "un-usable" land, coastal land with erosion)

- Conservation groups should take advantage of local or traditional knowledge: set up events with farmers who farm sustainably, or responsible fisherman, to learn about what they see and witness as they work on the land/sea every day.
- Incorporate experiential visits and ecotourism into conservation plan as a way to increase public knowledge and appreciation of natural habitat

Government legislation and policies:

- Encourage the province to mandate an increase in the watershed buffer zone from 15m to a minimum of 30m
- Encourage changes and improvements to provincial land use planning strategies
- Encourage government to enforce existing legislation that protects buffer margins between housing and coastline
- Encourage government to create a follow-up assessment for appropriate culvert designs for newly installed culverts
- Encourage government to change how permits are given for coastal armouring (based on coastal dynamics rather than site by site)
- Encourage government to increase public consultation for new roads and road development
- Encourage government to create a follow-up impact assessment after new roads installed
- Encourage government to create legislation for impact assessments and design/site standards for windmill sites. This should include for habitat and species.
- Encourage government to provide an incentive for stream crossing reductions
- Encourage government to enforce legislative penalties and charges
- Work with governments to reduce the spread of invasives (i.e. transportation) and promote active regulation of invasive species

Collaboration:

- Providing educational/workshop opportunities between conservation groups, providing further training opportunities and knowledge of new techniques and standards in our field, and strengthening relationship between conservation groups
- Collaboration between watershed groups and other partners to ensure proper installation of culverts and dams
- Encourage private landowners to place their property under the Natural Areas Protection Act
- Encourage Federation of Agriculture leader to look beyond potatoes
- Develop Fisheries management strategy in conjunction with watershed groups to help establish targets for certain groups of species, which will triage what activities could/should be permitted in various watersheds
- Partner with watershed groups to help communicate with private landowners
- Partner with environmental industry companies that promote small scale green power solar panels
- Partner with environmental industry companies to provide public workshops and engagement sessions to encourage sustainable energy use and available technologies
- Work with industry (i.e. horticulture, agriculture, etc.) to reduce the spread of invasives, educate consumers and offer alternatives

Research & Funding:

- Ensure upkeep funding for existing functional structures
- Investment in research opportunities, including wave height/intensity measurements, tide gauges overview
- Engage in more baseline inventories (flora, fauna) and environmental impact assessments through contractors
- Investment in new equipment that facilitates conservation research:
 - o Drone (with thermal imaging camera or near-field IR)
 - o ATV or side-by-side with small bed for transporting field equipment or garbageitems at clean ups
 - o Trail cameras for wildlife photography
- Increase frequency of land cover / land use mapping in the province, which is currently limited to once every 10 years
- Establishment of a Curator of Natural History and museum with PEI records for the province
- A renewed biodiversity strategy employed by the Government of PEI
- Investment in infrastructure that is scientifically demonstrated to improve fish passage

D. Conservation Partners

i. National and Province Partners

Province of PEI - Communities, Land, and Environment (CLE)

The Department of Communities, Land and Environment takes action to safeguard the environment; protect land and water resources; and foster strong communities and local government. The Province of PEI (CLE) is responsible for managing all conserved provincial lands in PEI, both through Wildlife Management Areas and lands protected by the Natural Areas Protection Act.

The Nature Conservancy of Canada

The Nature Conservancy of Canada (NCC) is the nation's leading land conservation organization, working to protect Canada's most important natural areas and the species they sustain. Since 1962 NCC and its partners have helped to protect more than 1 million ha across Canada. NCC has been helping to protect land in PEI since 1982 and has worked with individuals and communities to protect more than 2,100 ha across the province and bioregion.

Parks Canada

On behalf of the people of Canada, Parks Canada protects and presents nationally significant examples of Canada's natural and cultural heritage, and foster public understanding, appreciation and enjoyment in ways that ensure the ecological and commemorative integrity of these places for present and future generations. Parks Canada operates the Cape Breton Highlands National Park.

Environment and Climate Change Canada - Canadian Wildlife Service

The Canadian Wildlife Service (CWS) has a mandate which focuses on migratory birds, species at risk, and their habitats, and is centered on the implementation of the Migratory Bird Convention Act, Canada Wildlife Act, Species at Risk Act, Canadian Environmental Protection Act, and the Federal Policy on Wetland Conservation. CWS identifies, designates and protects important habitats such as National Wildlife Areas under the Canada Wildlife Act and Migratory Bird Sanctuaries under the Migratory Bird Convention Act. In addition to conducting migratory bird surveys, CWS provides support for activities that benefit species at risk through its main funding programs, the Habitat Stewardship Program (HSP) and the Aboriginal Fund for Species at Risk (AFSAR). Additional funding

resources include the HSP and AFSAR Prevention Stream (for species other than species at risk), and the National Conservation Plan – National Wetland Conservation Fund, the Gulf of Maine Initiative, and the Ecological Gifts Program. Environment Canada also funds the EcoAction Community Funding Program, the Atlantic Ecosystem Initiatives, and Environmental Damages Fund. CWS works closely with its partners in the development of recovery documents for species at risk and supports activities described within recovery documents for the completion of the schedule of studies for the identification of critical habitat. CWS supports the EHJV, and provides science guidance to conservation partners on conservation actions and priorities for migratory birds, species at risk, and their habitats, including involvement in the development, refinement, and implementation of HCSs, and the NS Bird Conservation Region 14 Strategy. CWS shares its migratory bird survey data and expertise to inform biodiversity and habitat conservation initiatives that contribute to meeting not only the CWS mandate, but also the broader mandates and objectives of its conservation partners. CWS is supportive of the Habitat Conservation Strategy approach as it represents how species and habitat data can be compiled and assessed in ways that benefit a broader suite of conservation-oriented user-groups.

The Atlantic Canada Conservation Data Centre (AC CDC)

The ACCDC enhances data management and information on biodiversity in the region through the maintenance of the most comprehensive and current database on the distribution of biodiversity in Atlantic Canada. The ACCDC database includes more than 1,030,000 geo-located records of species occurrences, over 186,000 of which represent species of conservation concern, and represents the single most comprehensive and current source of information regarding the distribution of Atlantic Canada's biodiversity. They also conduct biological surveys in areas of high biodiversity significance to further understanding of rare species' status and distribution.

Ducks Unlimited Canada

Ducks Unlimited Canada (DUC) is the leader in wetland conservation. DUC partners with government, industry, non-profit organizations and landowners to conserve, restore, and manage wetlands and grasslands that are critical for waterfowl, wildlife and the environment. DUC protects land through several means, including acquisitions, conservation easements, and revolving lands strategies. They aim to develop initiatives to conserve coastal habitat for waterfowl to protect molting, staging, and wintering habitat; to maintain diverse habitat quality and quantity needed to sustain current breeding waterfowl numbers; to develop new initiatives that address problems of survival and recruitment of sea ducks; and to acquire wetland inventories and more complete waterfowl surveys to focus conservation programs. There are two wetlands in the Cape Breton bioregion that are maintained by DUC.

ii. First Nations Government

The M'ikmag Confederacy of Prince Edward Island

The Mi'kmaq are the only Indigenous People of PEI. They are separated geographically into two First Nation Councils: The Lennox Island First Nation, and the Abegweit First Nation. The Mi'kmaq Confederacy of PEI works to advance Aboriginal and treaty rights on PEI; together, both the Abegweit and Lennox Island First Nations work to promote knowledge and understanding of Mi'kmaq rights, culture and traditions through research, advocacy, partnership and programs and services.

The Integrated Resource Management (IRM) division of MCPEI is responsible for providing technical advice and assistance for all aspects of resources and resource management including environmental issues. The scope of work includes: Marine Fisheries; Food Social and Ceremonial Fisheries (FSC); Watershed Management; Species at Risk; Aquaculture; Hunting; Trapping; Forestry; Non-Timber Forest Products (NTFP); Crafts; Culturally Important Wildlife; Fresh Water Fishing; Agriculture; Land

Management; Land Use; Duty to Consult (DTC); Drinking Water; Wastewater Management; Wind and Solar Energy; Oil and Gas exploration; Climate Change; and other Environmental Issues as they arise.

Staff of MCPEI are involved in a number of projects focused on restoring and/or maintaining viable populations of culturally sensitive species in PEI, including Black Ash and Atlantic Salmon.

Their projects include the Abegweit Biodiversity Enhancement Hatchery, where both Atlantic Salmon and Brook Trout are raised to be released back to PEI rivers. The facility is also used for educational purposes to teach youth about the importance of environmental sustainability and biodiversity.

MCPEI also partners with the province of PEI to propagate Black Ash seedlings from PEI, growing them in nurseries before planting them in the appropriate habitat.

MCPEI works very closely with Parks Canada to achieve their mutual goals of co-managing the PEI National Park and Park Historic Sites, and the presentation of Mi'kmaq history and culture. Their latest endeavor involves the protection and co-management of Hog Islands in Malpeque Bay.

iii. Regional Partners

Island Nature Trust

Island Nature Trust (INT) is a non-government, not-for-profit land trust dedicated to the protection and management of Natural Areas in PEI (Canada). Island Nature Trust envisions a future where PEI has a network of protected, robust natural areas championed by knowledgeable, engaged Islanders. Its mission is to serve the Island community in natural areas expansion and conservation. In 1979, Island Nature Trust was incorporated as the first private, provincially-based nature trust in Canada. It is governed by a Board of Directors of 12 to 16 members, which includes 8 to 12 members of the Trust and one representative from each of four founding organizations: Museums and Heritage PEI, PEI Wildlife Federation, Natural History Society of PEI, and the Biology Department of the University of PEI. Island Nature Trust currently owns over 3,800 acres, protected under the PEI Natural Areas Protection Act and managed to enhance and restore ecological integrity. Stewardship and outreach programs include Piping Plover Guardians, Conservation Guardians, support for farmers who conserve habitat for bobolink and barn swallow, delivery of school curriculum modules related to beach – dune ecosystems and piping plover, support for the IBA program in PEI and engagement of woodlot owners in forest bird conservation.

PEI Watershed Alliance

The PEI Watershed Alliance (PEIWA) is non-profit cooperative association of watershed management groups on PEI. The overall goal of the PEIWA is to improve and protect the environmental quality of PEI watersheds, for the benefit of all Island residents. The Alliance shall empower Island watershed groups to achieve their goals by promoting cooperation, by serving their needs and by providing a strong, united voice in addressing Island-wide watershed issues.

PEI Invasive Species Council

The PEI Invasive Species Council is a non-profit group of individuals and organizations focused on the creation of a framework for the management of invasive species that threaten PEI's environmental, economic and social health. The PEIISC is hosted by Island Nature Trust, a non-profit, charitable land trust that provides the working group with administrative support and work space. Our council has representatives from federal, provincial and municipal governments, UPEI, and the community at large who wish to create a framework for the management of invasive species that threaten PEI's environmental, economic and social health.

Nature PEI

The Natural History Society of PEI has existed as an organization of Island residents with roots to the **1880's**. The current organization has existed since 1969 with a formal incorporation in 1991 as a registered, non-profit organization and is directed by a volunteer executive elected from its members. The founding mandate continues today. The Natural History Society of PEI was formed:

- To join together as a provincial body the nature lovers and other interested persons of PEI for the exchange of information and the keeping of records;
- To protect, insofar as humanly possible, the flora and fauna of the province;
- To promote, encourage, and enjoy the study of natural history;
- To create in the public mind a greater appreciation of the value of our wildlife and its habitat;
- To hold educational meetings and demonstrations designed to further public knowledge of our natural history;
- To assist, work with, and support other organizations, government bureaus or other agencies having similar or allied objects

University of Prince Edward Island - Biology

The Biology department at the University of PEI has a well-developed research component that includes a Master of Science program. Students also participate in research at the undergraduate level through the Honours program, special studies, and as summer employees. In addition to being able to supervise graduate students in the Department of Biology, some of our faculty members have graduate faculty adjunct appointments at other universities or through the Faculty of Veterinary Medicine at the University of PEI.

Through Holland College, students who complete the Wildlife Conservation Technology program can continue their studies at UPEI to complete Bachelor of applied wildlife conservation.

University of Prince Edward Island - Climate Lab

The UPEI Climate Lab conducts research and science on climate change vulnerability, impacts and adaptation. Established in 2012, the UPEI Climate Lab is launching research programs, monitoring programs, a volunteer watch system, a climate seminar series, an annual climate science symposium, a climate student award, training sessions, an academic programme on applied climate change, and an international peer-reviewed journal.

E. Actions

i. Partner Actions

The following table (table 12) presents the conservation actions undertaken by organizations working in the PEI bioregion to mitigate identified threats and contribute to the conservation of priority habitats and the species they host over the course of a five-year planning period. Though they cannot be considered comprehensive, actions are presented for each partner organization.

Table 12 – Conservation Actions and Associated Information for the PEI Bioregion

Conservation Actions – description of related actions (specific and measurable if possible) ¹	Collaborators	Expected date of Completion	Priority Habitat(s) ²	Primary Related Threat(s) ³
1. Land/Water Protection				
1.1 Site/Area Protection Protect a minimum of 700 hectares (1,730 acres) of P1 and P2 lands in the PEI Bioregion	NCC	2026	All targets	All threats
1.1 Site/Area Protection Acquire lands to be protected and conserved for future generations, manage these lands as an example of appropriate and sustained use, and help private landowners voluntarily protect their lands	INT	Ongoing	All targets	All threats
1.1 Site/Area Protection Continue management and protection of existing provincially protected lands and resource lands	Province of PEI	Ongoing	All targets	All threats
1.1 Site/Area Protection Protect a minimum of 50 hectares (124 acres) of P1 and P2 of hardwood Acadian forest mosaic and minimum of 100 hectares (247 acres) of Softwood Acadian forest mosaic	NCC	2026	Acadian Forest Mosaic	Wood harvest; road fragmentation, wind energy development; housing, cottage, and recreational development
1.1 Site/Area Protection Protect a minimum of 110 hectares (272 acres) of beach and dune habitat plus associated upland	NCC	2026	Beaches and Dunes	Tourism and recreation; road fragmentation

¹

¹ Categories based on IUCN – CMP Unified Classification of Conservation Actions Needed (Version 2.0). Actions are meant to be specific and measureable if possible, and are not listed in order of importance.

² Priority Habitats: Beaches and dunes, coastal islands, freshwater wetlands, rivers, streams, & riparian ecosystems, Acadian forest mosaic, agroecosystems, salt marshes & estuaries

³ See Appendix D. Threats for current and emerging threat classification according to IUCN – CMP categories with regional descriptions.

1.1 Site/Area Protection Protect a minimum of 100 hectares (247 acres) of freshwater wetlands 1.1 Site/Area Protection	NCC NCC, INT, DU	2026 Ongoing	Freshwater wetlands Salt marshes &	Tourism and recreation; road fragmention; stream crossings Tourism & recreation;
Work with other partners to protect an additional 250 hectares (618 acres) of public land around Percival River and Estuary			estuaries, Acadian Forest Mosaic	road fragmentation
1.1 Site/Area Protection NCC conservation lands in the Bioregion are designated under provincial Natural Areas Protection Act	NCC	Ongoing	All targets	All threats
1.1 Site/Area Protection Deliver incentive programs, to conserve natural features of agroecosystems	INT, Province of PEI (ALUS program)	Ongoing	Agroecosystems	Annual/Perennial non- timber crops, agricultural effluents
1.1 Site/Area Protection Partner with watershed groups and PEI Watershed Alliance to determine strategic plans for rivers where land securement is not a viable conservation option	NCC	2026	Rivers, Streams, & Riparian Areas	Annual/Perennial non- timber crops, agricultural effluents, wood harvest, stream crossings
1.1 Site/Area Protection Collaborate with partners and government to protect the ecologically, historically, and culturally significant Hog Islands in Malpeque Bay	MCPEI, NCC, Parks Canada	Ongoing	Beaches & dunes, salt marshes & estuaries, Acadian Forest Mosaic, Coastal Islands	Aquaculture garbage and solid waste; erosion
2. Land/Water Management				
2.1 Site/Area Management Work collaboratively with partners and neighbours to adaptively manage NCC conservation lands in the bioregion, including the development of management plans and baseline inventories, and undertake priority site management activities. Monitor key threats on NCC properties, and where possible, take direct action to mitigate threats posing an imminent impact to conservation priority habitats.	NCC	Ongoing	All habitats	All threats

2.1 Site/Area Management Map beaches and dunes separately in the Bioregion	Province of PEI	2026	Beaches and dunes	Tourism and recreation; coastal armouring
2.1 Site/Area Management Identify and map tidal flats in the Bioregion	Province of PEI	2026	Beaches and dunes	Tourism and recreation; coastal armouring
2.1 Site/Area Management Investigate/research best management practices and/or alternatives to coastal armouring through ecosystem service approach.	UPEI Climate Lab	Ongoing	Beaches & dunes, salt marshes & estuaries	Coastal Erosion, tourism & recreation
2.1 Site/Area Management Identify, map, and assess potential old growth stands on private and public lands, and help maintain old forests and associated biodiversity for landscape connectivity	INT, Province of PEI	2026	Acadian Forest Mosaic	Wood harvest; tourism and recreation; incompatible agricultural land use practices; wind energy development; road fragmentation
2.1 Site/Area Management Increase knowledge of distribution of rare mammals, birds, reptiles and amphibians in bioregion	INT, UPEI (Biology)	Ongoing	All targets	All threats
2.1 Site/Area Management Increase knowledge of distribution and relative abundance of under- represented fauna in PEI	NaturePEI, NCC	Ongoing	All targets	All threats
2.1 Site/Area Management Investigate impervious surface mapping	Province of PEI	2026		
2.1 Site/Area Management Undertake project on the North River to determine ecological impacts of high-volume water withdrawals	UPEI (Biology), Province of PEI	Ongoing	Rivers, Streams, & Riparian Areas, Freshwater wetlands	Stream crossings, housing, cottage, and recreational development
2.1 Site/Area Management Evaluate the effectiveness of shoreline stabilization structures and their potential long-term impacts on the coastline of PEI; develop an	UPEI (Climate)	Ongoing	Beaches & dunes, salt marshes & estuaries	Coastal armouring, erosion, tourism & recreation

inventory of existing shoreline structures and assess the historic				
changes to the coastal geomorphology since their installation.				
2.1 Site/Area Management Collaborate with partners to bring together climate observations from climate stations across the province to create a comprehensive climate data record.	UPEI (Climate)	Ongoing	All targets	
2.1 Site/Area Management Inspect, maintain and repair water control structures that are not functioning	Province of PEI, DUC, watershed groups	Ongoing	Rivers, Streams, & Riparian Areas, Freshwater wetlands	Stream crossings, housing, cottage, and recreational development
2.1 Site/Area Management Maintain and operate two coastal change monitoring programs across the Province; a traditional terrestrial monitoring method using peg-line measurements, and an emerging method using sUAS (small Unmanned Aerial Systems).	UPEI (Climate Lab)	Ongoing	All targets	Erosion
2.1 Site/Area Management Maintain a biosecurity protocol for farmers and landowners who have land or watercourses adjacent to farmer fields	PEI Watershed Alliance	Ongoing	Rivers, Streams, & Riparian Areas	Annual/Perennial non- timber crops, agricultural effluents
2.2 Invasive/Problematic Species Control Identify and coordinate definitive invasive species maps and databases; consolidate data collected by various conservation groups in the bioregion	NCC, PEI ISC, UPEI	Ongoing	All targets	Invasive Species
2.2 Invasive/Problematic Species Control Maintain a volunteer base for detecting new invasive species, and recording locations of known invasive species – the Spotter's Network	PEI ISC	Ongoing	All targets	Invasive Species
2.2 Invasive/Problematic Species Control Preventative work based on upcoming invasive threats that may migrate here due to the planet's changing climate and newly accommodating weather conditions.	Parks Canada, ISC, Province (FFW)	Ongoing	All targets	Invasive Species

2.2 Invasive/Problematic Species Control Manage 5 invasive species within PEI National Park boundaries: Purple Loosestrife, Garlic Mustard, Scotch Pine, Gypsy Moth, and Glossy Buckthorn. Actively monitor the growth and distribution of 30 other known invasive species	Parks Canada	Ongoing	All targets	Invasive Species
2.3 Habitat and Natural Process Restoration Partner with Island watershed groups and other partners to consolidate stream connectivity data to isolate areas of best and worst stream connectivity	Watershed groups, PEI Watershed Alliance, Province of PEI, DUC, INT	Ongoing	Rivers, streams, & Riparian habitats	Incompatiable Agricultural Land Use Practices, culverts and dams
2.3 Habitat and Natural Process Restoration Determination of appropriate fish passage designs for non- salmonids	UPEI (Biology), DUC	Ongoing	Rivers, Streams, & Riparian Areas, Freshwater Wetlands	Stream crossings, housing, cottage, and recreational development
2.3 Habitat and Natural Process Restoration Manage the 'Field to Forest' program, which offers advice and assistance to landowners who want to convert abandoned agricultural field back to native Acadian forest	Parks Canada	Ongoing	Acadian Forest Mosaic	Wood Harvest, annual/perennial non- timber crops, invasive species
3. Species Management				
3.1 Species Management Update status of eel grass in PEI; collect partner data (LIDAR, green crab) to update assessment of eel grass health within Bioregion	NCC, UPEI Biology, Southern Gulf of St. Lawrence Coalition on Sustainability	2026	Salt marshes & estuaries	Invasive Species
3.1 Species Management Ensure the perpetuation and healthy population of culturally significant species, including Black Ash, Atlantic Salmon, and Brook Trout	MCPEI, Province of PEI	Ongoing	Acadian Forest Mosaic, Rivers, Streams & Riparian Areas	Stream crossings, wood harvest, housing, cottage, and recreational development
3.1 Species Management Monitor piping plover nesting success, beach usage, and key threats on conservation lands. Compose and submit the five-year Piping Plover Census.	INT, Parks Canada	Ongoing	Beaches and dunes	Tourism and recreation

3.1 Species Management Study habitat needs for threatened birds in forested natural areas in PEI to help inform forest management practices in the province	INT	Ongoing	Acadian Forest Mosaic	Wood harvest, wind energy development, road fragmentation, housing, cottage, and recreational development
3.1 Species Management Continue work with rural landowners and farmers to help protect nesting habitat for farmland bird species, the Bobolink and the Barn Swallow	INT, Province (ALUS)	Ongoing	Agroecosystems	Annual/perennial non- timber crops
4. Education and Awareness				
4.3 Awareness and communications Improve site access to properties in PEI where appropriate; where not possible, implement a "virtual access" program through video footage.	NCC	2026	All targets	All threats
4.3 Awareness and communications Hold a minimum of 2 conversation volunteer events and 2 interpretive events every season in the bioregion	NCC	2026	All targets	All Threats
4.3 Awareness and communications Create a volunteer program that consolidates volunteer property stewards and NCC volunteer ambassadors, growing base and diversity of volunteers in PEI to include trained individuals who can speak on behalf of NCC	NCC	Ongoing	All targets	
4.3 Awareness and communications Maintain Conservation Guardian program of stewardship volunteers to support neighbours of INT properties in their guardianship of natural areas	INT	Ongoing	All targets	All threats
4.3 Awareness and communications Host corporate and individual volunteer events in INT natural areas to grow local support, ownership and knowledge within Island communities	INT	Ongoing	All targets	All threats

4.3 Awareness and communications Seek new outreach and engagement opportunities in local communities within proximity to NCC areas of operation	NCC	Ongoing	All targets
4.3 Awareness and Communications Develop an online land-use database (a 'living memory') of culturally important species on PEI. This database will provide information on areas of traditional land use.	MCPEI	Ongoing	All targets
4.3 Awareness and Communications Maintain the PEI Nature Tracker App species record database	Province of PEI, PEI Watershed Alliance	Ongoing	All targets
4.3 Awareness and Communications Develop new awareness materials, and maintain existing awareness materials, for the status and importance of watersheds in PEI	PEI Watershed Alliance	Ongoing	Rivers, Streams, & Riparian Areas
4.3 Awareness and Communications Host weekly meetings, promote natural history of PEI through field trips, newsletter, and citizen science projects	Nature PEI	Ongoing	All targets
4.3 Awareness and Communications Develop a flora manual for PEI	PEI Museum & Heritage Foundation, Province, ACCDC, INT, Nature PEI	Ongoing	
4.3 Awareness and Communications Coordinate The Climate Diary: The Climate Diary is a means for citizen scientists and to identify and record observations of naturally occurring plant and animal life cycle events over time on PEI.	UPEI (Climate Lab)	Ongoing	All targets
4.3 Awareness and Communications Develop, with partners, the Coastal Community Adaptation Tool-kit to support communities in better understanding and preparing for the impacts of climate change.	UPEI (Climate Lab)	Ongoing	All targets
4.3 Awareness and Communications Host two educational programs: 'Project Webfoot' and 'Youth Waterfowler Heritage Day' to help build awareness around wetlands	DUC, INT	Ongoing	Freshwater Wetlands, Salt Marshes & Estuaries, Rivers,

and the wildlife who depend on them. These programs are for everyone but structure for kids to help raise young conservationists.			Streams, & Riparian Areas	
4.3 Awareness and Communications Deliver and grow grade 7 science curriculum module on beach – dune ecosystems as well as grade 4 piping plover game. Seek new opportunities to engage schools in local conservation immersion education.	INT	Ongoing	Beaches and dunes, species- at-risk, ecosystem services	Use threats (vehicles, paths, dogs)
4.3 Awareness and Communications Continue to be the lead organization for the Maritime Natural Infrastructure Collaborative in PEI, creating tools to integrate values of ecosystem services in land use planning in inland and coastal environments	INT	Ongoing	All targets	Climate change threats
5. Legislation 5.1.2 Legislation (National level)	ECCC, DFO	Ongoing	All targets	All threats
Implement the Migratory Bird Convention Act (MBCA), Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act (WAPPRIITA), Species at Risk Act (SARA), Canadian Environmental Protection Act (CEPA), Canada Wildlife Act (CWA), Environmental Enforcement Act (EEA), Canadian Environmental Assessment Act (CEAA), Fisheries Act (water pollution).	2000, 810	Ongoing	7 III tai goto	7 Wil till edis
5.1.2 Legislation (sub-national) Collaborate with province on conservation component of their land management plan in determining ecologically significant provincial lands	NCC, province of PEI	Ongoing	All targets	All threats
5.1.2 Legislation (sub-national) Continue to assess provincial lands for conservation through the Natural Areas Protection Act, along with working with private landowners who wish to place their property under the Natural Areas Protection Act	Province of PEI, INT	Ongoing	All targets	All threats

5.2 Policies & Regulation Encourage government for changes that promote conservation of PEI's flora, fauna, and natural habitats	Nature PEI, INT, PEI ISC, NCC	Ongoing	All targets	All threats
5.2 Policies & Regulation Encourage, support, and ultimately contribute to the drafting of a Species-at-Risk act for the province of PEI.	All Conseravtion Partners	Ongoing	All targets	
5.2 Policies & Regulation The UPEI Climate Lab is developing the PEI Climate Change Adaptation Recommendations Report for the Government of PEI.	UPEI (Climate Lab)	Ongoing	All targets	
5.2 Policies & Regulation Work with government to encourage appropriate wetland conservation policies within the province of PEI	DUC	Ongoing	Freshwater Wetlands, Salt Marshes & Estuaries, Rivers, Streams, & Riparian Areas	
5.2 Policies & Regulation Develop a PEI watershed strategy in conjunction with the Province of PEI	PEI Watershed Alliance, Province of PEI	Ongoing	Rivers, Streams, & Riparian Areas	Stream crossings, Annual/Perennial non- timber Crops, agricultural effluents
5.2 Policies & Regulation Encourage government to refrain from hydraulic fracking and offshore oil and gas development around PEI	PEI Watershed Alliance	Ongoing	All targets	All threats
6. Livelihood, Economic and other Incentives				
6.3 Market Forces Manage the ALUS (Alternative Land Use Services) program, a community based program that offers incentives to farmers to implement agricultural practices that encourage diversity and sustainability.	Province of PEI	Ongoing	Agro-ecosystems	Annual/perennial non- timber crops, Agricultural effluents
6.3 Market Forces Manage the Forest Enhancement Program, which can provide woodland owners with advice and financial assistance for their	Province of PEI	Ongoing	Acadian Forest Mosaic	Wood Harvest, road fragmentation

woodlands for recreation, forest products, wildlife habitat, and forest restoration and health.				
6.3 Market Forces Enhance the understanding of the regional and sector-specific economic impacts of climate change and to generate knowledge of comparing relative costs and benefits of potential adaptation measures. Undertake a cost–benefit analysis (CBA) of climate change adaptation options by studying six coastal areas within the Atlantic Provinces for case study analysis.	UPEI (Climate Lab)	Ongoing	All targets	
6.4 Conservation Payments Implement and encourage the use of the EC Ecological Gifts (Ecogifts) program	NCC, INT, ECCC	Ongoing		
7. External Capacity Building				
7.1 Institutional and Civil Society Development Provide ECCC-CWS support and input into the development of Habitat Conservation Strategies.	All Conservation Partners	Ongoing		
7.3 Conservation Finance Administer and coordinate the PEI Wildlife Conservation Fund program	INT	Ongoing		

ii. Knowledge Gaps

While this plan strives to address and discuss the full range of habitat conservation priorities and threats to biodiversity in the PEI Bioregion, it is not within the scope of the strategy to identify or in any way assign all potential conservation actions required to address all problems, questions, information gaps, or other activities associated with each habitat priority or threat. This section will briefly discuss some of the identified gaps in knowledge, available information, and actions regarding the conservation priority habitat assessment and their threats. Knowledge gaps were developed both by NCC authors and conservation partners.

- 1. Identify location of tidal flats across the province, as they are not currently mapped. They may currently be rolled-up into salt marshes, but this is unknown.
- 2. Identify location of beaches across the province, as they are not currently mapped.
- 3. Identify how to effectively assess health of sand dunes and beaches (e.g. sediment budget, trail density, percent cover of vegetation).
- 4. Dune dynamics: a need to collect information to produce a model of dune geomorphology
- 5. Up-to-date mapping of dynamic regions such as the Conway Sandhills that frequently shift, breach.
- 6. Who owns new land resulting from shoreline accretion? Is it possible to project future areas of sand accretion and potential blow outs?
- 7. Investigate and map sand deposits located around PEI (i.e. within the Northumberland Strait).
- 8. Identify how to effectively assess eelgrass health.
- 9. Identify the impacts of wharves on sediment supply to beaches and sand dunes.
- 10. Investigate/research best management practices and/or alternatives to coastal armouring.
- 11. Explore the relationship between land trusts and real estate companies to find ways that would benefit both land conservation and real estate relationships
- 12. Lack of research and equipment for sea level rise: wave height/intensity measurements and more tidal gauges
- 13. How much water withdrawal can occur before negative impacts to fish habitat are observed?
- 14. Location and mapping of natural (ground-flow) springs in PEI.
- 15. Identify how to effectively map stream connectivity. There is no central database for conservation use (but may currently be in the works).
- 16. Culvert and dam analysis identify priority barriers for restoration and work with groups to create effective solutions to restore hydrologic regime and connectivity.
- 17. Identify ideal culvert designs that consider both impact on wildlife and economic value.
- 18. Identify areas of best representation of old growth forest in PEI.
- 19. Identify potential sites of forest habitat for interior forest birds. Complete point counts for target species.
- 20. Research impact of road fragmentation on small mammal movement.
- 21. Investigate best practices for reducing impact of roads on habitats and wildlife movement
- 22. Increase knowledge of distribution of rare species (small mammals and reptiles).
- 23. Determine the historical extent of freshwater wetlands to use as a baseline for comparison.
- 24. Investigate agricultural incentives: short term financial losses of farmers for ploughing later, investing in cover crops will equal better long-term return?
- 25. Identify agricultural partners willing to research/work with conservation interests.
- 26. Research feasibility and impact of fall ploughing and winter field cover (level of prevention of soil loss and increase in crop productivity)
- 27. Investigate distribution of native fish species across water bodies in PEI.

- 28. Investigate, predict and identify the most likely emerging invasive species threat to PEI
- 29. There is currently no definitive invasive species maps/databases, although several organizations (e.g. watershed groups, provincial government) do collect observation data within their watershed/properties/regions.
- 30. Investigate rainbow trout and their impact on native fish diversity and populations.
- 31. Research options for advanced detection and management tools for upcoming invasive species threats
- 32. The impact of climate change and what that will mean for future threats of invasive species in PEI
- 33. Explore the social concept of closing natural areas completely and its suitability for PEI
- 34. Create a standard for suitable activities within conservation areas.
- 35. There is currently no provincial ecological land classification/zonation information.
- 36. There is no provincial Species At Risk Act. Is current legislation providing effective protection?

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APPENDICES

Appendix A: List of Abbreviations

Acronym	Full Reference
ACCDC	Atlantic Canada Conservation Data Centre
BCR	Bird Conservation Region
BSC	Bird Studies Canada
COSEWIC	Committee on the status of Endangered Wildlife in Canada
CVI	Conservation Value Index
CWS	Canadian Wildlife Service
CWS	Canadian Wildlife Service
DUC	Ducks Unlimited Canada
ECCC	Environment Canada & Climate Change
EHJV	Eastern Habitat Joint Venture
HCS	Habitat Conservation Strategy
IBA	Important Bird Area
INT	Island Nature Trust
IUCN	International Union for Conservation of Nature
LCI	Landscape Conservation Index
MBBA	Maritimes Breading Bird Atlas
MBU	Marine Biogeographic Unit
MEA	Maritime Energy Association
MOS	Measure of Success
NAAP	Northern Appalachians-Acadian Ecoregional Plan
NABCI	North American Bird Conservation Initiative
NACP	Natural Area Conservation Plan
NAWMP	North American Waterfowl Management Plan
NCC	Nature Conservancy of Canada
OME	Ontario Ministry of Environment
OMNR	Ontario Ministry of Nature Resources
PEINP	Prince Edward Island National Park
Pers. Comm.	Personal Communication
R.S.P.E.I.	Revised Statutes of Prince Edward Island
WMA	Wildlife Management Area

Appendix B: Glossary of Biodiversity and Conservation Ranks

Committee on the Status of Endangered Wildlife in Canada (COSEWIC): is a national committee of experts that assesses and designates which wild species are in danger of disappearing from Canada. COSEWIC assigns the following status to species:

Extinct (EXT)	A species that no longer exists
Extirpated (EXP)	A species no longer existing in the wild in Canada, but occurring elsewhere in the wild
Endangered (END)	A species facing imminent extirpation or extinction throughout its range
Threatened (THR)	A species likely to become endangered if nothing is done to reverse the factors
	leading to its extirpation or extinction
Special Concern (SC)	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species
Not At Risk (NAR)	A species that has been evaluated and found to be not at risk
Data Deficient (DD)	A species for which there is insufficient information to support a status designation

Species at Risk (SAR): species designated as Endangered, Threatened or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or listed through provincial endangered species legislation.

Global Rank (G-RANK): the overall status of a species or ecological community is regarded as its "global" status; this range-wide assessment of condition is referred to as its global conservation status rank. Global conservation status assessments are generally carried out by NatureServe scientists with input from relevant natural heritage member programs (e.g., CDCs and NHICs) and experts on particular taxonomic groups, and are based on a combination of quantitative and qualitative information. The factors considered in assessing conservation status include the total number and condition of occurrences; population size; range extent and area of occupancy; short- and long-term trends in these previous factors; scope, severity, and immediacy of threats, number of protected and managed occurrences, intrinsic vulnerability and environmental specificity.

Global Ranks

Rank	Definition
GX	Presumed Extinct (species): Not located despite intensive searches and virtually no likelihood of rediscovery. Eliminated (ecological communities): Eliminated throughout its range, with no restoration potential due to extinction of dominant or characteristic species.
GH	Possibly Extinct (species): Missing; known from only historical occurrences but still some hope of rediscovery. Presumed Eliminated: Historic, ecological communities)-Presumed eliminated throughout its range, with no or virtually no likelihood that it will be rediscovered, but with the potential for restoration, for example, American Chestnut Forest.
G1	Critically Imperilled: At very high risk of extinction due to extreme rarity (often 5 or fewer populations), very steep declines, or other factors.
G2	Imperilled: At high risk of extinction due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors.
G3	Vulnerable: At moderate risk of extinction due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors.
G4	Apparently Secure: Uncommon but not rare; some cause for long-term concern due to declines or other factors.
G5	Secure: Common; widespread and abundant.

Variant Ranks

Rank	Definition
G#G#	Range Rank—A numeric range rank (e.g., G2G3) is used to indicate the range of uncertainty in the
	status of a species or community. A G2G3 rank would indicate that there is a roughly equal chance of
	G2 or G3 and other ranks are much less likely. Ranges cannot skip more than one rank (e.g., GU should
	be used rather than G1G4).
GU	Unrankable—-Currently unrankable due to lack of information or due to substantially conflicting
	information about status or trends. Whenever possible, the most likely rank is assigned and a
	question mark qualifier may be added (e.g., G2?) to express minor uncertainty, or a range rank (e.g.,
	G2G3) may be used to delineate the limits (range) of uncertainty.
GNR	Unranked—Global rank not yet assessed.
GNA	Not Applicable—A conservation status rank is not applicable because the species is not a suitable
	target for conservation activities.

Rank Qualifiers

Rank	Definition
?	Inexact Numeric Rank—Denotes some uncertainty about the numeric rank (e.g. G3? - Believed most
	likely a G3, but some chance of either G2 or G4).
Q	Questionable taxonomy—Taxonomic distinctiveness of this entity at the current level is
	questionable; resolution of this uncertainty may result in change from a species to a subspecies or
	hybrid, or the inclusion of this taxon in another taxon, with the resulting taxon having a lower-priority
	conservation priority.
С	Captive or Cultivated Only—At present extant only in captivity or cultivation, or as a reintroduced
	population not yet established.

Sub-national (Provincial) Rank (S-RANK): provincial ranks are used by natural heritage member programs to set conservation priorities for rare species and vegetation communities. These ranks are not legal designations. Provincial ranks are assigned in a manner similar to that described for global ranks, but consider only those factors within the political boundaries of a province. Comparison of global and provincial ranks, gives an indication of the status and rarity of an element in that province in relation to its overall conservation status, therefore providing insight into the urgency of conservation action for it in the province.

Subnational (S) Conservation Status Ranks

Status	Definition
SX	Presumed Extirpated—Species or community is believed to be extirpated from the province. Not located despite intensive searches of historical sites and other appropriate habitat, and virtually no likelihood that it will be rediscovered.
SH	Possibly Extirpated (Historical)—Species or community occurred historically in the province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years. A species or community could become SH without such a 20-40 year delay if the only known occurrences in a nation or state/province were destroyed or if it had been extensively and unsuccessfully looked for. The SH rank is reserved for species or communities for which some effort has been made to relocate occurrences, rather than simply using this status for all elements not known from verified extant occurrences.
S1	Critically Imperilled—Critically imperilled in the province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the province.
S2	Imperilled—Imperilled in the province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province.

S3	Vulnerable—Vulnerable in the province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation.
S4	Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5	Secure—Common, widespread, and abundant in the province.
SNR	Unranked—Province conservation status not yet assessed.
SU	Unrankable—Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.
SNA	Not Applicable —A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S#	Range Rank —A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

Appendix C: List of Significant Species for the PEI Bioregion with Coarse Resolution Habitat Associations

				Conservation	on Sta	IUS			-	А	ssocia	ted H	abita	t Tarç	gets		
Common Name	Scientific Name	Species Type	Global Rank	Provincial Rank	COSEWIC	IUCN Red List	NAAP Target	BCR 14 Priority	MBU 12 Priority	Acadian Forest Mosaic	Beaches and Sand Dunes	CoastalIslands	Freshwater Wetlands	Grassland Birds	Rivers, Streams and Riparian	Salt Marsh and Estuary	Other notes ¹
Wire Horsehair Lichen	Bryoria glabra	Fungus or Lichen	N/A	S1?						Χ							CNALH
Boreal Horsehair Lichen	Bryoria implexa	Fungus or Lichen	GNR	S1?						Χ							CNALH
Blonde Horsehair Lichen	Bryoria nadvornikiana	Fungus or Lichen	GNR	S2?						Х							McMullin 2014
Smooth Horsehair Lichen	Bryoria salazinica	Fungus or Lichen	GNR	S1?						Х							Goward et al., (1998)
True Icelandmoss Lichen	Cetraria islandica	Fungus or Lichen	G5	S2?							Х		Х				Reilly (1972)
Speckled Icelandmoss Lichen	Cetraria islandica ssp. Crispiformis	Fungus or Lichen	G5TNR	S2?							Х		Х				Reilly (1972)*
Frothing Seastorm Lichen	Cetrelia chicitae	Fungus or Lichen	G5	S2?						Х							NatureServe
Valley Oakmoss Lichen	Evernia prunastri	Fungus or Lichen	N/A	S2?						Χ							CNALH
Textured Lungwort Lichen	Lobaria scrobiculata	Fungus or Lichen	G4	S2S3						Χ			Х				NatureServe, McMullin et al., (2012)
Fringed Kidney Lichen	Nephroma helveticum	Fungus or Lichen	G4G5	S2?						Χ							CNALH
Mustard Kidney Lichen	Nephroma laevigatum	Fungus or Lichen	G5?	S2?						Χ							McMullin et al., (2012)
Veined Shingle Lichen	Pannaria Iurida	Fungus or Lichen	G3G5	S1?						Χ							CNALH
Black-bordered Shingles Lichen	Parmeliella triptophylla	Fungus or Lichen	G3G5	S2?						Х							McMullin et al., (2012)
Brown-gray Moss-shingle Lichen	Protopannaria pezizoides	Fungus or Lichen	G4G5	S2?						Х		Х					Canadian Field Naturalists
Northern Coral Lichen	Sphaerophorus globosus	Fungus or Lichen	G4G5	S2?						Х							CNALH, Sillett and Goslin (1999)
Shelter Shingle Lichen	Vahliella leucophaea	Fungus or Lichen	G5?	S2?						Χ					Х		CNALH
Willow Feather Moss	Amblystegium varium	Non-vascular Plant	G5	S2S3						Χ							Flora of North America
Slender Anomodon Moss	Anomodon attenuatus	Non-vascular Plant	G5	S1S2						Χ							NatureServe

Common Anomodon Moss	Anomodon rostratus	Non-vascular Plant	G5	S1?		Х				CNALH
a Moss	Atrichum crispum	Non-vascular Plant	G4?	S2?		X		Х		NS FEC
Slender Smoothcap Moss	Atrichum tenellum	Non-vascular Plant	G4G5	S1S2		X		X		NS FEC
Little Groove Moss	Aulacomnium androgynum	Non-vascular Plant	G5	S1S2		X		^		Flora of North America
Whitish Ragged Moss	Brachythecium albicans	Non-vascular Plant	G5	S2?		X				NS FEC
Short-leaved Ragged Moss	Brachythecium oedipodium	Non-vascular Plant	G4G5	S2S3		X				NS FEC
	Brachythecium oxycladon	Non-vascular Plant	G5	S1S2		X				NS FEC
Rusty Ragged Moss	Brachythecium plumosum	Non-vascular Plant	G5	S2?						NS FEC
3 00	'			S2S3		X				NS FEC
Matted Ragged Moss	Brachythecium populeum	Non-vascular Plant	G5			X				Montana gov, - Montana Field Guide.
a Moss	Bryhnia graminicolor	Non-vascular Plant	G5	S1		Х				Montana gov, - Montana Field Guide.
Tufted Bryum Moss	Bryum caespiticium	Non-vascular Plant	G5	S1?		Х				G Committee of the comm
Pale Bryum Moss	Bryum pallescens	Non-vascular Plant	G5	S1?		Х				Montana gov, - Montana Field Guide.
Weigel's Bryum Moss	Bryum weigelii	Non-vascular Plant	G4G5	S1?		Х				Montana gov, - Montana Field Guide.
Brown Shield Moss	Buxbaumia aphylla	Non-vascular Plant	G4G5	S2?		Х				NatureServe
Giant Spear Moss	Calliergon giganteum	Non-vascular Plant	G5	S2?					Х	Montana gov, - Montana Field Guide.
Richardson's Spear Moss	Calliergon richardsonii	Non-vascular Plant	G4	S1				Х		Montana gov, - Montana Field Guide.
Common Large Wetland Moss	Calliergonella cuspidata	Non-vascular Plant	G5	S2S4		Х				Montana gov, - Montana Field Guide.
Golden Creeping Moss	Campylium chrysophyllum	Non-vascular Plant	G5	S1S2		Х				Montana gov, - Montana Field Guide.
a Moss	Campylium polygamum	Non-vascular Plant	G5	S1?				Х		Montana gov, - Montana Field Guide.
a Moss	Campylostelium saxicola	Non-vascular Plant	G3G5	S1S2		Х				Flora of North America
Transparent Fork Moss	Dichodontium pellucidum	Non-vascular Plant	G4G5	S2S3				Х		Flora of North America
a Moss	Dicranella cerviculata	Non-vascular Plant	G5?	S1?			Х	Х		Flora of North America
Awl-leaved Forklet Moss	Dicranella subulata	Non-vascular Plant	G5?	S2S3					Х	Flora of North America
Bonjean's Broom Moss	Dicranum bonjeanii	Non-vascular Plant	G4G5	S1?				Х		Montana gov, - Montana Field Guide.
Condensed Broom Moss	Dicranum condensatum	Non-vascular Plant	G5	S1		Х				UBOF
a Dicranum Moss	Dicranum leioneuron	Non-vascular Plant	G4G5	S1?				Х		NatureServe
Ontario Broom Moss	Dicranum ontariense	Non-vascular Plant	G4G5	S2S4		Х				Flora of North America
Spurred Broom Moss	Dicranum spurium	Non-vascular Plant	G5	S1S2		Х				Flora of North America
Green Broom Moss	Dicranum viride	Non-vascular Plant	G5	S2S4		Х				Flora of North America
False Beard Moss	Didymodon fallax	Non-vascular Plant	G5	S1?		Х				Flora of North America
a Moss	Ditrichum rhynchostegium	Non-vascular Plant	G3G5	S1		Х				Flora of North America
Slender Extinguisher Moss	Encalypta procera	Non-vascular Plant	G4G5	S1?		Х				Flora of North America
Lesser Pocket Moss	Fissidens bryoides	Non-vascular Plant	G5	S2S3					Х	Fundy Model Forest
		1			_1					

Yew-leaved Pocket Moss	Fissidens taxifolius	Non-vascular Plant	G5	S1?		Х			Flora of North America
Greater Water Moss	Fontinalis antipyretica	Non-vascular Plant	G5	S1?			Х	Х	UBOF
Aquatic Moss	Fontinalis antipyretica var. antipyretica	Non-vascular Plant	G5TNR	S1?			Х	Х	UBOF*
a Moss	Fontinalis antipyretica var. gigantea	Non-vascular Plant	G5TNR	S1?		Х	Х		Flora of North America
a moss	Fontinalis hypnoides	Non-vascular Plant	G4G5	S1			Х	Х	Flora of North America
a Moss	Grimmia hartmanii	Non-vascular Plant		S1		X			Flora of North America
Tufted Rock Beardless Moss	Gymnostomum aeruginosum	Non-vascular Plant	G5	S1		X	Х	Х	Flora of North America
a Moss	Hamatocaulis vernicosus	Non-vascular Plant	G5	S1			Х		UBOF
Dimorphous Tangle Moss	Heterocladium dimorphum	Non-vascular Plant	G4G5	S2S3		X			Flora of North America
Brookside Feather Moss	Hygroamblystegium fluviatile	Non-vascular Plant	G5	S1?				Х	Flora of North America
Fountain Feather Moss	Hygroamblystegium tenax	Non-vascular Plant	G5	S2S3		Х			Flora of North America
Claw Brook Moss	Hygrohypnum ochraceum	Non-vascular Plant	G5	S1?		Х			Flora of North America
Cypress-leaved Plait Moss	Hypnum cupressiforme	Non-vascular Plant	G5	S1S3		Х	Х		NS FEC
a Moss	Hypnum cupressiforme var. cupressiforme	Non-vascular Plant	G5T5	S1S3		Х	Х		NS FEC
a Moss	Hypnum cupressiforme var. filiforme	Non-vascular Plant	G5TNR	S1?		Х	Х		NS FEC
Curved-leaved Plait Moss	Hypnum curvifolium	Non-vascular Plant	G5	S1?		Х	Х		NS FEC
Meadow Plait Moss	Hypnum pratense	Non-vascular Plant	G5	S1		Х	Х		NS FEC
Kneiff's Feather Moss	Leptodictyum riparium	Non-vascular Plant	G5	S2S4			Х	Х	Flora of North America
a Moss	Leucodon andrewsianus	Non-vascular Plant	G5T5	S2?		Х			Flora of North America
a Moss	Leucodon brachypus	Non-vascular Plant	G5	S1		Х			Flora of North America
Ambiguous Leafy Moss	Mnium ambiguum	Non-vascular Plant	G5	S1?			Х		NS FEC
a Moss	Mnium spinulosum	Non-vascular Plant	G5	S2S4			Х		NS FEC
Wahlenberg's Spur Moss	Oncophorus wahlenbergii	Non-vascular Plant	G5	S2S4				Х	Flora of North America
a Moss	Orthotrichum speciosum var. elegans	Non-vascular Plant	G5T5	S1?		Х			Flora of North America
a Moss	Orthotrichum stellatum	Non-vascular Plant	G5	S1S2		Х		Х	flora of North America
Long-leaved Notchleaf Moss	Paraleucobryum longifolium	Non-vascular Plant	G5	S2?		Х			Flora of North America
a Moss	Philonotis marchica	Non-vascular Plant	G5	S1			Х		Journal of botany
Toothed Leafy Moss	Plagiomnium ciliare	Non-vascular Plant	G5	S2S4		Х			Koponen (1974)
Common Leafy Moss	Plagiomnium medium	Non-vascular Plant	G5	S2S4		Х	Х		Koponen (1974)
Oeder's Apple Moss	Plagiopus oederiana	Non-vascular Plant	G5?	S1?		Х			Forest Service

Round Silk Moss	Plagiothecium cavifolium	Non-vascular Plant	G5	S2S4			Х			Flora of North America
Bark Willow Moss	Platydictya subtilis	Non-vascular Plant	G3G5	S1S2			Х			Flora of North America
a Moss	Pogonatum pensilvanicum	Non-vascular Plant	G5	S2S4			Х			Flora of North America
a Moss	Pohlia andalusica	Non-vascular Plant	G3G5	S2S4					Х	Flora of North America
Blunt-bud Nodding Moss	Pohlia bulbifera	Non-vascular Plant	G4G5	S1S2				Х	Х	Flora of North America
Opal Nodding Moss	Pohlia cruda	Non-vascular Plant	G5	S1			Х			Flora of North America
a Moss	Pohlia filum	Non-vascular Plant	G4G5	S1?	1		Х			Flora of North America
Cottony Nodding Moss	Pohlia proligera	Non-vascular Plant	G4G5	S1?	1				Х	Flora of North America
Bank Haircap Moss	Polytrichum formosum	Non-vascular Plant	G5	S1S2			Х)	(Flora of North America
a Hair-Cap Moss	Polytrichum formosum var. formosum	Non-vascular Plant		S1S2			Х)	(NS FEC
Ohio Haircap Moss	Polytrichum ohioense	Non-vascular Plant	G5	S2S4			Х)	(NS FEC
River Thyme Moss	Pseudobryum cinclidioides	Non-vascular Plant	G5	S2?				Х		Flora of North America
Elegant Silk Moss	Pseudotaxiphyllum elegans	Non-vascular Plant	G5	S1S2			Х			Flora of North America
Capillary Wing Moss	Pterigynandrum filiforme	Non-vascular Plant	G4G5	S1S2			Х			Flora of North America
Many-flowered Leskea Moss	Pylaisiella polyantha	Non-vascular Plant	G5	S2S4				Х		Flora of North America
a Moss	Pylaisiella selwynii	Non-vascular Plant	G5	S1S3				Х		Flora of North America
Appalachian Leafy Moss	Rhizomnium appalachianum	Non-vascular Plant	G5	S2S4			Х	Х		NS FEC
Dotted Leafy Moss	Rhizomnium punctatum	Non-vascular Plant	G5	S2S4			X	Х		NS FEC
Elf Bloom Moss	Schistidium agassizii	Non-vascular Plant	G3G5	S1?					Х	Flora of North America
Radiate Bloom Moss	Schistidium apocarpum	Non-vascular Plant	G5	S1?			Х			Flora of North America
a Moss	Schistidium maritimum	Non-vascular Plant	G3G5	S1?			X			Flora of North America
River Bloom Moss	Schistidium rivulare	Non-vascular Plant	G4G5	S1S2			Х		Х	Flora of North America
Northern Peatmoss	Sphagnum capillifolium	Non-vascular Plant	G5	S2S4				Х		Flora of North America
Central Peat Moss	Sphagnum centrale	Non-vascular Plant	G5	S2?				Х		UBOF
Compact Peat Moss	Sphagnum compactum	Non-vascular Plant	G5	S2S4				Х		UBOF
Feathery Peat Moss	Sphagnum cuspidatum	Non-vascular Plant	G5	S2S4				Х		UBOF
a Peatmoss	Sphagnum flavicomans	Non-vascular Plant	G4	S1?				Х		NatureServe
Flexuous Peatmoss	Sphagnum flexuosum	Non-vascular Plant	G5	S1?				Х		UBOF
Streamside Peat Moss	Sphagnum riparium	Non-vascular Plant	G5	S1?				Х		INSTAAR, University of Colorado
Russow's Peat Moss	Sphagnum russowii	Non-vascular Plant	G5	S2S4	1			Х		UBOF
Delicate Peat Moss	Sphagnum subtile	Non-vascular Plant	G5?Q	S1S2				Х		UBOF
Soft Peat Moss	Sphagnum tenellum	Non-vascular Plant	G5	S1?				Х		UBOF
Rigid Peat Moss	Sphagnum teres	Non-vascular Plant	G5	S2?			Х	Х		Flora of North America

Warnstorf's Peat Moss	Sphagnum warnstorfii	Non-vascular Plant	G5	S2?				Х		Flora of North America
Wulf's Peat Moss	Sphagnum wulfianum	Non-vascular Plant	G5	S2?		Х				Flora of North America
Geniculate Four-tooth Moss	Tetraphis geniculata	Non-vascular Plant	G3G5	S1?		Х				Flora of North America
Little Georgia	Tetrodontium brownianum	Non-vascular Plant	G3G4	S1		Х			Х	UBOF
a Moss	Tetrodontium brownianum var. ovatum	Non-vascular Plant		S1		Х			Х	UBOF*
a Moss	Trematodon ambiguus	Non-vascular Plant	G5	S2S4		Х				Flora of North America
a brown moss	Warnstorfia fluitans	Non-vascular Plant	G5	S2S4		Х		Х		Flora of North America
White Baneberry	Actaea pachypoda	Vascular plant	G5	S2		Х				GoBotany
Slender Agalinis	Agalinis tenuifolia	Vascular plant	G5	S1		Х				GoBotany
Slender Agalinis	Agalinis tenuifolia var. tenuifolia	Vascular plant	G5	S1		Х				GoBotany
Hooked Agrimony	Agrimonia gryposepala	Vascular plant	G5	S2		Х		Х	Х	NatureServe
Short-awned Foxtail	Alopecurus aequalis	Vascular plant	G5	S1				Х	Х	GoBotany
Short-awned Foxtail	Alopecurus aequalis var. aequalis	Vascular plant	G5T5?	S1				Х	Х	GoBotany
Canada Serviceberry	Amelanchier canadensis	Vascular plant	G5	S1?		Х				GoBotany
Fernald's Serviceberry	Amelanchier fernaldii	Vascular plant	G2G4Q	S1				Х	Х	GoBotany
Running Serviceberry	Amelanchier stolonifera	Vascular plant	G5	S1?		Х	Х			http://cwf-fcf.org/en/discover- wildlife/flora- fauna/flora/serviceberries.html
Bog Rosemary	Andromeda polifolia	Vascular plant	G5	S2				Х		GoBotany
Bog Rosemary	Andromeda polifolia var. glaucophylla	Vascular plant	G5T5	S2				Х		GoBotany
Canada Anemone	Anemone canadensis	Vascular plant	G5	S1				Х	Х	GoBotany
Purple-stemmed Angelica	Angelica atropurpurea	Vascular plant	G5	S2				Х	Х	GoBotany
Seaside Angelica	Angelica lucida	Vascular plant	G5	S1		Х	Х			GoBotany
Howell's Pussytoes	Antennaria howellii ssp. canadensis	Vascular plant	G5T5?	S1		Х				GoBotany
American Groundnut	Apios americana	Vascular plant	G5	S1				Х	Х	GoBotany
American Spikenard	Aralia racemosa	Vascular plant	G4G5	S2		Х		Х		NatureServe
American Spikenard	Aralia racemosa ssp. racemosa	Vascular plant	G4G5T4T5	S2		Х			Х	GoBotany
Arethusa	Arethusa bulbosa	Vascular plant	G4	S2				Х		NatureServe
Swamp Milkweed	Asclepias incarnata	Vascular plant	G5	S1				Х	Х	GoBotany
Swamp Milkweed	Asclepias incarnata ssp. incarnata	Vascular plant	G5T5	S1				Х	Х	GoBotany
Maritime Saltbush	Atriplex acadiensis	Vascular plant	G4?	S1S3			Х			X GoBotany
Frankton's Saltbush	Atriplex franktonii	Vascular plant	G2G4	S1S2			Х			Taschereau (1972)

Heart-leaved Birch	Betula papyrifera var. cordifolia	Vascular plant	G5T5	S2?		Х					GoBotany
Bog Birch	Betula pumila	Vascular plant	G5	S2				Х			NatureServe
Bog Birch	Betula pumila var. renifolia	Vascular plant	G5T3T5	S2				Х	2	<	GoBotany
Connecticut Beggar-Ticks	Bidens heterodoxa	Vascular plant	G2Q	S2	Y		Х	Х		Х	NatureServe
Red Bulrush	Blysmus rufus	Vascular plant	G5	S2						Х	NatureServe
Cut-leaved Moonwort	Botrychium dissectum	Vascular plant	G5	S1		Х					GoBotany
Triangle Moonwort	Botrychium lanceolatum	Vascular plant	G5	S1S2		Х		Х			GoBotany
Lance-Leaf Grape-Fern	Botrychium lanceolatum var. angustisegmentum	Vascular plant	G5T4	S1S2		Х		Х			GoBotany
Daisy-leaved Moonwort	Botrychium matricariifolium	Vascular plant	G5	S2		Х					GoBotany
Leathery Moonwort	Botrychium multifidum	Vascular plant	G5	S2		Х					GoBotany
Least Moonwort	Botrychium simplex	Vascular plant	G5	S1		Х		Х		<	NatureServe, GoBotany
Northern Shorthusk	Brachyelytrum septentrionale	Vascular plant	G4G5	S1		Х					GoBotany
Water-shield	Brasenia schreberi	Vascular plant	G5	S1				Х		<	GoBotany
Slim-stemmed Reed Grass	Calamagrostis stricta	Vascular plant	G5	S2S3		Х		Х		<	GoBotany
Slim-stemmed Reed Grass	Calamagrostis stricta ssp. stricta	Vascular plant	G5T5	S2S3		Х		Х	2	<	GoBotany
Slim-stemmed Reed Grass	Calamagrostis stricta var. stricta	Vascular plant	G5T5	S2S3		Х		Х		<	GoBotany*
Northern Water-starwort	Callitriche hermaphroditica	Vascular plant	G5	S1S2				Х			GoBotany, LBOF
Common Harebell	Campanula rotundifolia	Vascular plant	G5	S1				Х	2	<	GoBotany
Two-leaved Toothwort	Cardamine diphylla	Vascular plant	G5	S1		Х				<	GoBotany
Large Toothwort	Cardamine maxima	Vascular plant	G5	S1		Х				<	GoBotany
Lesser Brown Sedge	Carex adusta	Vascular plant	G5	S1		Х					GoBotany
Yellow-Fruited Sedge	Carex annectens	Vascular plant	G5	S1				Х			GoBotany
Water Sedge	Carex aquatilis	Vascular plant	G5	S2?				Х		<	GoBotany
Water Sedge	Carex aquatilis var. aquatilis	Vascular plant	G5T5	S2?				Х	2	<	GoBotany
Silvery-flowered Sedge	Carex argyrantha	Vascular plant	G5	S1		Х					GoBotany
Atlantic Sedge	Carex atlantica	Vascular plant	G5	S1				Х			GoBotany
Atlantic Sedge	Carex atlantica ssp. atlantica	Vascular plant	G5T4	S1				Х			GoBotany
Golden Sedge	Carex aurea	Vascular plant	G5	S2S3		Х		Х	2	<	NatureServe
Bromelike Sedge	Carex bromoides	Vascular plant	G5	S1		Х		Х		<	GoBotany
Bromelike Sedge	Carex bromoides ssp. bromoides	Vascular plant	G5T5	S1		Х		Х		<	GoBotany
Creeping Sedge	Carex chordorrhiza	Vascular plant	G5	S1				Х			NatureServe
Bearded Sedge	Carex comosa	Vascular plant	G5	S1				Х			NatureServe
Dense Sedge	Carex cumulata	Vascular plant	G4?	S1		Х					GoBotany

Northern Sedge	Carex deflexa	Vascular plant	G5	S2		Х				NatureServe, GoBotany
Yellow Sedge	Carex flava	Vascular plant	G5	S2			Х	Х		NatureServe
Fernald's Hay Sedge	Carex foenea	Vascular plant	G5	S2?		Х				GoBotany
Northern Long Sedge	Carex folliculata	Vascular plant	G4G5	S1			Х	Х		GoBotany
Limestone Meadow Sedge	Carex granularis	Vascular plant	G5	S1			Х	Х		GoBotany
Northern Bog Sedge	Carex gynocrates	Vascular plant	G5	S1		Х	Х			GoBotany
Hayden's Sedge	Carex haydenii	Vascular plant	G5	S1			Х	Х		GoBotany
Porcupine Sedge	Carex hystericina	Vascular plant	G5	S1S2			Х	Х		GoBotany
Slender Sedge	Carex lasiocarpa	Vascular plant	G5	S1S2			Х	Х		GoBotany
Slender Sedge	Carex lasiocarpa var. americana	Vascular plant	G5T5	S1S2			Х	Х		GoBotany
Mud Sedge	Carex limosa	Vascular plant	G5	S2			Х			GoBotany
Livid Sedge	Carex livida	Vascular plant	G5	S1			Х			GoBotany
Livid Sedge	Carex livida var. radicaulis	Vascular plant	G5T5	S1			Х			GoBotany
Sallow Sedge	Carex Iurida	Vascular plant	G5	S1			Х	Х		GoBotany
Mackenzie's Sedge	Carex mackenziei	Vascular plant	G4?	S2S3					Χ	GoBotany
Few-Flowered Sedge	Carex pauciflora	Vascular plant	G5	S1		Х	Х			NatureServe
Long-stalked Sedge	Carex pedunculata	Vascular plant	G5	S2		Х		Х		GoBotany
Eastern Star Sedge	Carex radiata	Vascular plant	G4	S1		Х				GoBotany
Loose-flowered Alpine Sedge	Carex rariflora	Vascular plant	G5	S1			Х			GoBotany
Loose-flowered Alpine Sedge	Carex rariflora var. rariflora	Vascular plant	G5T5	S1			Х			GoBotany
Estuary Sedge	Carex recta	Vascular plant	G4	S1S2			Х	Х	Х	GoBotany
Narrow-leaved Beaked Sedge	Carex rostrata	Vascular plant	G5	S1			Х	Х		GoBotany
Tussock Sedge	Carex stricta	Vascular plant	G5	S2S3			Х	Х		GoBotany
Sparse-Flowered Sedge	Carex tenuiflora	Vascular plant	G5	S1			Х			GoBotany, LBOF
Tinged Sedge	Carex tincta	Vascular plant	G4G5	S1		Х				GoBotany
Deep Green Sedge	Carex tonsa	Vascular plant	G5	S2S3		Х				GoBotany
Deep Green Sedge	Carex tonsa var. rugosperma	Vascular plant	G5T5	S2S3		Х				GoBotany
Shaved Sedge	Carex tonsa var. tonsa	Vascular plant	G5T5	S1?		Х				GoBotany
Blunt Broom Sedge	Carex tribuloides	Vascular plant	G5	S1			Х	Х		GoBotany
Three-Seed Sedge	Carex trisperma var. billingsii	Vascular plant	G5T4	S2S3		Х	Х			GoBotany
Northern Beaked Sedge	Carex utriculata	Vascular plant	G5	S2S3			Х	Х		GoBotany
Estuarine Sedge	Carex vacillans	Vascular plant	GNR	S1?			Х	Х	Χ	GoBotany
Inflated Sedge	Carex vesicaria	Vascular plant	G5	S1S2			Х			GoBotany

Inflated Sedge	Carex vesicaria var. jejuna	Vascular plant	G5T5?	S1S2				Х	Х		GoBotany
Fox Sedge	Carex vulpinoidea	Vascular plant	G5	S2S3				Х			GoBotany
Fox Sedge	Carex vulpinoidea var. vulpinoidea	Vascular plant	G5T5	S2S3				Х			GoBotany
Wiegand's Sedge	Carex wiegandii	Vascular plant	G4	S1		Х		Х			NatureServe
Water Whorl Grass	Catabrosa aquatica	Vascular plant	G5	S1				Х			Botanical Society of the British Isles (1998)
Water Whorl Grass	Catabrosa aquatica var. Iaurentiana	Vascular plant	G5TNR	S1				Х			Botanical Society of the British Isles (1998)
Seaside Spurge	Chamaesyce polygonifolia	Vascular plant	G5?	S2			Х				GoBotany
Red Pigweed	Chenopodium rubrum	Vascular plant	G5	S1						Χ	GoBotany
Broad-leaved Enchanter's Nightshade	Circaea lutetiana	Vascular plant	G5	S2		Х			Х		Verburg and During (1998)
Broad-leaved Enchanter's Nightshade	Circaea lutetiana ssp. canadensis	Vascular plant	G5T5	S2		Х			Х		GoBotany
Swamp Thistle	Cirsium muticum	Vascular plant	G5	S2S3	Υ			Х	Х	Χ	GoBotany
Smooth Twigrush	Cladium mariscoides	Vascular plant	G5	S1				Х	Х	Χ	NatureServe, GoBotany
Carolina Spring Beauty	Claytonia caroliniana	Vascular plant	G5	S1S2		Х			Х		GoBotany
Carolina Spring Beauty	Claytonia caroliniana var. caroliniana	Vascular plant	G5T5	S1S2		Х			Х		GoBotany
Virginia Clematis	Clematis virginiana	Vascular plant	G5	S2S3		Х		Х	Х		GoBotany
Chinese Hemlock-parsley	Conioselinum chinense	Vascular plant	G5	S1		Х		Х	Х		GoBotany
Spotted Coralroot	Corallorhiza maculata	Vascular plant	G5	S2		Х					GoBotany
Early Coralroot	Corallorhiza trifida	Vascular plant	G5	S2		Х		Х			GoBotany
Broom Crowberry	Corema conradii	Vascular plant	G4	S2		Х					NatureServe
Round-leaved Dogwood	Cornus rugosa	Vascular plant	G5	S1		Х					Hinds (2000)
Pale Corydalis	Corydalis sempervirens	Vascular plant	G5	S2		Х					GoBotany
Water Pygmyweed	Crassula aquatica	Vascular plant	G5	S1				Х	Х	Х	NatureServe, GoBotany
Fireberry Hawthorn	Crataegus chrysocarpa	Vascular plant	G5	S1?		Х		Х	Х		GoBotany
Fireberry Hawthorn	Crataegus chrysocarpa var. chrysocarpa	Vascular plant	G5T5	S1?		Х			Х		GoBotany
Holmes' Hawthorn	Crataegus holmesiana	Vascular plant	G5	S1		Х					GoBotany
Swamp Dodder	Cuscuta gronovii	Vascular plant	G5	S2				Х	Х		GoBotany
Swamp Dodder	Cuscuta gronovii var. gronovii	Vascular plant	G5T5	S2				Х	Х		GoBotany
Yellow Lady's-slipper	Cypripedium parviflorum	Vascular plant	G5	S2		Х		Х	Х		NatureServe, GoBotany

Yellow Lady's-slipper	Cypripedium parviflorum var. pubescens	Vascular plant	G5T5	S2		Х		Х	Х		NatureServe
Showy Lady's-Slipper	Cypripedium reginae	Vascular plant	G4	S2		Х		Х	Х		NatureServe
A Bladderfern	Cystopteris tenuis	Vascular plant	G5	S1		Х					Reznicek et al., (2011)
Dewdrop	Dalibarda repens	Vascular plant	G5	S1		Х		Х			NatureServe, GoBotany
Flattened Oat Grass	Danthonia compressa	Vascular plant	G5	S1		Х					GoBotany
Shrubby Cinquefoil	Dasiphora fruticosa	Vascular plant	G5	S1				Х	Х		GoBotany
Shrubby Cinquefoil	Dasiphora fruticosa ssp. floribunda	Vascular plant	G5T5	S1				Х	Х		GoBotany
Swamp Loosestrife	Decodon verticillatus	Vascular plant	G5	S1				Х	Х		GoBotany
Tufted Hair Grass	Deschampsia caespitosa	Vascular plant	G5	S1		Х		Х	Х		GoBotany
Dutchman's Breeches	Dicentra cucullaria	Vascular plant	G5	S1		Х			Х		GoBotany
Starved Panic Grass	Dichanthelium depauperatum	Vascular plant	G5	S1S2		Х					GoBotany
Starved Panic Grass	Dichanthelium depauperatum var. 1	Vascular plant	G5TNR	S1S2		Х					GoBotany
Salt Grass	Distichlis spicata	Vascular plant	G5	S2S3						Χ	GoBotany
Twisted Whitlow-grass	Draba incana	Vascular plant	G5	S1		Х					GoBotany
Spoon-Leaved Sundew	Drosera intermedia	Vascular plant	G5	S1				Х			University of Idaho & USDA
Male Fern	Dryopteris filix-mas	Vascular plant	G5	S1		Х					NatureServe
Three-Way Sedge	Dulichium arundinaceum	Vascular plant	G5	S2				Х	Х		GoBotany*
Small Waterwort	Elatine minima	Vascular plant	G5	S1					Х		GoBotany
Quill Spikerush	Eleocharis nitida	Vascular plant	G4	S1				Х			NatureServe
Ovate Spikerush	Eleocharis ovata	Vascular plant	G5	S1					Х		GoBotany
Dwarf Spikerush	Eleocharis parvula	Vascular plant	G5	S2S3				Х	Х	Χ	NatureServe, GoBotany
Few-flowered Spikerush	Eleocharis quinqueflora	Vascular plant	G5	S1				Х	Х		GoBotany
Slender Spikerush	Eleocharis tenuis	Vascular plant	G5	S2?					Х		GoBotany
Slender Spikerush	Eleocharis tenuis var. tenuis	Vascular plant	G5T5?	S2?					Х		GoBotany
Nuttall's Waterweed	Elodea nuttallii	Vascular plant	G5	S1					Х		GoBotany
Slender Wild Rye	Elymus trachycaulus	Vascular plant	G5	S2		Х		Х	Х		GoBotany
Slender Wild Rye	Elymus trachycaulus ssp. trachycaulus	Vascular plant	G5T5	S2		Х		Х	Х		GoBotany
Virginia Wild Rye	Elymus virginicus	Vascular plant	G5	S1		Х	Х	Х	Х	Χ	GoBotany
Virginia Wild Rye	Elymus virginicus var. virginicus	Vascular plant	G5T5	S1		Х	Х	Х	Х	Χ	GoBotany
Pink Crowberry	Empetrum eamesii	Vascular plant	G5	S2			Х				Flora of North America

Pink Crowberry	Empetrum eamesii ssp. atropurpureum	Vascular plant	G5T5	S2				Х				Flora of North America
Pink Crowberry	Empetrum eamesii ssp. eamesii	Vascular plant	G5TNR	S2				Х				Flora of North America
Purple-veined Willowherb	Epilobium coloratum	Vascular plant	G5	S1?					Х	Х		NatureServe
Downy Willowherb	Epilobium strictum	Vascular plant	G5?	S2					Х	Х		GoBotany
Dwarf Scouring-Rush	Equisetum scirpoides	Vascular plant	G5	S1			Х		Х	Х		NatureServe, GoBotany
Variegated Horsetail	Equisetum variegatum	Vascular plant	G5	S1				Х	Х	Х	:	NatureServe
Variegated Horsetail	Equisetum variegatum var. variegatum	Vascular plant	G5T5	S1				Х	Х	Х		NatureServe
Annual Fleabane	Erigeron annuus	Vascular plant	G5	S1								GoBotany
Philadelphia Fleabane	Erigeron philadelphicus	Vascular plant	G5	S1						Х		GoBotany
Philadelphia Fleabane	Erigeron philadelphicus var. philadelphicus	Vascular plant	G5T5	S1						٧	'	GoBotany
White Buttons	Eriocaulon aquaticum	Vascular plant	G5	S1					Х	Х	X	NatureServe
Russet Cotton-Grass	Eriophorum chamissonis	Vascular plant	G5	S1S2								
Slender Cottongrass	Eriophorum gracile	Vascular plant	G5	S1					Х			GoBotany
Slender Cottongrass	Eriophorum gracile var. gracile	Vascular plant	G5T4T5	S1					Х			GoBotany
Russet Cottongrass	Eriophorum russeolum	Vascular plant	G5	S1S2					Х			Aiken et al., (2007)
Russet Cotton-Grass	Eriophorum russeolum var. russeolum	Vascular plant	G5T5	S1S2								
Green-keeled Cottongrass	Eriophorum viridicarinatum	Vascular plant	G5	S2					Х			NatureServe
Common Boneset	Eupatorium perfoliatum	Vascular plant	G5	S2					Х	Х		GoBotany
Common Boneset	Eupatorium perfoliatum var. perfoliatum	Vascular plant	G5T5	S2					Х	Х		GoBotany
Rand's Eyebright	Euphrasia randii	Vascular plant	G5	S1?				Х				GoBotany
Large-leaved Aster	Eurybia macrophylla	Vascular plant	G5	S2S3			Х					GoBotany
Black Ash	Fraxinus nigra	Vascular plant	G5	S2			Х		Х	Х		GoBotany
Common Bedstraw	Galium aparine	Vascular plant	G5	S1			Х		Х			GoBotany
Northern Bedstraw	Galium boreale	Vascular plant	G5	S1			Х		Х			GoBotany
Labrador Bedstraw	Galium labradoricum	Vascular plant	G5	S1S2			Х		Х			NatureServe
Blunt-leaved Bedstraw	Galium obtusum	Vascular plant	G5	S1					Х			illinoiswildflowers
Blunt-leaved Bedstraw	Galium obtusum ssp. obtusum	Vascular plant	G5T4	S1					Х			illinoiswildflowers
Dwarf Huckleberry	Gaylussacia bigeloviana	Vascular plant	G5T4T5	S2					Х			GoBotany
Bicknell's Crane's-bill	Geranium bicknellii	Vascular plant	G5	S1	_		Х		Х	Х		NatureServe
White Avens	Geum canadense	Vascular plant	G5	S2S3			Х		Х			GoBotany

White Avens	Geum canadense var. canadense	Vascular plant	G5T5	S2S3		Х		Х		GoBotany
Large-Leaved Avens	Geum macrophyllum	Vascular plant	G5	S2?		Х		Х		GoBotany
	Geum macrophyllum var. macrophyllum	Vascular plant	G5T5	S2?		Х				Burke Museum of Natural History and Culture (2015)
Northern Manna Grass	Glyceria borealis	Vascular plant	G5	S2S3				Х	Х	GoBotany
Canada Manna Grass	Glyceria canadensis	Vascular plant	G5	S2				Х		GoBotany
Northern Mannagrass	Glyceria laxa	Vascular plant	G5	S1				Х	Х	GoBotany
Menzies' Rattlesnake-plantain	Goodyera oblongifolia	Vascular plant	G5?	S1		Х		Х		GoBotany
Lesser Rattlesnake-plantain	Goodyera repens	Vascular plant	G5	S2		Х		Х		GoBotany
Checkered Rattlesnake- Plantain	Goodyera tesselata	Vascular plant	G5	S2		Х				GoBotany
American Witch-Hazel	Hamamelis virginiana	Vascular plant	G5	S1		Х		Х	Х	NatureServe, GoBotany
Canada Hawkweed	Hieracium canadense	Vascular plant	G5	S2?		Х			Х	GoBotany
Canada Hawkweed	Hieracium canadense var. canadense	Vascular plant	G5T5	S2?		Х		Х	Х	GoBotany
Umbellate Hawkweed	Hieracium umbellatum	Vascular plant	G5	S1		Х				GoBotany
Common Mare's-Tail	Hippuris vulgaris	Vascular plant	G5	S2				Х	Х	GoBotany
Seabeach Sandwort	Honckenya peploides	Vascular plant	G5	S2S3			Х			GoBotany
Seabeach Sandwort	Honckenya peploides ssp. robusta	Vascular plant	G5T4	S2S3			Х			Hinds (2000)
Pinebarren Golden Heather	Hudsonia ericoides	Vascular plant	G4	S1			Х			NatureServe
9	Hudsonia tomentosa var. intermedia	Vascular plant	G5T4	S1?		Х	Х	Х	Х	NatureServe, GoBotany
Common Hop	Humulus lupulus var. lupuloides	Vascular plant	G5T5	S1?		Х				NatureServe
Pale St John's-Wort	Hypericum ellipticum	Vascular plant	G5	S1				Х	Х	GoBotany
Large St John's-wort	Hypericum majus	Vascular plant	G5	S1?				Х	Х	GoBotany
Dwarf St John's-wort	Hypericum mutilum	Vascular plant	G5	S1				Х	Х	GoBotany
Hooker's Iris	Iris setosa	Vascular plant	G5?	S2S3			Х			GoBotany
Hooker's Iris	Iris setosa var. canadensis	Vascular plant	G5?T5?	S2S3			Х			GoBotany
Lake Quillwort	Isoetes lacustris	Vascular plant	GNR	S1				Х	Х	GoBotany
Canada Rush	Juncus canadensis	Vascular plant	G5	S2?				Х	Х	GoBotany
Dudley's Rush	Juncus dudleyi	Vascular plant	G5	S1S2					Х	GoBotany
Thread Rush	Juncus filiformis	Vascular plant	G5	S2S3					Х	GoBotany
Greene's Rush	Juncus greenei	Vascular plant	G5	S1			Х			GoBotany
Bayonet Rush	Juncus militaris	Vascular plant	G4	S1					Х	GoBotany

Common Juniper	Juniperus communis var. montana	Vascular plant	G5T4T5	S2?			X				Flora of North America
Creeping Juniper	Juniperus horizontalis	Vascular plant	G5	S2				Х	Х		Hinds (2000)
Canada Wood Nettle	Laportea canadensis	Vascular plant	G5	S1			Х			Х	GoBotany
Beach Pinweed	Lechea maritima	Vascular plant	G5	S1				Х			GoBotany
Beach Pinweed	Lechea maritima var. subcylindrica	Vascular plant	G5T2	S1	SC	Υ		Х			COSEWIC (2008)
Star Duckweed	Lemna trisulca	Vascular plant	G5	S2S3					Х	Х	GoBotany
Southern Mudwort	Limosella australis	Vascular plant	G4G5	S2				Х	Х		X NatureServe, GoBotany
Yellow-seeded False Pimperel	Lindernia dubia	Vascular plant	G5	S1					Х	Х	GoBotany
Yellow-seeded False Pimperel	Lindernia dubia var. dubia	Vascular plant	G5T5	S1					Х	Х	GoBotany
Loesel's Twayblade	Liparis loeselii	Vascular plant	G5	S2					Х	Х	GoBotany
Southern Twayblade	Listera australis	Vascular plant	G4	S1					Х		GoBotany
Broad-Leaved Twayblade	Listera convallarioides	Vascular plant	G5	S2					Х	Х	NatureServe, GoBotany
Heart-leaved Twayblade	Listera cordata	Vascular plant	G5	S2					Х	Х	GoBotany
Heart-leaved Twayblade	Listera cordata var. cordata	Vascular plant	G5T5	S2					Х	Х	GoBotany
Water Lobelia	Lobelia dortmanna	Vascular plant	G4G5	S1					Х		NatureServe
Northern Bog Clubmoss	Lycopodiella inundata	Vascular plant	G5	S2S3					Х	Х	GoBotany
Northern Clubmoss	Lycopodium complanatum	Vascular plant	G5	S2S3			Х				GoBotany
Hickey's Tree-clubmoss	Lycopodium hickeyi	Vascular plant	G5	S2S3			Х				GoBotany
One-cone clubmoss	Lycopodium lagopus	Vascular plant	G5	S2S3			Х				GoBotany
Flat-branched Tree-clubmoss	Lycopodium obscurum	Vascular plant	G5	S1S2			Х				GoBotany
Ground-Fir	Lycopodium sabinifolium	Vascular plant	G4	S1S2			Х				
Sitka Clubmoss	Lycopodium sitchense	Vascular plant	G5	S1			Х				
White Adder's-Mouth	Malaxis brachypoda	Vascular plant	G4Q	S1			Х		Х		GoBotany
Green Adder's-Mouth	Malaxis unifolia	Vascular plant	G5	S2S3					Х		NatureServe
Tall Millet Grass	Milium effusum	Vascular plant	G5	S1			Х				GoBotany
Tall Millet Grass	Milium effusum var. cisatlanticum	Vascular plant	G5TNR	S1			Х				GoBotany
Square-stemmed Monkeyflower	Mimulus ringens	Vascular plant	G5	S2?					Х		GoBotany
Square-stemmed Monkeyflower	Mimulus ringens var. ringens	Vascular plant	G5T5	S2?					Х	Х	X GoBotany
Partridgeberry	Mitchella repens	Vascular plant	G5	S1S2			Х				GoBotany
Spiked Muhly	Muhlenbergia glomerata	Vascular plant	G5	S1S2			Х		Х		GoBotany
Mexican Muhly	Muhlenbergia mexicana	Vascular plant	G5	S2			Х		Х		GoBotany

Variable-leaved Water Milfoil	Myriophyllum heterophyllum	Vascular plant	G5	S1				Х	Х	GoBotany
Andean Water Milfoil	Myriophyllum quitense	Vascular plant	G4?	S1				Х		Flora of North America
Slender Water Milfoil	Myriophyllum tenellum	Vascular plant	G5	S1				Х		GoBotany
Slender Naiad	Najas flexilis	Vascular plant	G5	S1				Х	Х	GoBotany
Red-disked Yellow Pond-lily	Nuphar lutea ssp. rubrodisca	Vascular plant	G5T3T5	S1				Х		GoBotany
Fragrant Water-lily	Nymphaea odorata	Vascular plant	G5	S1				Х	Х	NatureServe
Fragrant Water-lily	Nymphaea odorata ssp. odorata	Vascular plant	G5T5	S1				Х	Х	NatureServe, GoBotany
Bog Aster	Oclemena nemoralis	Vascular plant	G5	S2				Х	Х	GoBotany
Oakes' Evening Primrose	Oenothera oakesiana	Vascular plant	G4G5Q	S1S3			Х			GoBotany
Northern Adder's-tongue	Ophioglossum pusillum	Vascular plant	G5	S1				Х	Х	NatureServe, GoBotany
One-Flowered Broomrape	Orobanche uniflora	Vascular plant	G5	S1		Х				GoBotany
White-grained Mountain Rice	Oryzopsis asperifolia	Vascular plant	G5	S1		Х				GoBotany
Hairy Sweet Cicely	Osmorhiza claytonii	Vascular plant	G5	S2		Х				GoBotany
Smooth Sweet Cicely	Osmorhiza longistylis	Vascular plant	G5	S1		Х				GoBotany
Ironwood	Ostrya virginiana	Vascular plant	G5	S1		Х				GoBotany
Ironwood	Ostrya virginiana var. virginiana	Vascular plant	G5T5	S1		Х				GoBotany
Golden Groundsel	Packera aurea	Vascular plant	G5	S2				Х	Х	GoBotany
Schweinitz's Groundsel	Packera schweinitziana	Vascular plant	G5?	S1				Х		GoBotany
Dwarf Ginseng	Panax trifolius	Vascular plant	G5	S2		Х				GoBotany
Marsh Grass-Of-Parnassus	Parnassia palustris	Vascular plant	G5	S1				Х		Michigan Natural Features Inventory (2000)
Marsh Grass-of-Parnassus	Parnassia palustris var. parviflora	Vascular plant	G5T4	S1			Х	Х		Bonnin et al., (2002)
Northern Sweet Coltsfoot	Petasites frigidus	Vascular plant	G5	S2S3				Х		GoBotany
Northern Sweet Coltsfoot	Petasites frigidus var. palmatus	Vascular plant	G5T5	S2S3				Х		GoBotany
Dwarf Clearweed	Pilea pumila	Vascular plant	G5	S1		Х			Х	GoBotany
Dwarf Clearweed	Pilea pumila var. pumila	Vascular plant	G5T5	S1		Х		Х	Х	GoBotany
Red Pine	Pinus resinosa	Vascular plant	G5	S2		Х		Х		NatureServe
Tall Northern Green Orchid	Platanthera aquilonis	Vascular plant	G5	S2		Х		Х		GoBotany
White Fringed Orchid	Platanthera blephariglottis	Vascular plant	G4G5	S2				Х		NatureServe, GoBotany
White Fringed Orchid	Platanthera blephariglottis var. blephariglottis	Vascular plant	G4G5T4?	S1				Х		NatureServe
Hooker's Orchid	Platanthera hookeri	Vascular plant	G4	S1		Х				GoBotany
Blunt-leaved Orchid	Platanthera obtusata	Vascular plant	G5	S1S2		Х		Х		GoBotany
Small Round-leaved Orchid	Platanthera orbiculata	Vascular plant	G5	S2		Х		Х		NatureServe, GoBotany

Grove Blue Grass	Poa alsodes	Vascular plant	G4G5	S1			Х			Х	GoBotany
Rose Pogonia	Pogonia ophioglossoides	Vascular plant	G5	S2					Х		GoBotany
Blood Milkwort	Polygala sanguinea	Vascular plant	G5	S1					Х		GoBotany
Water Smartweed	Polygonum amphibium var. emersum	Vascular plant	G5T5	S1					Х	Х	NatureServe
Halberd-leaved Tearthumb	Polygonum arifolium	Vascular plant	G5	S2					Х	Х	GoBotany
Fowler's Knotweed	Polygonum fowleri	Vascular plant	G5	S1				Х)	X GoBotany
Pennsylvania Smartweed	Polygonum pensylvanicum	Vascular plant	G5	S1					Х	Х	GoBotany
Dotted Smartweed	Polygonum punctatum	Vascular plant	G5	S2S3					Х	X)	X GoBotany
Dotted Smartweed	Polygonum punctatum var. confertiflorum	Vascular plant	G5T5	S2S3					Х	X	χ GoBotany*
Sharp-fruited Knotweed	Polygonum raii	Vascular plant	G3G5Q	S1?				Х			GoBotany
Bushy Knotweed	Polygonum ramosissimum	Vascular plant	G5	S2S3				Х)	X GoBotany
Bushy Knotweed	Polygonum ramosissimum var. ramosissimum	Vascular plant	G5T5	S2S3				Х)	X GoBotany
Climbing False Buckwheat	Polygonum scandens	Vascular plant	G5	S1			Х		Х	Х	GoBotany
Climbing False Buckwheat	Polygonum scandens var. scandens	Vascular plant	G5T5	S1			Х			Х	GoBotany
Appalachian Polypody	Polypodium appalachianum	Vascular plant	G4G5	S1			Х				GoBotany
Rock Polypody	Polypodium virginianum	Vascular plant	G5	S1			Х				GoBotany
Braun's Holly Fern	Polystichum braunii	Vascular plant	G5	S1			Х				GoBotany
Pickerelweed	Pontederia cordata	Vascular plant	G5	S1					Х	Х	GoBotany
Balsam Poplar	Populus balsamifera	Vascular plant	G5	S2S3			Х		Х	Х	NatureServe
Balsam Poplar	Populus balsamifera ssp. balsamifera	Vascular plant	G5T5	S2S3			Х		Х	Х	GoBotany
Alpine Pondweed	Potamogeton alpinus	Vascular plant	G5	S1S2					Х	Х	GoBotany
Ribbon-leaved Pondweed	Potamogeton epihydrus	Vascular plant	G5	S2					Х	Х	GoBotany
Oakes' Pondweed	Potamogeton oakesianus	Vascular plant	G4	S1					Х	Х	GoBotany
Blunt-leaved Pondweed	Potamogeton obtusifolius	Vascular plant	G5	S2					Х	Х	GoBotany
Vasey's Pondweed	Potamogeton vaseyi	Vascular plant	G4	S1					Х	Х	NatureServe, GoBotany
Flat-stemmed Pondweed	Potamogeton zosteriformis	Vascular plant	G5	S1					Х	Х	GoBotany
Macoun's Cudweed	Pseudognaphalium macounii	Vascular plant	G5	S2			Х				GoBotany
Eastern Cudweed	Pseudognaphalium obtusifolium	Vascular plant	G5	S1				Х			NatureServe, GoBotany, Hoagland and Buthod (2005)
Eastern Cudweed	Pseudognaphalium obtusifolium ssp. obtusifolium	Vascular plant	G5T5	S1			Х				University of Texas

Seaside Alkali Grass	Puccinellia americana	Vascular plant	G4G5Q	S1?							x GoBotany
Pink Pyrola	Pyrola asarifolia	Vascular plant	G5	S2		Х		Х			GoBotany
Pink Pyrola	Pyrola asarifolia ssp. asarifolia	Vascular plant	G5T5	S2		Х		Х	2	X	NatureServe, GoBotany
Green-flowered Pyrola	Pyrola chlorantha	Vascular plant	G5	S1S2		Х					GoBotany
Gmelin's Water Buttercup	Ranunculus gmelinii	Vascular plant	G5	S2				Х		X	GoBotany
Pennsylvania Buttercup	Ranunculus pensylvanicus	Vascular plant	G5	S1				Х	2	X	Massachusetts Fish and Wildlife (2011), GoBotany
Hooked Buttercup	Ranunculus recurvatus	Vascular plant	G5	S1?		Х		Х	2	X	GoBotany
Hooked Buttercup	Ranunculus recurvatus var. recurvatus	Vascular plant	G5T5	S1?		Х		Х		x	GoBotany
Cursed Buttercup	Ranunculus sceleratus	Vascular plant	G5	S1				Х			GoBotany
Staghorn Sumac	Rhus typhina	Vascular plant	G5	S1S2		Х					GoBotany
Carolina Rose	Rosa carolina	Vascular plant	G5	S2S3		Х					GoBotany
Carolina Rose	Rosa carolina var. carolina	Vascular plant	G5T5	S2S3		Х					GoBotany
Cloudberry	Rubus chamaemorus	Vascular plant	G5	S2				Х			GoBotany
Showy Blackberry	Rubus elegantulus	Vascular plant	G4?Q	S1		Х		Х		X	GoBotany
Pennsylvania Blackberry	Rubus pensilvanicus	Vascular plant	G5	S1?		Х		Х			GoBotany
Vermont Blackberry	Rubus vermontanus	Vascular plant	G5	S1S2		Х					GoBotany
Cut-Leaved Coneflower	Rudbeckia laciniata	Vascular plant	G5	S2	Υ	Х		Х		X	GoBotany
Cut-Leaved Coneflower	Rudbeckia laciniata var. laciniata	Vascular plant	G5T5	S2		Х		Х	2	X	GoBotany
Tierra del Fuego Dock	Rumex fueginus	Vascular plant	G5T4T5	S1S2				Х		X	x GoBotany
Sea-Side Dock	Rumex maritimus	Vascular plant	G5	S2S3				Х		X	IUCN
Tierra del Fuego Dock	Rumex maritimus var. fueginus	Vascular plant	G5T4T5	S1S2				Х			Shay 1984
Peach-leaved Dock	Rumex maritimus var. persicarioides	Vascular plant	G5T3?Q	S1S2				Х		X	? Flora of North America/St John (1915)
Seabeach Dock	Rumex pallidus	Vascular plant	G4	S1?			Х	Х	2	X	x GoBotany
Knotted Pearlwort	Sagina nodosa	Vascular plant	G5	S1S2			Х				GoBotany
Knotted Pearlwort	Sagina nodosa ssp. borealis	Vascular plant	G5T5	S1S2			Х				GoBotany
Grass-leaved Arrowhead	Sagittaria graminea	Vascular plant	G5	S1				Х	2	X	GoBotany
Grass-leaved Arrowhead	Sagittaria graminea var. graminea	Vascular plant	G5T5	S1				Х	2	X	GoBotany
Sage Willow	Salix candida	Vascular plant	G5	S1				Х			GoBotany
Meadow Willow	Salix petiolaris	Vascular plant	G5	S1S2				Х			GoBotany
Seaside Brookweed	Samolus valerandi	Vascular plant	G5	S1				Х		X	x GoBotany
Seaside Brookweed	Samolus valerandi ssp. parviflorus	Vascular plant	G5T5	S1				Х		X	x GoBotany
Purple Oat Grass	Schizachne purpurascens	Vascular plant	G5	S1		Х		Х			GoBotany

Water Bulrush	Schoenoplectus subterminalis	Vascular plant	G4G5	S1						Х	Х		NatureServe
Georgia Bulrush	Scirpus georgianus	Vascular plant	G5	S1						Х			GoBotany
Stalked Bulrush	Scirpus pedicellatus	Vascular plant	G4	S1?						Х	Х		GoBotany
Hanging Bulrush	Scirpus pendulus	Vascular plant	G5	S1						Х		Χ	GoBotany; Flora of North America
Tall Goldenrod	Solidago altissima	Vascular plant	G5	S1				Х					GoBotany
Early Goldenrod	Solidago juncea	Vascular plant	G5	S1				Х					GoBotany
Large-leaved Goldenrod	Solidago macrophylla	Vascular plant	G5	S1				Х					GoBotany
American Burreed	Sparganium americanum	Vascular plant	G5	S2?						Х	Х		GoBotany
Floating Burreed	Sparganium fluctuans	Vascular plant	G5	S1						Х	Х		GoBotany
Small Burreed	Sparganium natans	Vascular plant	G5	S1						Х	Х		GoBotany
Slender Wedge Grass	Sphenopholis intermedia	Vascular plant	G5	S1				Х		Х	Х		GoBotany
Nodding Ladies'-Tresses	Spiranthes cernua	Vascular plant	G5	S1				Х		Х			GoBotany
Yellow Ladies'-tresses	Spiranthes ochroleuca	Vascular plant	G4	S1				Х		Х			GoBotany
Hooded Ladies'-Tresses	Spiranthes romanzoffiana	Vascular plant	G5	S2S3				Х		Х	Х		NatureServe, GoBotany
Trailing Stitchwort	Stellaria alsine	Vascular plant	G5	S2S3						Х	Х		GoBotany
Boreal Stitchwort	Stellaria borealis	Vascular plant	G5	S2S3						Х	Х		GoBotany
Boreal Stitchwort	Stellaria borealis ssp. borealis	Vascular plant	G5T5	S2S3						Х	Х		GoBotany
Saltmarsh Starwort	Stellaria humifusa	Vascular plant	G5?	S1								Χ	GoBotany
Thread-leaved Pondweed	Stuckenia filiformis	Vascular plant	G5	S1						Х	Х		GoBotany
Thread-leaved Pondweed	Stuckenia filiformis ssp. alpina	Vascular plant	G5T5	S1						Х	Х		GoBotany
Thread-leaved Pondweed	Stuckenia filiformis ssp. occidentalis	Vascular plant	G5T5	S1				Х			Х		Flora of North America
Horned Sea-blite	Suaeda calceoliformis	Vascular plant	G5	S1?					Х			Χ	NatureServe, GoBotany
Boreal Aster	Symphyotrichum boreale	Vascular plant	G5	S2						Х			GoBotany
Gulf of St Lawrence Aster	Symphyotrichum laurentianum	Vascular plant	G2	S1	TH	Υ	′		Х			Χ	NatureServe
Annual Saltmarsh Aster	Symphyotrichum subulatum	Vascular plant	G5	S1		Υ	′			Х	Χ	Χ	GoBotany
Annual Saltmarsh Aster	Symphyotrichum subulatum (non- Bathurst pop)	Vascular plant	G5T5	S1		Υ	′			Х	Х	Х	GoBotany
Canada Germander	Teucrium canadense	Vascular plant	G5	S2					Х	Х	Х	Χ	GoBotany
Canada Germander	Teucrium canadense var. canadense	Vascular plant	G5T5	S2					Х	Х	Х	Х	GoBotany
Northern Meadow-rue	Thalictrum venulosum	Vascular plant	G5	S1				Х		Х	Х		NatureServe, GoBotany
Alpine Clubrush	Trichophorum alpinum	Vascular plant	G5	S1						Х	Х		NatureServe
Tufted Clubrush	Trichophorum caespitosum	Vascular plant	G5	S2						Х	Х		IUCN

Gaspé Arrowgrass	Triglochin gaspensis	Vascular plant	G3G4	S2S3						Χ	NatureServe
Marsh Arrowgrass	Triglochin palustris	Vascular plant	G5	S2?				Х	Х	Χ	IUCN
Eastern Hemlock	Tsuga canadensis	Vascular plant	G5	S3S4	NT		Х				NatureServe
Horned Bladderwort	Utricularia cornuta	Vascular plant	G5	S1S2				Х	Х		GoBotany
Twin-stemmed Bladderwort	Utricularia geminiscapa	Vascular plant	G4G5	S1				Х	Х		GoBotany
Greater Bladderwort	Utricularia macrorhiza	Vascular plant	G5	S1				Х	Х		GoBotany
Lesser Bladderwort	Utricularia minor	Vascular plant	G5	S2				Х	Х		GoBotany
Alpine Bilberry	Vaccinium uliginosum	Vascular plant	G5	S1							GoBotany
Swamp Valerian	Valeriana uliginosa	Vascular plant	G4Q	S2S3			Х	Х			NatureServe
Wild Celery	Vallisneria americana	Vascular plant	G5	S1				Х	Х		GoBotany
Blue Vervain	Verbena hastata	Vascular plant	G5	S1				Х	Х		GoBotany
Blue Vervain	Verbena hastata var. hastata	Vascular plant	G5T5	S1				Х	Х		GoBotany
Hobblebush	Viburnum lantanoides	Vascular plant	G5	S1S2			Х				GoBotany
Lance-leaved Violet	Viola lanceolata	Vascular plant	G5	S1				Х	Х		GoBotany
Lance-leaved Violet	Viola lanceolata ssp. lanceolata	Vascular plant	G5T5	S1				Х	Х		GoBotany
Northern Bog Violet	Viola nephrophylla	Vascular plant	G5	S1S2				Х	Х		GoBotany
Downy Yellow Violet	Viola pubescens	Vascular plant	G5	S2			Х		Х		GoBotany
Downy Yellow Violet	Viola pubescens var. scabriuscula	Vascular plant	G5T5	S2			Х		Х		GoBotany
Arrow-Leaved Violet	Viola sagittata	Vascular plant	G5	S1?			Х	Х	Х		GoBotany
Arrow-Leaved Violet	Viola sagittata var. ovata	Vascular plant	G5T5	S1?			Х	Х	Х		GoBotany
Virginia Chain Fern	Woodwardia virginica	Vascular plant	G5	S2				Х			GoBotany
Horned Pondweed	Zannichellia palustris	Vascular plant	G5	S2?				Х	Х	Χ	NatureServe, GoBotany, IUCN
a Ground Beetle	Acupalpus canadensis	Invertebrate	GNR	S1S2							Unknown
a Ground Beetle	Acupalpus pumilus	Invertebrate		S1S2							Unknown
Subarctic Darner	Aeshna subarctica	Invertebrate	G5	S1				Х			Spitzer and Danks (2006), Sahlen et al., (2004)
Milbert's Tortoiseshell	Aglais milberti	Invertebrate	G5	S1S2			Х	Х	Х		NatureServe
Milbert's Tortoise Shell	Aglais milberti milberti	Invertebrate	G5T5	S1S2			Х	Х	Х		NatureServe*
a Ground Beetle	Agonum affine	Invertebrate	GNR	S2S3							Unknown
a Ground Beetle	Agonum canadense	Invertebrate	GNR	S1S2							Unknown
a Ground Beetle	Agonum cupripennis	Invertebrate		S2S3							Unknown
a Ground Beetle	Agonum metallescens	Invertebrate		S1S2							Unknown
a Ground Beetle	Agonum octopunctatum	Invertebrate		S1S2							Unknown
a Ground Beetle	Agonum propinquum	Invertebrate	GNR	S1S2							Unknown

a Ground Beetle	Agonum superioris	Invertebrate	G?	S1S2							Unknown
a Ground Beetle	Agonum trigeminum	Invertebrate		S1S2							Unknown
a Ground Beetle	Amara avida	Invertebrate		S2S3							Unknown
a Ground Beetle	Amara cupreolata	Invertebrate	GNR	S1S2							Unknown
a Ground Beetle	Amara laevipennis	Invertebrate	G?	S1S2							Unknown
a Ground Beetle	Amara lunicollis	Invertebrate		S1S2							Unknown
a Ground Beetle	Amara obesa	Invertebrate		S2S3							Unknown
a Ground Beetle	Amara patruelis	Invertebrate		S1S2							Unknown
a Ground Beetle	Amara quenseli	Invertebrate		S2S3							Unknown
a Ground Beetle	Anisodactylus kirbyi	Invertebrate	GNR	S1S2							Unknown
a Ground Beetle	Anisodactylus nigrita	Invertebrate		S2S3							Unknown
a Ground Beetle	Anisodactylus rusticus	Invertebrate		S1S2							Unknown
a Ground Beetle	Badister grandiceps	Invertebrate	GNR	S1S2							Unknown
a Ground Beetle	Badister ocularis	Invertebrate		S1S2							Unknown
Springtime Darner	Basiaeschna janata	Invertebrate	G5	S1						Х	White et al., (1968)
a Ground Beetle	Bembidion constrictum	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion contractum	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion fortestriatum	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion frontale	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion mimus	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion nigripes	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion nitidum	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion obscurellum	Invertebrate		S2S3							Unknown
a Ground Beetle	Bembidion petrosum	Invertebrate		S1S2							Unknown
a Ground Beetle	Bembidion sejunctum	Invertebrate		S2S3							Unknown
a Ground Beetle	Blethisa hudsonica	Invertebrate		S1S2							Unknown
a Ground Beetle	Blethisa quadricollis	Invertebrate	G?	S1S2							Unknown
Bumble Bee, Gypsy Cuckoo	Bombus bohemicus	Invertebrate			EN			Х			COSEWIC (2014)
Yellow-banded Bumblebee	Bombus terricola	Invertebrate	G2G4	SNR	SC	VU		Х	Х		IUCN
Ocellated Darner	Boyeria grafiana	Invertebrate	G5	S1				Х	Х	Х	IUCN
Fawn Darner	Boyeria vinosa	Invertebrate	G5	S1						Х	Worthern et al. (2001)
Henry's Elfin	Callophrys henrici	Invertebrate	G5	S1				Х	Х	Х	NatureServe
Henry's Elfin	Callophrys henrici henrici	Invertebrate	G5T?	S1				Х	Х	Х	NatureServe

Bog Elfin	Callophrys lanoraieensis	Invertebrate	G3G4	S2			Х		Х			N	NatureServe
Eastern Pine Elfin	Callophrys niphon	Invertebrate	G5	S2			Χ		Х			N	NatureServe
Eastern Pine Elfin	Callophrys niphon clarki	Invertebrate		S2			Χ		Х				NatureServe
Hoary Elfin	Callophrys polios	Invertebrate	G5	S1			Χ		Х			N	NatureServe
Ebony Jewelwing	Calopteryx maculata	Invertebrate	G5	S1							Х	N	NatureServe
a Ground Beetle	Calosoma calidum	Invertebrate		S2S3								L	Jnknown
a Ground Beetle	Carabus maeander	Invertebrate	G?	S2S3								L	Jnknown
a Ground Beetle	Carabus serratus	Invertebrate		S1S2								L	Jnknown
Calico Pennant	Celithemis elisa	Invertebrate	G5	S1					Х			II	UCN
a Ground Beetle	Chlaenius niger	Invertebrate		S1S2								L	Jnknown
a Ground Beetle	Chlaenius pennsylvanicus	Invertebrate		S1S2								L	Jnknown
Aurora Damsel	Chromagrion conditum	Invertebrate	G5	S1					Х		Х	V	Vhite et al., (1968)
Transverse Ladybird Beetle	Coccinella transversoguttata	Invertebrate		S1S2			Х			Х		L	University of michigan
Transverse Lady Beetle	Coccinella transversoguttata richardsoni	Invertebrate		S1S2			Х			Х			Jniversity of michigan
Monarch	Danaus plexippus	Invertebrate	G5	S1B	SC		Χ	Х	Х			N	NatureServe
Monarch	Danaus plexippus plexippus	Invertebrate	G5T3T4	S1B			Х	Х	Х			N	NatureServe*
a Ground Beetle	Diplocheila obtusus	Invertebrate	GNR	S1S2									
Petite Emerald	Dorocordulia lepida	Invertebrate	G5	S1					Х			V	Vhite et al., (1968)
a Ground Beetle	Dromius piceus	Invertebrate		S1S2								L	Jnknown
a Ground Beetle	Dyschirius globulosa	Invertebrate		S1S2								L	Jnknown
a Ground Beetle	Dyschirius sellatus	Invertebrate		S1S2								L	Jnknown
a Ground Beetle	Dyschirius sphaericollis	Invertebrate		S2S3								L	Jnknown
a Ground Beetle	Elaphropus incurvus	Invertebrate		S2S3								L	Jnknown
a Ground Beetle	Elaphrus americanus	Invertebrate	GNR	S2S3								L	Jnknown
a Ground Beetle	Elaphrus clairvillei	Invertebrate	GNR	S2S3								L	Jnknown
Azure Bluet	Enallagma aspersum	Invertebrate	G5	S1					Х			N	ЛсРеек (1990)
Little Bluet	Enallagma minusculum	Invertebrate	G4	S1							Х	N	NatureServe
Early Hairstreak	Erora laeta	Invertebrate	GU	S1			Х					N	NatureServe
Baltimore Checkerspot	Euphydryas phaeton	Invertebrate	G4	S2			Х		Х		Х	N	NatureServe
Baltimore Checkerspot	Euphydryas phaeton phaeton	Invertebrate	G5T4	S2			Х		Х		Х	N	NatureServe*
Harvester	Feniseca tarquinius	Invertebrate	G4	S2S3			Х		Х		Х	N	NatureServe
Harlequin Darner	Gomphaeschna furcillata	Invertebrate	G5	S1					Х				UCN
Dusky Clubtail	Gomphus spicatus	Invertebrate	G5	S2			Χ			Х		E	Birding New Brunswick

a Ground Beetle	Harpalus herbivagus	Invertebrate		S2S3						Unknown
a Ground Beetle	Harpalus laticeps	Invertebrate		S1S2						Unknown
a Ground Beetle	Harpalus pensylvanicus	Invertebrate		S1S2						Unknown
a Ground Beetle	Harpalus plenalis	Invertebrate		S2S3						Unknown
a Ground Beetle	Lebia fuscata	Invertebrate	GNR	S2S3						Unknown
a Ground Beetle	Lebia pumila	Invertebrate		S2S3		Х				Majka (2010)
a Ground Beetle	Lebia viridis	Invertebrate	GNR	S2S3						Unknown
Amber-Winged Spreadwing	Lestes eurinus	Invertebrate	G4	S2			Х			Stoks and McPeek (2003)
Frosted Whiteface	Leucorrhinia frigida	Invertebrate	G5	S1			Х			Lajeunesse et al., (2004), Wisoncsion Odonata Suirvey
Crimson-Ringed Whiteface	Leucorrhinia glacialis	Invertebrate	G5	S2			Х			IUCN
Salt Marsh Copper	Lycaena dospassosi	Invertebrate	G2G3	S2					Х	NatureServe
a Ground Beetle	Notiophilus aeneus	Invertebrate	GNR	S2S3						Unknown
Compton Tortoiseshell	Nymphalis I-album	Invertebrate	G5	S2		Х				NatureServe
Compton Tortoiseshell	Nymphalis I-album j-album	Invertebrate	G5T5	S2						Unknown
Jutta Arctic	Oeneis jutta	Invertebrate	G5	S1		Х	Х			NatureServe
Jutta Arctic	Oeneis jutta ascerta	Invertebrate	G5T4	S1		Х	Х			NatureServe*
a Ground Beetle	Omophron tessellatum	Invertebrate		S2S3						Unknown
a Ground Beetle	Oxypselaphus pusillus	Invertebrate		S1S2						Unknown
Wandering Glider	Pantala flavescens	Invertebrate	G5	S2B			Х	Х		Sherratt and Harvey (1989)
a Ground Beetle	Platynus decens	Invertebrate		S2S3						Unknown
a Ground Beetle	Platynus tenuicollis	Invertebrate		S2S3						Unknown
Northern Blue	Plebejus idas	Invertebrate	G5	S2		Х	Х			NatureServe
Crowberry Blue	Plebejus idas empetri	Invertebrate	G5T3T4	S2			Х			NatureServe
Green Comma	Polygonia faunus	Invertebrate	G5	S2		Х		Х		NatureServe
Green Comma	Polygonia faunus faunus	Invertebrate	G5T5	S2		Х		Х		NatureServe
Grey Comma	Polygonia progne	Invertebrate	G4G5	S2		Х	Х			NatureServe
Satyr Comma	Polygonia satyrus	Invertebrate	G5	S2		Х		Х		NatureServe
a Ground Beetle	Pseudamara arenaria	Invertebrate	GNR	S2S3						Unknown
a Ground Beetle	Pterostichus commutabilis	Invertebrate	GNR	S1S2						Unknown
a Ground Beetle	Pterostichus coracinus	Invertebrate	GNR	S1S2						Unknown
a Ground Beetle	Pterostichus tristis	Invertebrate		S2S3		Х				Majka (2010)
Acadian Hairstreak	Satyrium acadica	Invertebrate	G5	S1S2		Х	Х	Х		NatureServe
Acadian Hairstreak	Satyrium acadica acadica	Invertebrate		S1S2		Х	Х	Х		Natureserve

Banded Hairstreak	Satyrium calanus	Invertebrate	G5	S1					>		Х				NatureServe
Banded Hairstreak	Satyrium calanus falacer	Invertebrate	G5T5	S1					>		Х				Natureserve*
Striped Hairstreak	Satyrium liparops	Invertebrate	G5	S1					>		Х		Х		NatureServe
Striped Hairstreak	Satyrium liparops strigosum	Invertebrate	G5T5	S1					>						Canadian Biodiversity Information Facility
Lake Emerald	Somatochlora cingulata	Invertebrate	G5	S1							Х		Х		IUCN
Forcipate Emerald	Somatochlora forcipata	Invertebrate	G5	S1							Х		Х		Massachusetts Fish and Wildlife (2012a)
Delicate Emerald	Somatochlora franklini	Invertebrate	G5	S1							Х				IUCN
Incurvate Emerald	Somatochlora incurvata	Invertebrate	G4	S1							Х				NatureServe
Kennedy's Emerald	Somatochlora kennedyi	Invertebrate	G5	S1							Х		Х		Massachusetts Fish and Wildlife (2012b)
Ocellated Emerald	Somatochlora minor	Invertebrate	G5	S1									Х		Cannings and Cannings (1997)
Aphrodite Fritillary	Speyeria aphrodite	Invertebrate	G5	S2					>				Х		NatureServe
Aphrodite Fritillary	Speyeria aphrodite winni	Invertebrate	G5TNR	S2					>				Х		Natureserve*
a Ground Beetle	Sphaeroderus stenostomus	Invertebrate		S1S2											Unknown
Black Meadowhawk	Sympetrum danae	Invertebrate	G5	S1							Х				Michiels and Dhont (1989, 1990)
a Ground Beetle	Syntomus americanus	Invertebrate	GNR	S2S3											Unknown
a Ground Beetle	Xestonotus lugubris	Invertebrate		S1S2											Unknown
Atlantic Sturgeon	Acipenser oxyrinchus	Fish	G3	SNA		NT							Х		NatureServe
Skate, Thorny	Amblyraja radiata	Fish			SC	VU									NatureServe
American Eel	Anguilla rostrata	Fish	G4	S4S5	TH	EN							Х		NatureServe
Slimy Sculpin	Cottus cognatus	Fish	G5	S1?							Х		Х		NatureServe
Skate, Smooth	Malacoraja senta	Fish			SC	EN								Χ	NatureServe; IUCN
Striped Bass	Morone saxatilis	Fish	G5	S2N	SC								Х		NatureServe
Northern Redbelly Dace	Phoxinus eos	Fish	G5	S2							Х		Х		NatureServe
Atlantic Salmon	Salmo salar	Fish	G5	S2S3	SC		Υ						Х		NatureServe, IUCN
Large Sleeper Shark	Somniosus microcephalus	Fish				NT								Χ	NatureServe
Smooth Greensnake	Opheodrys vernalis	Reptile	G5	S2					>		Х		Х		NatureServe
Pickerel Frog	Lithobates palustris	Amphibian	G5	S1	NAR				>		Х		Х		NatureServe
Sharp-shinned Hawk	Accipiter striatus	Bird	G5	S4B	NAR			Υ	>			Х			Environment Canada (2013)
Spotted Sandpiper	Actitis macularius	Bird	G5	S3S4B				Υ			Х	Х	Х	Х	NatureServe, Environment Canada (2013)
Nelson's Sparrow	Ammodramus nelsoni	Bird	G5	S4B	NAR			Υ			Х	Х		Х	Environment Canada (2013)
Northern Pintail	Anas acuta	Bird	G5	S1S2B							Х	Χ	Χ	Χ	NatureServe
Northern Shoveler	Anas clypeata	Bird	G5	S2B							Х		Х	Χ	NatureServe

Green-winged Teal	Anas crecca	Bird	G5	S5B				Υ	Υ				Х		Х	Х	NatureServe, Environment Canada (2013)
Blue-winged Teal	Anas discors	Bird	G5	S3B									Х	Х	Х	Χ	NatureServe
Mallard	Anas platyrhynchos	Bird	G5	S5B				Υ	Υ				Х	Х	Х	Χ	NatureServe, Environment Canada (2013)
American Black Duck	Anas rubripes	Bird	G5	S5B,S4N				Υ	Υ				Х	Х	Х	Χ	NatureServe, Environment Canada (2013)
Ruddy Turnstone	Arenaria interpres	Bird	G5	S3M							Х				Х		NatureServe
Short-eared Owl	Asio flammeus	Bird	G5	S1B	SC			Υ		Х			Х	Х		Х	Environment Canada (2013)
Long-eared Owl	Asio otus	Bird	G5	S1?						Х			Х		Х		NatureServe
Ring-necked Duck	Aythya collaris	Bird	G5	S5B				Υ					Х		Х	Χ	NatureServe, Environment Canada (2013)
Upland Sandpiper	Bartramia longicauda	Bird	G5	S1B			Υ						Х	Х			NatureServe
Ruffed Grouse	Bonasa umbellus	Bird	G5	S5				Υ		Х							Environment Canada (2013)
American Bittern	Botaurus lentiginosus	Bird	G4	S4B				Υ					Х		Х	Х	NatureServe, Environment Canada (2013)
Brant	Branta bernicla	Bird	G5	S2M									Х	Х	Х	Χ	NatureServe
Canada Goose	Branta canadensis	Bird	G5	S5M				Υ	Υ				Х	Х	Х	Х	NatureServe, Environment Canada (2013)
Common Goldeneye	Bucephala clangula	Bird	G5	S5N					Υ	Х			Х		Х	Х	NatureServe, Environment Canada (2013)
Barrow's Goldeneye	Bucephala islandica	Bird	G5	S2N	SC		Υ	Υ					Х		Х		NatureServe, Environment Canada (2013)
Rough-legged Hawk	Buteo lagopus	Bird	G5	S2S3N								Χ	Х	Х	Χ		NatureServe
Broad-winged Hawk	Buteo platypterus	Bird	G5	S1?B						Х			Х		Х		NatureServe
Lapland Longspur	Calcarius Iapponicus	Bird	G5	S3S4N										Х			NatureServe
Sanderling	Calidris alba	Bird	G5	S3M					Υ		Х						Environment Canada (2013)
Dunlin	Calidris alpina	Bird	G5	S4N					Υ		Х		Х			Х	NatureServe, Environment Canada (2013)
Red Knot	Calidris canutus	Bird	G4T2	S2M	EN				Υ		Х					Χ	NatureServe
White-rumped Sandpiper	Calidris fuscicollis	Bird	G5	S3M							Х		Х	Х	Х	Χ	NatureServe
Purple Sandpiper	Calidris maritima	Bird	G5	S2M					Υ		Х						NatureServe
Pectoral Sandpiper	Calidris melanotos	Bird	G5	S2S3M									Х	Х	Х	Χ	NatureServe
Least Sandpiper	Calidris minutilla	Bird	G5	S3M					Υ		Х				Х	Х	NatureServe, Environment Canada (2013)
Semipalmated Sandpiper	Calidris pusilla	Bird	G5	S3M		NT	Υ		Υ		Х						Environment Canada (2013)
Pine Siskin	Carduelis pinus	Bird	G5	S2S3B, S4N						Х				Х			NatureServe
Veery	Catharus fuscescens	Bird	G5	S3B				Υ		Х							Environment Canada (2013)
Black Guillemot	Cepphus grylle	Bird	G5	S2B								Х					NatureServe
Piping Plover	Charadrius melodus	Bird	G3	S1B	EN	NT	Υ	Υ	Υ		Х	Χ					NatureServe, Environment Canada

Killdeer	Charadrius vociferus	Bird	G5	S2S3B				Υ			Х		Х	Χ		Х	NatureServe, Environment Canada
Common Nighthawk	Chordeiles minor	Bird	G5	S1B	TH			Υ		Х			Х			Χ	NatureServe, Environment Canada (2013)
Bonaparte's Gull	Chroicocephalus philadelphia	Bird	G5	S5N					Υ				Х		Х	Х	NatureServe, Environment Canada (2013)
Long-tailed Duck	Clangula hyemalis	Bird	G5	S5N		VU			Υ						Х	Х	NatureServe, Environment Canada (2013)
Evening Grosbeak	Coccothraustes vespertinus	Bird	G5	S1S2B, S2S3N				Υ		Χ							Environment Canada (2013)
Black-billed Cuckoo	Coccyzus erythropthalmus	Bird	G5	S3B				Υ		Χ							Environment Canada (2013)
Olive-sided Flycatcher	Contopus cooperi	Bird	G4	S2B	TH	NT		Υ		Χ			Х		Χ		Environment Canada (2013)
Eastern Wood-Pewee	Contopus virens	Bird	G5	S3B	SC			Υ		Χ							Environment Canada (2013)
Bay-breasted Warbler	Dendroica castanea	Bird	G5	S2B				Υ		Χ					Χ		Environment Canada (2013)
Cape May Warbler	Dendroica tigrina	Bird	G5	S3B				Υ		Χ							Environment Canada (2013)
Black-throated Green Warbler	Dendroica virens	Bird	G5	S5B				Υ		Χ							Environment Canada (2013)
Bobolink	Dolichonyx oryzivorus	Bird	G5	S2B	TH			Υ						Χ			Environment Canada (2013)
Pileated Woodpecker	Dryocopus pileatus	Bird	G5	S2						Χ					Χ		NatureServe
Gray Catbird	Dumetella carolinensis	Bird	G5	S3B						Χ					Χ		NatureServe
Yellow-bellied Flycatcher	Empidonax flaviventris	Bird	G5	S3B						Х			Х		Χ		NatureServe
Horned Lark	Eremophila alpestris	Bird	G5	S1?B, S4N										Χ			NatureServe
Rusty Blackbird	Euphagus carolinus	Bird	G4	S1B	SC	VU		Υ		Χ			Х		Χ		Environment Canada (2013)
American Coot	Fulica americana	Bird	G5	S1B	NAR								Х		Χ	Χ	NatureServe
Wilson's Snipe	Gallinago delicata	Bird	G5	S3B				Υ					Х	Χ			Environment Canada (2013)
Common Loon	Gavia immer	Bird	G5	S1B, S4M	NAR			Υ	Υ				Х		Х		NatureServe, Environment Canada (2013)
Red-throated Loon	Gavia stellata	Bird	G5	SNA					Υ				Х		Χ	Χ	NatureServe
Bald Eagle	Haliaeetus leucocephalus	Bird	G5	S4	NAR			Υ		Х			Х		Х	Х	NatureServe, Environment Canada (2013)
Barn Swallow	Hirundo rustica	Bird	G5	S2B	TH			Υ					Х	Χ	Х	Х	NatureServe, Environment Canada (2013)
Harlequin Duck	Histrionicus histrionicus	Bird	G4	S1M			Υ								Χ		NatureServe
Baltimore Oriole	Icterus galbula	Bird	G5	S1B						Х					Χ		NatureServe
Herring Gull	Larus argentatus	Bird	G5	S2B, S5N							Х	Χ		Χ	Χ		NatureServe
Ring-billed Gull	Larus delawarensis	Bird	G5	S1B, S5M							Х		Х	Χ	Χ	Χ	NatureServe
Great Black-backed Gull	Larus marinus	Bird	G5	S2S3B, S5N								Х	Х		Χ		NatureServe
Short-billed Dowitcher	Limnodromus griseus	Bird	G5	S3M							Х		Х	Χ	Χ	Х	NatureServe
Hudsonian Godwit	Limosa haemastica	Bird	G4	S2S3M					Υ		Х		Х		Х	Х	NatureServe, Environment Canada (2013)
Hooded Merganser	Lophodytes cucullatus	Bird	G5	S1B, S4M						Χ			Х		Χ	Х	NatureServe

Red Crossbill	Loxia curvirostra	Bird	G5	S1B					Х							NatureServe
White-winged Crossbill	Loxia leucoptera	Bird	G5	S3					Х							NatureServe
Belted Kingfisher	Megaceryle alcyon	Bird	G5	S5B			Υ					Х		Х	Х	NatureServe, Environment Canada (2013)
White-winged Scoter	Melanitta fusca	Bird	G5	S5N		VU		Υ	Х						Χ	Environment Canada (2013)
Black Scoter	Melanitta nigra	Bird	G5	S5N				Υ	Х						Χ	Environment Canada (2013)
Surf Scoter	Melanitta perspicillata	Bird	G5	S5N				Υ						Х		Environment Canada (2013)
Red-breasted Merganser	Mergus serrator	Bird	G5	S1S2B, S5N					Х		Χ	Х		Х		NatureServe
Northern Mockingbird	Mimus polyglottos	Bird	G5	S1B									Х	Х		NatureServe
Brown-headed Cowbird	Molothrus ater	Bird	G5	S1S2B			Υ						Х			Environment Canada (2013)
Eskimo Curlew	Numenius borealis	Bird	GH	SHM	EN	CR						Χ	Х		Χ	NatureServe
Hudsonian Whimbrel	Numenius phaeopus hudsonicus	Bird	G5TNR	S4N			Υ	Υ				Х	Х			Environment Canada (2013)
Mourning Warbler	Oporornis philadelphia	Bird	G5	S4B			Υ		Х							Environment Canada (2013)
Ruddy Duck	Oxyura jamaicensis	Bird	G5	S1B								Χ		Х	Х	NatureServe
Osprey	Pandion haliaetus	Bird	G5	S5B			Υ					Х		Х	Х	NatureServe, Environment Canada (2013)
Northern Parula	Parula americana	Bird	G5	S5B			Υ		Х			Х		Х		Environment Canada (2013)
Gray Jay	Perisoreus canadensis	Bird	G5	S2			Υ		Х			Х		Х		NatureServe, Environment Canada (2013)
Great Cormorant	Phalacrocorax carbo	Bird	G5	S1B				Υ			Χ			Х		NatureServe
Red-necked Phalarope	Phalaropus lobatus	Bird	G4G5	SNA	SC							Х		Х	Χ	NatureServe
Rose-breasted Grosbeak	Pheucticus Iudovicianus	Bird	G5	S2S3B			Υ		Х							Environment Canada (2013)
Black-backed Woodpecker	Picoides arcticus	Bird	G5	S1					Х			Χ		Х		NatureServe
American Three-toed Woodpecker	Picoides dorsalis	Bird	G5	S1					Х			Х		Х		NatureServe
Pine Grosbeak	Pinicola enucleator	Bird	G5	S1?B,S4N					Х							NatureServe
American Golden-Plover	Pluvialis dominica	Bird	G5	S2S3M			Υ			Х			Х			Environment Canada (2013)
Black-bellied Plover	Pluvialis squatarola	Bird	G5	S3M				Υ		Χ			Х	Х	Х	NatureServe
Horned Grebe	Podiceps auritus	Bird	G5	SNA		VU		Υ				Х		Х	Х	NatureServe, Environment Canada (2013)
Red-necked Grebe	Podiceps grisegena	Bird	G5	S3M	NAR							Х		Х		NatureServe
Pied-billed Grebe	Podilymbus podiceps	Bird	G5	S4B			Υ	Υ				Х		Х	Х	NatureServe, Environment Canada (2013)
Boreal Chickadee	Poecile hudsonica	Bird	G5	S3			Υ		Х			Х		Х		NatureServe, Environment Canada (2013)
Vesper Sparrow	Pooecetes gramineus	Bird	G5	S1S2B									Χ			NatureServe
Sora	Porzana carolina	Bird	G5	S5B			Υ					Χ	Х		Χ	Environment Canada (2013)

Virginia Rail	Rallus limicola	Bird	G5	S2B		Υ					Х		Χ	Χ	NatureServe, Environment Canada (2013)
Ruby-crowned Kinglet	Regulus calendula	Bird	G5	S3B				Х							NatureServe
Bank Swallow	Riparia riparia	Bird	G5	S2S3B	TH	Υ							Χ		Environment Canada (2013)
American Woodcock	Scolopax minor	Bird	G5	S5B		Υ		Х							Environment Canada (2013)
Northern Waterthrush	Seiurus noveboracensis	Bird	G5	S3B				Х			Х		Χ	Χ	NatureServe
American Redstart	Setophaga ruticilla	Bird	G5	S5B		Υ		Х							Environment Canada (2013)
Eastern Bluebird	Sialia sialis	Bird	G5	S1B	NAR			Х				Χ	Χ		NatureServe
White-breasted Nuthatch	Sitta carolinensis	Bird	G5	S1				Х					Χ		NatureServe
Common Tern	Sterna hirundo	Bird	G5	S1B	NAR	Υ	Υ		Х	Х	Х		Х	Х	NatureServe, Environment Canada (2013)
Arctic Tern	Sterna paradisaea	Bird	G5	S1?B					Х	Х			Χ	Χ	NatureServe
Tree Swallow	Tachycineta bicolor	Bird	G5	S3S4B				Х			Х	Χ	Χ	Χ	NatureServe
Lesser Yellowlegs	Tringa flavipes	Bird	G5	S3M		Υ	Υ				Х			Χ	Environment Canada (2013)
Greater Yellowlegs	Tringa melanoleuca	Bird	G5	S3S4M				Х			Х	Χ	Χ	Χ	NatureServe
Willet	Tringa semipalmata	Bird	G5	S4B			Υ		Х		Х			Х	NatureServe, Environment Canada (2013)
Solitary Sandpiper	Tringa solitaria	Bird	G5	SNA		Υ	Υ				Х			Х	NatureServe, Environment Canada (2013)
Eastern Kingbird	Tyrannus tyrannus	Bird	G5	S2B		Υ		Х			Х	Χ	Χ		NatureServe, Environment Canada
Tennessee Warbler	Vermivora peregrina	Bird	G5	S2B		Υ		Х							Environment Canada (2013)
Philadelphia Vireo	Vireo philadelphicus	Bird	G5	S1S2B				Х				Χ	Χ		NatureServe
Canada Warbler	Wilsonia canadensis	Bird	G5	S2B	TH	Υ		Х			Х		Х		NatureServe, Environment Canada (2013)
Wilson's Warbler	Wilsonia pusilla	Bird	G5	S1?B		Υ		Х			Х				NatureServe, Environment Canada (2013)
White-throated Sparrow	Zonotrichia albicollis	Bird	G5	S5B		Υ		Х				Х			Environment Canada (2013)
Little Brown Myotis	Myotis lucifugus	Mammal	G3G4	S1	EN			Х			Х		Χ		NatureServe
Northern Long-eared Myotis	Myotis septentrionalis	Mammal	G1G2	S1	EN			Х					Х		NatureServe
Atlantic Walrus	Odobenus rosmarus rosmarus	Mammal	G4TNR	SX	SC									Χ	NatureServe
American Pygmy Shrew	Sorex hoyi	Mammal	G5	S2S3				Х			Х		Χ		NatureServe
American Water Shrew	Sorex palustris	Mammal	G5	S1?							Х		Χ		NatureServe
¹ Exceptions and other notes															

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Appendix D: IUCN threats classification scheme (version 3.2)

World Conservation Union-Conservation Measures Partnership (IUCN-CMP) classification of threats to biodiversity as per Salafsky *et al.* (2008).

Threat Category/Sub-category	Definition
1 Residential and commercial development	Human settlements of other non-agricultural land uses with a substantial footprint
1.1 Housing and urban areas	Human cities, towns and settlements including nonhousing development typically integrated with housing
1.2 Commercial and industrial areas	Factories and other commercial centers
1.3 Tourism and recreation areas	Tourism and recreation sites with a substantial footprint
2 Agriculture and aquaculture	Threats from farming and ranching as a result of agricultural expansion and intensification, including siviculture, mariculture and aquaculture
2.1 Annual and perennial non- timber crops	Crops planted for food, fodder, fiber, fuel or other uses
2.2 Wood and pulp plantations	Stands of timber planted for timber or fiber outside of natural forests, often with non-native species
2.3 Livestock farming and ranching	Domestic terrestrial animals raised in one location on farmed of nonlocal resources (farming); also domestic or semidomesticated animals allowed to roam in the wild and supported by natural habitats (ranching)
2.4 Marine and freshwater aquaculture	Aquatic animals raised in one location on farmed or nonlocal resources; also hatchery fish allowed to roam in the wild 3 Energy production and mining Threats from production of nonbiological resources
3 Energy production and mining	Threats from production of nonbiological resources
3.1 Oil and gas drilling	Exploring for, developing, and producing petroleum and other liquid hydrocarbons
3.2 Mining and quarrying	Exploring for, developing, and producing minerals and rocks
3.3 Renewable energy	Exploring, developing and producing renewable energy 4 Transportation and service corridors Threats from long, narrow transport corridors and the vehicles that use them including associated wildlife mortality
4 Transportation and service corridors	Threats from long, narrow transport corridors and the vehicles that use them including associated wildlife mortality
4.1 Roads and railroads	Surface transport on roadways and dedicated tracks
4.2 Utility and service lines	Transport of energy and resources
4.3 Shipping lanes	Transport on and in freshwater and ocean waterways
4.4 Flight paths	Air and space transport 5 Biological resource use Threats from consumptive use of "wild" biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific species

5 Biological resource use	Threats from consumptive use of "wild" biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific
5.1 Hunting and collecting terrestrial animals	species Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsidence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch
5.2 Gathering terrestrial plants	Harvesting plants, fungi, and other nontimber/nonanimal products for commercial, recreation, subsidence, research or cultural purposes, or for control purposes
5.3 Logging and wood harvesting	Harvesting trees and other woody vegetation for timber, fiber, or fuel
5.4 Fishing and harvesting aquatic resources	Harvesting aquatic wild animals or plants for commercial, recreation, subsidence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch 6 Human intrusions and disturbance Threats from human activities that alter, destroy and disturb habitats and species associated with nonconsumptive uses of biological resources
6 Human intrusions and disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with nonconsumptive uses of biological resources
6.1 Recreational activities	People spending time in nature or travelling in vehicles outside established transport corridors, usually for recreation purposes
6.2 War, civil unrest and military exercises	Actions by formal or paramilitary forces without a permanent footprint
6.3 Work and other activities	People spending time in or travelling in natural environments for reasons other than recreation or military activities
7 Natural system modifications	Threats from actions that convert or degrade habitat in service of "managing" natural or seminatural systems, often to improve human welfare
7.1 Fire and fire suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation
7.2 Dams and water	Changing water flow patterns from their natural range of
management/use	variation either deliberately or as a result of other activities
7.3 Other ecosystem modifications	Other actions that convert or degrade habitat in the service of "managing" natural systems to improve human welfare. 8 Invasive and other problematic species and genes Threats from non-native and native plants, animals, pathogens/microbes, or genetic material that have or are predicted to have harmful effects on biodiversity following their introduction, spread, and/or increase in abundance
8 Invasive and other problematic species and genes	Threats from non-native and native plants, animals, pathogens/microbes, or genetic material that have or are predicted to have harmful effects on biodiversity following their introduction, spread, and/or increase in

	abundance
8.1 Invasive non-native/alien species	Harmful plants, animals, pathogens and other microbes not originally found within the ecosystem(s) in question and directly or indirectly introduced and spread into it by human activities
8.2 Problematic native species	Harmful plants, animals, pathogens and other microbes that are originally found within the ecosystem(s) in question, but have become "out of balance" or "released" directly or indirectly due to human activities
8.3 Introduced genetic material	Human-altered or transported organisms or genes 9 Pollution Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources
9 Pollution	Threats from introduction of exotic and/or excess materials or energy from point and nonpoint sources
9.1 Household sewage and urban waste water	Water-borne sewage and nonpoint runoff from housing and urban areas that include nutrients, toxic chemicals and/or sediments
9.2 Industrial and military effluents	Water-borne pollutants from industrial and military sources including mining, energy production, and other resource extraction industries that include nutrients, toxic chemicals and/or sediments
9.3 Agricultural and forestry effluents	Water-borne pollutants from agricultural, sivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied
9.4 Garbage and solid waste	Rubbish and other solid materials including those that entangle wildlife
9.5 Air-borne pollutants	Atmospheric pollutants from point and non-point sources
9.6 Excess energy	Inputs of heat, sound or light that disturb wildlife or ecosystems 10 Geological events Threats from catastrophic geological events
10 Geological events	Threats from catastrophic geological events
10.1 Volcanoes	Volcanic events
10.2 Earthquakes/tsunamis	Earthquakes and associated events
10.3 Avalanches/landslides	Avalanches or landslides
11 Climate change and severe weather	Long-term climatic changes that may be linked to global warming and other severe climatic or weather events outside of the natural range of variation that could wipe out a vulnerable species or habitat
11.1 Habitat shifting and alteration	Major changes in habitat composition and location
11.2 Droughts	Periods in which rainfall falls below the normal range of variation
11.3 Temperature extremes	Periods in which temperatures exceed or go below the normal range of variation
11.4 Storms and flooding	Extreme precipitation and/or wind events or major shifts in seasonality of storms

Appendix E: IUCN Conservation Actions Classification Scheme (Version 2.0); taken directly from the website

- 1 Land/water protection
 - 1.1 Site/area protection
 - 1.2 Resource & habitat protection
- 2 Land/water management
 - 2.1 Site/area management
 - 2.2 Invasive/problematic species control
 - 2.3 Habitat & natural process restoration
- 3 Species management
 - 3.1 Species management
 - 3.1.1 Harvest management
 - 3.1.2 Trade management
 - 3.1.3 Limiting population growth
 - 3.2 Species recovery
 - 3.3 Species re-introduction
 - 3.3.1 Reintroduction
 - 3.3.2 Benign introduction
 - 3.4 Ex-situ conservation
 - 3.4.1 Captive breeding/artificial propagation
 - 3.4.2 Genome resource bank
- 4 Education & awareness
 - 4.1 Formal education
 - 4.2 Training
 - 4.3 Awareness & communications
- 5 Law & policy
 - 5.1 Legislation
 - 5.1.1 International level
 - 5.1.2 National level
 - 5.1.3 Sub-national level
 - 5.1.4 Scale unspecified
 - 5.2 Policies and regulations
 - 5.3 Private sector standards & codes
 - 5.4 Compliance and enforcement
 - 5.4.1 International level
 - 5.4.2 National level
 - 5.4.3 Sub-national level
 - 5.4.4 Scale unspecified
- 6 Livelihood, economic & other incentives
 - 6.1 Linked enterprises & livelihood alternatives
 - 6.2 Substitution
 - 6.3 Market forces
 - 6.4 Conservation payments
 - 6.5 Non-monetary values

Appendix F: Conservation Actions Prioritization Methodology

Purpose of Analysis

The prioritization methodology described below was used to identify areas within the Prince Edward Island Bioregion where conservation efforts should be concentrated. The goal is to achieve the best possible protection in the areas that are the most critical for the defined biodiversity targets and significant species, while minimizing their associated threats.

Conservation Prioritization

The priority ranks assigned within the Prince Edward Island Bioregion were the result of combining three weighted metrics to represent the ecological significance of habitat, landscape context, and species. Whenever possible a two-tiered equation was applied based on the minimum patch size and uniqueness of habitat occurrences in the Bioregion. The methodology was deliberately designed to promote parcels of land that contained larger patches of priority habitats, and rare/priority species and habitat occurrences. The more high quality priority habitats an area contained, the higher the priority rank it received. Promoting small extents of multiple priority habitats was avoided by selecting minimum size criteria for habitat-based biodiversity habitats. Higher scores were given to areas with larger patches of ecosystems selected as biodiversity habitats.

Data Pre-Processing

Biodiversity Target Data Sources:

- Sand Dunes Sand dunes were selected from the provincial resource inventory (CLASS1 = SDW).
- Salt marsh Salt marshes were selected from the provincial resource inventory (CLASS1 = BKW OR SAW).
- Freshwater Wetlands Eight types of freshwater wetlands were selected from the provincial resource inventory: Bog, deep marsh, shallow marsh, meadow, open water, seasonally flooded flat, shrub swamp, and wooded swamp (LANDUSE = WET and CLASS1 = BOW, DMW, SMW, MDW, OWW, SFW, SSW, or WSW respectively).
 - o Wetlands that are currently being harvested for peat, or have a high probability of being harvested in the future were excluded from the analysis based on suggestions from partners (G. Gregory, personal communication, February 8, 2016).
- Aquatic and Riparian Areas Aquatic features were extracted from the provincial hydrographic network, and buffered by 60 m.
- Coastal Islands Coastal islands that are identified in the Subdivision and Development Regulations of the Planning Act of Prince Edward Island were manually selected from the Prince Edward Island property lines database.
- Forest Mosaic Forests were organized into five subgroups based on New Brunswick forest community and wildlife habitat definitions (New Brunswick Department of Natural Resources, 2013). This was done using the "WOODSTOCK" field in the provincial resource inventory, which was created by the PEI Department of Agriculture and Forestry to classify forest species assemblages (M. Montigny, personal communication, April 8, 2015).
 - o Mature and Old age class categories were extracted (DEV_STAGE = M or O).
 - o All polygons with the following treatment attributes were excluded using the HISTORY1, HISTORY2 and SITE fields:
 - Clear Cut (CC)
 - Plantation (PN, PN-76, etc.)
 - Old Field (OF)

- o Forests polygons dominated by White Spruce (*Picea glauca*) on previously cultivated land were excluded from the analysis.
- o Forest polygons were classified as one of the following forest communities:
 - Old Tolerant Hardwood Habitat (OTHH)
 - Beech, Red Oak, Sugar Maple, Yellow Birch (BEPR, RO, SMPR, SMSW, YBPR)
 - Tolerant Hardwood (THPR)
 - Tolerant Hardwood Mix (THMX)
 - Tolerant Hardwood-Softwood (THSW)
 - Old Intolerant Hardwood Habitat (OIHH)
 - Intolerant Hardwood Mix (IHMX)
 - Intolerant Hardwood-Softwood (IHSW)
 - Poplar (POPR, POSW)
 - Red Maple (RMPR)
 - White Birch (WBPR, WBSW)
 - Old Pine Habitat (PINE)
 - Red Pine (RPPR)
 - White Pine (WP)
 - Old Spruce-Fir Habitat (OSFH)
 - Cedar (CE)
 - Hemlock (HE)
 - Black Spruce (BSPR)
 - Red Spruce (RS)
 - Balsam Fir (BFIH, BFPR, BFSP, BFTH)
 - Softwood-Tolerant Hardwood (SWTH)
 - Softwood-Intolerant Hardwood (SWIH)
 - Softwood Mix (SWMX)
 - Softwood-Pure (SWPR)
 - Mixed Spruce (SPBF, SPLA)
 - White Spruce (WSPR)
 - Other Old Habitat (OTHER)
 - Alder-Softwood (ALSW)
 - Eastern Larch (LAIH, LAPR, LASP)

Cleaning the Data

The first step prior to the prioritization analysis was to clean the GIS data before assignment of weights on the habitats was calculated. In order to avoid weighting polygons based on topographic errors, all polygons of the same habitat type were dissolved in ArcGIS to eliminate any insignificant boundaries between contiguous patches. Area of each patch was recalculated and weights were then assigned based on the new area of the dissolved polygons.

Conservation Analysis

Two-tiered Equation

For each target habitat, final scores between 0 and 1 were assigned, with 1 representing ecologically significant habitat best suited for nested targets. All target habitat occurrences (except coastal islands and riparian areas – see below) were scored using a two-tiered equation that equally contribute to the habitat uniqueness and size score:

$$Score = \frac{(Uniqueness + Size)}{2}$$

Uniqueness.

Conceptually, variations in enduring features across the landscape (geology, climate, topography and soils) can potentially result in different ecological attributes of a habitat type. As a result, it is assumed that differences in habitats between ecodistricts may support different assemblages of specialist species. Two uniqueness calculations account for the rarity of habitat types within each ecodistrict, and within the bioregion as a whole:

$$U_{1} = 1 - \left(\frac{Habitat_{NA-Eco}}{Habitat_{NA-Total}}\right)$$

$$U_2 = 1 - \left(\frac{Habitat_{NA-Total}}{Target_{NA-Total}}\right)$$

 $U_2 = 1 - \left(\frac{Habitat_{NA-Total}}{Target_{NA-Total}}\right)$ where Habitat refers to the type of habitat (e.g. bog) that is nested within a particular biodiversity Target (e.g., Freshwater Wetlands). Subscript NA-Eco denotes the ecodistrict area that is within the bioregion and subscript NA-Total denotes the total area within the Bioregion. The final uniqueness score is determined by calculating the average of the two area based assessments:

$$Uniqueness = \left(\frac{U_1 + U_2}{2}\right)$$

This method of calculating uniqueness gives equal weighting to each of the base assessments. U_1 addresses the uniqueness of ecodistrict-specific habitat as compared to all other occurrences of the same habitat within the Bioregion (e.g. uniqueness of bogs in ecodistrict 534 as compared to all other bogs within the Bioregion), while U_2 addresses the uniqueness of the habitat type in general (e.g. the uniqueness of bogs as compared to all other freshwater wetlands within the Bioregion). For habitat types represented by their own target (e.g. salt marsh), the U₂ equation was not applicable, and the final uniqueness score was based on the output of the U₁ equation only.

Size:

The Size score is calculated for each habitat occurrence by dividing the occurrence size by the minimum size criteria from the NAAP (Anderson et al. 2006) or from the old forest community and wildlife habitat definitions for New Brunswick (New Brunswick Department of Natural Resources, 2013). The largest patch size for each forest community was used in the analysis to capture all species that were identified within the respective community type (Table P1).

$$Size = \frac{Habitat_{Patch Size}}{Habitat_{Critical Patch Size}}$$

Habitat occurrences that meet or exceed the minimum threshold receive a score of 1, and those below the minimum size they receive a score from 0 to 0.99 depending on the size of the patch. Based on feedback from partners, it was decided that all salt marshes and sand dunes within the Bioregion are important across the landscape regardless of size. Therefore all occurrences of sand dunes and salt marshes were automatically given a Size score of 1 regardless of their actual size.

Table F1. Minimum size criteria for each applicable habitat type within the Prince Edward Island Bioregion.

Habitat*	Minimum Size (Acres)	Minimum Size (Ha)
Freshwater Wetlands	50	20.2
Acadian Forest Mosaic		
Tolerant Hardwood (OTHH)	247.1	100
Intolerant Hardwood (OIHH)	74.1	30
Spruce - Fir (OSFH)	926.6	375
Pine (PINE)	24.7	10
Other (OTHER)	926.6	375

^{*}All Sand dune and salt marsh occurrences were given a Size score of 1 regardless of their actual size. This decision was based on discussions with partners regarding the importance of these habitats within the Bioregion.

Representivity:

Representivity is calculated using two area based assessments (R₁ and R₂), as follows:

$$R_1 = \frac{Eco_{NA}}{Eco_{Total}}$$

$$R_2 = \frac{Habitat_{NA-Eco}}{Habitat_{Eco}}$$

where *Eco* refers to the area of land represented by the ecodistrict in total (subscript *Total*), and within the Bioregion (subscript *NA*). The subscript *Eco* refers to the total amount of each *Habitat* within the ecodistrict, regardless of the proportion that is within the Bioregion boundary. The final representivity score is calculated as:

$$Representivity = 1 - \left(\frac{R_1}{R_2}\right)$$

This method of calculating representivity accounts for the total area each ecodistrict represents within the Bioregion boundary, and this number is prorated by the percent of habitat that occurs within the portion of the ecodistrict within the Bioregion. However, since the Prince Edward Island Bioregion is an island, there are no target features beyond the ecodistrict borders. As a result, R_1 and R_2 will always be equal since the habitat type is equally represented across the ecodistrict, both inside and outside of the bioregion boundary, and the resulting representivity score will be zero. Therefore representivity was not used in the prioritization analysis.

Additional Habitat Weighting

Wetland Buffers:

Salt marsh, sand dune, and freshwater wetland habitat occurrences were assigned buffers of 275 m (Canadian Wildlife Service, Ontario Ministry of Natural Resources & Ontario Ministry of Environment, 1998). Areas of permanent land conversion (urban areas, paved roads etc.) were removed from the buffer layers so as not to prioritize non-natural areas. All target habitat occurrences that fell within these buffers received an addition of 0.2 to their score.

Riparian Areas:

The Prince Edward Island hydrographic network was buffered by 60 m. Areas of permanent land conversion (urban areas, paved roads etc.) were removed from the buffer so as not to prioritize non-natural areas. Habitat occurrences that fell within the riparian buffer received an addition of 0.2 to their score.

Upland Hardwood Forest:

All forest stands that had any combination of American Beech (*Fagus grandifolia*), Sugar Maple (*Acer saccharum*), or Yellow Birch (*Betula alleghaniensis*) that comprised 30% or more of the forest cover received an addition of 0.2 to their score (e.g. MacQuarrie and Lacroix, 2003).

Species Analyses

As part of collaboration with the Canadian Wildlife Service and other conservation organizations within the Maritime region, a biodiversity composite was developed for the Prince Edward Island Bioregion. The objective of the composite was to determine "biodiversity hotspots" across the province, which was then used within the bioregion boundary to determine areas of high conservation value. See Appendix F for a complete methodology of the New Brunswick Biodiversity Composite.

Combining the Data

Once all vector layers (shapefiles) and species composites (GRIDS) were prepared, each was converted into raster format using a cell size of 10m. A small cell size was based on the error of the data layers and was used in order to ensure the resolution of the data would not be generalized. All rasters were then overlaid and added together using the Cell Statistics tool to give an overall scoring across the bioregion. Table E2 shows the list of all rasters that were combined for prioritization with their respective scoring.

Table F2. List of rasterized layers used in the bioregion analysis and their respective scoring ranges.

Prioritization Raster	Scoring Values
Acadian Forest Mosaic	0 – 1
Freshwater Wetlands	0 – 1
Salt Marsh	0 – 1
Sand Dunes	0 – 1
Coastal Islands	0.2
Riparian Buffers	0.2
Wetland Buffers	0.2
General Biodiversity Species Composite	0 – 1
Species at Risk Species Composite	0 – 1

Results

The results of the final prioritization seem to be consistent with firsthand knowledge of conditions across the Prince Edward Island Bioregion, although the results of this analysis should be used in combination with field visits and local knowledge. An area with a low score does not indicate that an area is of little conservation value, rather it is of lesser conservation value than higher scoring areas.

Table F3. Summary of results of the conservation value index for the Prince Edward Island Bioregion.

Priority Ranking	Break Values	Acres	На	Percent of Bioregion
Very High	1.79-3.38	202,671	82,018	14.4
High	1.32-1.78	450,980	182,505	32.0
Moderate	0.65-1.31	672,030	271,961	47.8
Low	0.00-0.64	27,982	11,324	2.0
Protected	N/A	53,157	21,512	3.8

Appendix G: Biodiversity Composite Methodology

Analyses rely on priority biodiversity species lists established by consensus according to objective selection criteria, recognising that important data gaps exist for several taxa. Specifically, species within these lists include ACCDC ranked S1, S2, or S3 with a G1, G2, or G3 ranking; BCR 14 PEI priority species; COSEWIC Endangered, Threatened, and Special Concern; or IUCN Red List Vulnerable or Near Threatened. Priority species habitat associations (where this information is available) can be considered for the purpose of more objective identification of priority habitats. In other words, tallies based on occurrence of priority species within certain habitat types can help inform the selection of habitat priorities if none are identified otherwise (see section on habitat data, below).

Table F1: Species Data Sources

Data Layers	Data Source	Data Type
Occurrence of mammals, reptiles, amphibians, vascular plants, non-vascular plants, fungi, lichens,	Atlantic Canada Conservation Data Centre	Points
Occurrence and abundance of shorebirds	Canadian Wildlife Service Atlantic Canada Shorebird Survey database	Raster
Probability of Observation for breeding birds	Bird Studies Canada	Raster
Occurrence of Species at Risk critical habitat	Canadian Wildlife Service Atlantic Region Critical Habitat Mapping Database	Polygons

Atlantic Canada Conservation Data Centre (ACCDC) data

Species Occurrence Data

The ACCDC dataset contains point data records for a large number of species occurring in Atlantic Canada. Points within the ACCDC database with low geographic certainty, and species that were not appropriate for the analyses were excluded from the dataset. All records with higher geographic certainty (according to the ACCDC data) were retained and then classified into broad groups consisting of: Mammals, Reptiles and Amphibians, Invertebrates, Vascular Plants, and Non-vascular Plants. Next, G and S ranks for these species were assessed. Only species with a ranking of S1 or S2, or S3 with a global ranking of G1, G2 or G3 were retained. All species listed by COSEWIC were retained, regardless of their S or G rankings. Species listed as BCR priority species were retained, regardless of S or G rankings. Those not already listed in the ACCDC were added to the list. Any IUCN Red List assessed species that were not already identified were retained.

Habitat associations were determined (where possible) for each species, based on information within datasets, specific studies, or expert advice.

Maritime Breeding Bird Atlas (MBBA) data

Probability of Observation (PObs) maps were produced by Bird Studies Canada by combining coordinates, elevation, slope, and aspect with survey effort, breeding evidence and point count data (presence only) to find the probability of finding a species after 20 hours of searching (i.e. layers do not represent how numerically abundant birds are). These layers attempt to model ecological conditions and are appropriate for making broad inferences about the probability of observing a species in a given area, but should not be used alone for making fine-scale predictions about which

habitats or features a species will be associated with since those variables were not included in the modelling. The main purpose of the maps is to provide a province-wide perspective on the distribution and abundance of birds, and not to draw local scale conclusions. Locations identified as high priority should be verified using point count data in order to confirm that squares or patches are indeed as important as they may seem (E. Dickson, personal communication, March 8, 2016).

Canadian Wildlife Service (CWS) Atlantic Canada Shorebird Survey Data
This dataset began as the Maritimes Shorebird Survey (MSS), following initial efforts by Canadian
Wildlife Service employees to monitor migrating shorebirds at a limited number of sites. The program
now enlists skilled volunteer contributors from throughout Atlantic Canada. Repeated within-season
surveys follow a defined protocol and typically occur during spring, summer and fall periods at
established locations. These layers represent predominantly non-breeding priority shorebird species.
Layers are created using species abundance data (counts, by shorebird survey site, by species) to
derive rasters using count data for species not captured adequately through other surveys.

Atlantic Region Species at Risk Critical Habitat Mapping

Mapping of Critical Habitat for Species at Risk in the Atlantic Region has involved identifying the unique aspects of each species' habitat and illustrating those elements through a GIS model. Through field work data and GIS applications, spatial reference that reflects the sensitivity of species and their respective habitats was created for two species. The model for the identification of Critical Habitat for Species at Risk will continue to be used to identify habitat for new species, as well as to refine the data available for existing Species at Risk.

ACCDC data

- 1) Generate point process layers (shapefiles) for each species within the dataset. All records must have a CDC Precision Code value of 3.7 or less (see table F1).
- 2) Generate 'Primary Buffers' by conducting kernel density analysis for each species, using a 500 m radius, a 10m output cell size and the appropriate 'POPULATION' parameter value (see figure F1). This approach attributes more value to pixels closest to the centroid with more precise observations.

Table G1: ACCDC precision code, definitions, spatial context, unit size, and range of values within the dataset.

Prec	Common Speech	Example	Unit Size	Literal Range (m)
6.0	within province	province	1000.0km	562.3 - 1778.3
5.7	in part of province	'NW NB'	500.0km	281.2 - 889.1
5.0	within in county	county	100.0km	56.2 - 177.8
4.7	within 50s of kilometers		50.0km	28.1 - 88.9
4.0	within 10s of kilometers	BBA grid	10.0km	5.6 - 17.8
3.7	within 5s of kilometers		5.0km	2.8 - 8.9
3.0	within kilometers	topo grid	1.0km	0.6 - 1.8
2.7	within 500s of meters		500.0m	281.2 - 889.1
2.0	within 100s of meters	ball field	100.0m	56.2 - 177.8
1.7	within 50s of meters		50.0m	28.1 - 88.9
1.0	within 10s of meters	boxcar	10.0m	5.6 - 17.8
0.7	within 5s of meters		5.0m	2.8 - 8.9
0.0	within meters (NOT USED)	pace	1.0m	0.6 - 1.8



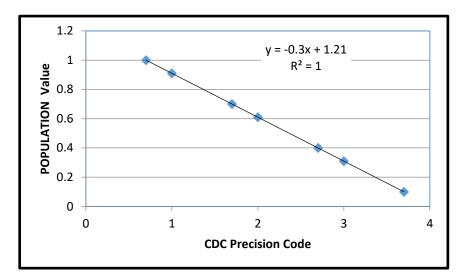


Figure G1: Population values derived for the purpose of informing the kernel density point process using precision code values found within the ACCDC dataset. The regression equation was used to populate the attribute field with the POPULATION value information.

- 3) Conduct buffer analysis to derive 'Secondary buffers' for each species, using a 5000 m radius. Use a fixed value of 0.2 for pixels within the secondary buffer.
- 4) Combine Primary and Secondary buffers for each species (at the provincial geographic scale) to create species rasters with pixel values ranging from 0 to 1 (Maritimes scale).
- 5) Overlay rasters from the suite of species to derive multi-species 'Biodiversity Composites'.

Species at Risk Critical Habitat data

- 1) All critical habitat polygons were converted to a raster with a value of one.
- 2) The Raster Calculator tool was used to combine the critical habitat raster with its corresponding species kernel density layer. Any cells with a value greater than one were reclassified as one.

Atlantic Canada Shorebird Survey (ACSS) data

- 1) For each shorebird species, the abundance raster was clipped to the extent of the Prince Edward Island Bioregion. Cells with a value of zero between observations were converted to NoData.
- 2) Get Raster Properties was used to extract the maximum cell value within each raster. The Raster Calculator was used to divide each cell in the raster by the Max value in order to produce a normalized raster with values between zero and one.

Probability of Observation (Pobs) data

- 1) For each species, the raster was clipped to the extent of the Prince Edward Island Bioregion. Pixels located between provinces (i.e. open water) were represented as NoData, and therefore no steps were necessary to remove values represented by zero.
- 2) Get Raster Properties was used to extract the maximum cell value within each raster. The Raster Calculator was used to divide each cell in the raster by the Max value in order to produce a normalized raster with values between zero and one.

Species Data Steps

In order to combine raster from the three data sources, all species must be represented by an equal range of values (i.e. between zero and one). Species were selected from one of the three datasets and placed into groups based on the desired composite. Groups of species rasters were input into the Cell Statistics tool and a raster sum was calculated. The output composite raster was normalised between zero and one for display, so that all composites could be visualized at the same numerical scale. While combining these datasets may present some bias due to the differing methods used in creating the individual species rasters, the results present a general indication of areas with the highest concentration of priority species.

List of Species Composites Subsets

- Mammals (ACCDC)
- Reptiles and Amphibians (ACCDC)
- Invertebrates (ACCDC)
- Vascular Plants (ACCDC)
- Non-vascular Plants (ACCDC)
- All Non-bird Species (ACCDC)
- Non-bird Species at Risk (ACCDC)
- Birds (ACSS, BSC)
- Bird Species at Risk (ACSS, BSC)
- Overall species composite (ACCDC, ACSS, BSC)
- Interior Forest Birds (BSC)
- The Flycatchers (BSC)
- The Swallows (BSC)

Results

Overlaying the rasters for the suite of priority species creates a biodiversity composite. These biodiversity composites can be adapted to illustrate biodiversity hotspots, hotspots for particular suites of species, hotspots for species associated with target habitats (based on species-habitat matrices), etc.

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Priority	Species				Specie	s Data S	Source									Com	posi	te Ma	ıp Na	me					
Common Name	Species Name	AC CDC Database (2015)	MBBA Relative Abundance Raster Data Feb 2013	MBBA Breeding Evidence Data 1990; 2010	CWS Atlantic Canada Shorebird Survey Database 2012	CWS Atlantic Coastal Waterfowl Survey Database 2012	International Union for Conservation of Nature	Birding Conservation Region 14/Marine Biogeographic Region 12	Atlantic CWS Eastern Canada Seabird at Sea Database	Province of PEI	Species at Risk (Fig)	Non-bird Species-at-Risk	Priority Species	All rare non-bird species	Rare & priority Birds	Rare Mammals	Rare Amphibians	Rare terrestrial Invertebrates	Rare Vascular Plants	Rare Non-Vascular Plants	Rare Lichens	Forest Interior Birds	Grassland Birds	Flycatchers	Bank & Barn Swallows
Wire Horsehair Lichen	Bryoria glabra	Χ							•												Χ				
Boreal Horsehair Lichen	Bryoria implexa	Χ																			Χ				
Blonde Horsehair Lichen	Bryoria nadvornikiana	Χ																			Χ				
Smooth Horsehair Lichen	Bryoria salazinica	Χ																			Χ				
True Icelandmoss Lichen	Cetraria islandica	Χ																			Χ				
Speckled Icelandmoss	Cetraria islandica ssp.																								
Lichen	crispiformis	Χ																			Χ				.
Frothing Seastorm Lichen	Cetrelia chicitae	Χ																			Χ				
Valley Oakmoss Lichen	Evernia prunastri	Χ																			Χ				
Textured Lungwort Lichen	Lobaria scrobiculata	Χ																			Χ				
Fringed Kidney Lichen	Nephroma helveticum	Χ																			Χ				
Mustard Kidney Lichen	Nephroma laevigatum	Χ																			Χ				
Veined Shingle Lichen	Pannaria lurida	Χ																			Χ				
Black-bordered Shingles																									
Lichen	Parmeliella triptophylla	Χ																			Χ				1
Brown-gray Moss-shingle																									
Lichen	Protopannaria pezizoides	Χ																			Χ				1
Northern Coral Lichen	Sphaerophorus globosus	Χ																			Χ				
Shelter Shingle Lichen	Vahliella leucophaea	Χ																			Χ				
Willow Feather Moss	Amblystegium varium	Χ																		Χ					
Slender Anomodon Moss	Anomodon attenuatus	Χ																		Χ					
Common Anomodon Moss	Anomodon rostratus	Χ																		Χ					
a Moss	Atrichum crispum	Χ																		Χ					
Slender Smoothcap Moss	Atrichum tenellum	Χ																		Χ					
	Aulacomnium																								
Little Groove Moss	androgynum	Χ																		Χ					1

Whitish Ragged Moss	Brachythecium albicans	Χ				ĺ				Χ		
	Brachythecium											
Short-leaved Ragged Moss	oedipodium	Χ								Χ		
Long-capsuled Ragged												
Moss	Brachythecium oxycladon	Χ								Χ		
	Brachythecium											
Rusty Ragged Moss	plumosum	Χ								Χ		
Matted Ragged Moss	Brachythecium populeum	Χ								Χ		
a Moss	Bryhnia graminicolor	Χ								Χ		
Tufted Bryum Moss	Bryum caespiticium	Χ								Χ		
Pale Bryum Moss	Bryum pallescens	Χ								Χ		
Weigel's Bryum Moss	Bryum weigelii	Χ								Χ		
Brown Shield Moss	Buxbaumia aphylla	Χ								Χ		
Giant Spear Moss	Calliergon giganteum	Χ								Χ		
Richardson's Spear Moss	Calliergon richardsonii	Χ								Χ		
Common Large Wetland												
Moss	Calliergonella cuspidata	Χ								Χ		
	Campylium											
Golden Creeping Moss	chrysophyllum	Χ								Χ		
a Moss	Campylium polygamum	Χ								Χ		
a Moss	Campylostelium saxicola	Χ								Χ		
	Dichodontium											
Transparent Fork Moss	pellucidum	Χ								Χ		
a Moss	Dicranella cerviculata	Χ								Χ		
Awl-leaved Forklet Moss	Dicranella subulata	Χ								Χ		
Bonjean's Broom Moss	Dicranum bonjeanii	Χ								Χ		
Condensed Broom Moss	Dicranum condensatum	Χ								Χ		
a Dicranum Moss	Dicranum leioneuron	Χ								Χ		
Ontario Broom Moss	Dicranum ontariense	Χ								Χ		
Spurred Broom Moss	Dicranum spurium	Χ								Χ		
Green Broom Moss	Dicranum viride	Χ								Χ		
False Beard Moss	Didymodon fallax	Χ								Χ		
	Ditrichum											
a Moss	rhynchostegium	Χ								Χ		
Slender Extinguisher Moss	Encalypta procera	Χ								Χ		
Lesser Pocket Moss	Fissidens bryoides	Χ								Χ		
Yew-leaved Pocket Moss	Fissidens taxifolius	Χ								Χ		
Greater Water Moss	Fontinalis antipyretica	Χ								Х		
	Fontinalis antipyretica var.											
Aquatic Moss	antipyretica	Χ								Χ		

	Fontinalis antipyretica var.		ĺ	[!
a Moss	gigantea	Χ								Χ		
a moss	Fontinalis hypnoides	Χ								Χ		
a Moss	Grimmia hartmanii	Χ								Χ		
	Gymnostomum											
Tufted Rock Beardless Moss	aeruginosum	Χ								Χ		
a Moss	Hamatocaulis vernicosus	Χ								Χ		
	Heterocladium											
Dimorphous Tangle Moss	dimorphum	Χ								Χ		
	Hygroamblystegium											
Brookside Feather Moss	fluviatile	Χ								Χ		
	Hygroamblystegium											
Fountain Feather Moss	tenax	Χ								Χ		
	Hygrohypnum											
Claw Brook Moss	ochraceum	Χ								Χ		
Cypress-leaved Plait Moss	Hypnum cupressiforme	Χ								Χ		
	Hypnum cupressiforme											
a Moss	var. cupressiforme	Χ								Χ		
	Hypnum cupressiforme											
a Moss	var. filiforme	Χ								Χ		
Curved-leaved Plait Moss	Hypnum curvifolium	Χ								Χ		
Meadow Plait Moss	Hypnum pratense	Χ								Χ		
Kneiff's Feather Moss	Leptodictyum riparium	Χ								Χ		
a Moss	Leucodon andrewsianus	Χ								Χ		
a Moss	Leucodon brachypus	Χ								Χ		
Ambiguous Leafy Moss	Mnium ambiguum	Χ								Χ		
a Moss	Mnium spinulosum	Χ								Χ		
Wahlenberg's Spur Moss	Oncophorus wahlenbergii	Χ								Χ		
	Orthotrichum speciosum											
a Moss	var. elegans	Χ								Χ		
a Moss	Orthotrichum stellatum	Χ								Χ		
Long-leaved Notchleaf	Paraleucobryum											
Moss	longifolium	Χ								Χ		
a Moss	Philonotis marchica	Χ								Χ		
Toothed Leafy Moss	Plagiomnium ciliare	Χ								Χ		
Common Leafy Moss	Plagiomnium medium	Χ								Χ		
Oeder's Apple Moss	Plagiopus oederiana	Χ								Χ		
Round Silk Moss	Plagiothecium cavifolium	Χ								Χ		
Bark Willow Moss	Platydictya subtilis	Χ								Χ		
	Pogonatum		1	1								
a Moss	pensilvanicum	Χ								Χ		

a Moss	Pohlia andalusica	Χ								Χ		
Blunt-bud Nodding Moss	Pohlia bulbifera	Χ								Χ		
Opal Nodding Moss	Pohlia cruda	Χ								Χ		
a Moss	Pohlia filum	Χ								Χ		
Cottony Nodding Moss	Pohlia proligera	Χ								Χ		
Bank Haircap Moss	Polytrichum formosum	Χ								Χ		
	Polytrichum formosum											
a Hair-Cap Moss	var. formosum	Χ								Χ		
Ohio Haircap Moss	Polytrichum ohioense	Χ								Χ		
	Pseudobryum											
River Thyme Moss	cinclidioides	Χ								Χ		
	Pseudotaxiphyllum											
Elegant Silk Moss	elegans	Χ								Χ		
Capillary Wing Moss	Pterigynandrum filiforme	Χ								Χ		
Many-flowered Leskea												
Moss	Pylaisiella polyantha	Χ								Χ		
a Moss	Pylaisiella selwynii	Χ								Χ		
	Rhizomnium											
Appalachian Leafy Moss	appalachianum	Χ								Χ		
Dotted Leafy Moss	Rhizomnium punctatum	Χ								Χ		
Elf Bloom Moss	Schistidium agassizii	Χ								Χ		
Radiate Bloom Moss	Schistidium apocarpum	Χ								Χ		
a Moss	Schistidium maritimum	Χ								Χ		
River Bloom Moss	Schistidium rivulare	Χ								Χ		
Northern Peatmoss	Sphagnum capillifolium	Χ								Χ		
Central Peat Moss	Sphagnum centrale	Χ								Χ		
Compact Peat Moss	Sphagnum compactum	Χ								Χ		
Feathery Peat Moss	Sphagnum cuspidatum	Χ								Χ		
a Peatmoss	Sphagnum flavicomans	Χ								Χ		
Flexuous Peatmoss	Sphagnum flexuosum	Χ								Χ		
Streamside Peat Moss	Sphagnum riparium	Χ								Χ		
Russow's Peat Moss	Sphagnum russowii	Χ								Χ		
Delicate Peat Moss	Sphagnum subtile	Χ								Χ		
Soft Peat Moss	Sphagnum tenellum	Χ								Χ		
Rigid Peat Moss	Sphagnum teres	Χ								Χ		
Warnstorf's Peat Moss	Sphagnum warnstorfii	Χ								Χ		
Wulf's Peat Moss	Sphagnum wulfianum	Χ								Χ		
Geniculate Four-tooth Moss	Tetraphis geniculata	Χ								Χ		
	Tetrodontium											
Little Georgia	brownianum	Χ								Χ		

	Tetrodontium													1	
a Moss	brownianum var. ovatum	Χ										Χ			
a Moss	Trematodon ambiguus	Χ										Χ			
a brown moss	Warnstorfia fluitans	Χ										Χ			
White Baneberry	Actaea pachypoda	Χ									Х				
Slender Agalinis	Agalinis tenuifolia	Χ									Х				
	Agalinis tenuifolia var.														
Slender Agalinis	tenuifolia	Χ									X				
Hooked Agrimony	Agrimonia gryposepala	Χ									X				
Short-awned Foxtail	Alopecurus aequalis	Χ									Х				
	Alopecurus aequalis var.														
Short-awned Foxtail	aequalis	Χ									X				
Canada Serviceberry	Amelanchier canadensis	Χ									X				
Fernald's Serviceberry	Amelanchier fernaldii	Χ									Χ				
Running Serviceberry	Amelanchier stolonifera	Χ									X				
Bog Rosemary	Andromeda polifolia	Χ									X				
	Andromeda polifolia var.														
Bog Rosemary	glaucophylla	Χ									Х				
Canada Anemone	Anemone canadensis	Χ									Х				
Purple-stemmed Angelica	Angelica atropurpurea	Χ									Х				
Seaside Angelica	Angelica lucida	Χ									Χ				
	Antennaria howellii ssp.														
Howell's Pussytoes	canadensis	Χ									Х				
American Groundnut	Apios americana	Χ									Х				
American Spikenard	Aralia racemosa	Χ									Х				
	Aralia racemosa ssp.														
American Spikenard	racemosa	Χ									Х				
Arethusa	Arethusa bulbosa	Χ									Х				
Swamp Milkweed	Asclepias incarnata	Χ									Х				
	Asclepias incarnata ssp.														
Swamp Milkweed	incarnata	X									X				
Maritime Saltbush	Atriplex acadiensis	Χ									Х				
Frankton's Saltbush	Atriplex franktonii	Χ									Х				
Heart Issued B'	Betula papyrifera var.														
Heart-leaved Birch	cordifolia	X									X		+	\rightarrow	
Bog Birch	Betula pumila	Χ	-	-							Х		+	\longrightarrow	
Dog Direb	Betula pumila var.	\/													
Bog Birch Connecticut Bogger Tieks	renifolia	X		-	-	1				-	X		+		
Connecticut Beggar-Ticks	Bidens heterodoxa	X	1	1	1						X		+	\longrightarrow	
Red Bulrush	Blysmus rufus	X	1	1	1						X		+	\longrightarrow	
Cut-leaved Moonwort	Botrychium dissectum	Χ									X				

Triangle Moonwort	Botrychium lanceolatum	Χ							Х			
	Botrychium lanceolatum											
Lance-Leaf Grape-Fern	var. angustisegmentum	Χ							X			
·	Botrychium											
Daisy-leaved Moonwort	matricariifolium	Χ							Χ			
Leathery Moonwort	Botrychium multifidum	Χ							X			
Least Moonwort	Botrychium simplex	Χ							Χ			
	Brachyelytrum											
Northern Shorthusk	septentrionale	Χ							X			
Water-shield	Brasenia schreberi	Χ							X			
Slim-stemmed Reed Grass	Calamagrostis stricta	Χ							Х			
	Calamagrostis stricta ssp.											
Slim-stemmed Reed Grass	stricta	Χ							X			
	Calamagrostis stricta var.											
Slim-stemmed Reed Grass	stricta	Χ							X			
	Callitriche											
Northern Water-starwort	hermaphroditica	Χ							Χ			
Common Harebell	Campanula rotundifolia	Χ							X			
Two-leaved Toothwort	Cardamine diphylla	Χ							X			
Large Toothwort	Cardamine maxima	Χ							Х			
Lesser Brown Sedge	Carex adusta	Χ							X			
Yellow-Fruited Sedge	Carex annectens	Χ							Χ			
Water Sedge	Carex aquatilis	Χ							X			
	Carex aquatilis var.											
Water Sedge	aquatilis	Χ							Χ			
Silvery-flowered Sedge	Carex argyrantha	Χ							Χ			
Atlantic Sedge	Carex atlantica	Χ							Χ			
	Carex atlantica ssp.											
Atlantic Sedge	atlantica	Χ							X			
Golden Sedge	Carex aurea	Χ							Χ			
Bromelike Sedge	Carex bromoides	Χ							Χ			
	Carex bromoides ssp.											
Bromelike Sedge	bromoides	Χ							Χ			
Creeping Sedge	Carex chordorrhiza	Χ							Χ			
Bearded Sedge	Carex comosa	Χ							Χ			
Dense Sedge	Carex cumulata	Χ							Χ		\perp	
Northern Sedge	Carex deflexa	Χ							Χ			
Yellow Sedge	Carex flava	Χ							Χ			
Fernald's Hay Sedge	Carex foenea	Χ							Χ			
Northern Long Sedge	Carex folliculata	Χ							Х			
Limestone Meadow Sedge	Carex granularis	Χ							Χ			

Northern Bog Sedge	Carex gynocrates	Χ	ĺ		ĺ	ĺ				Х			. [
Hayden's Sedge	Carex haydenii	Χ								X			
Porcupine Sedge	Carex hystericina	Χ								Х			
Slender Sedge	Carex lasiocarpa	Χ								Х			
	Carex lasiocarpa var.												
Slender Sedge	americana	Χ								X			ı
Mud Sedge	Carex limosa	Χ								X			
Livid Sedge	Carex livida	Χ								X			
Livid Sedge	Carex livida var. radicaulis	Χ								X			
Sallow Sedge	Carex Iurida	Χ								X			1
Mackenzie's Sedge	Carex mackenziei	Χ								X			1
Few-Flowered Sedge	Carex pauciflora	Χ								X			
Long-stalked Sedge	Carex pedunculata	Χ								X			1
Eastern Star Sedge	Carex radiata	Χ								X			
Loose-flowered Alpine													1
Sedge	Carex rariflora	Χ								X			i
Loose-flowered Alpine	Carex rariflora var.												
Sedge	rariflora	Χ								X			I
Estuary Sedge	Carex recta	Χ								X			
Narrow-leaved Beaked													
Sedge	Carex rostrata	Χ								X			I
Tussock Sedge	Carex stricta	Χ								Х			į
Sparse-Flowered Sedge	Carex tenuiflora	Χ								Χ			I
Tinged Sedge	Carex tincta	Χ								X			I
Deep Green Sedge	Carex tonsa	Χ								X			I
	Carex tonsa var.												
Deep Green Sedge	rugosperma	Χ								X			I
Shaved Sedge	Carex tonsa var. tonsa	Χ								Х			I
Blunt Broom Sedge	Carex tribuloides	Χ								X			I
	Carex trisperma var.												ı
Three-Seed Sedge	billingsii	Χ								Х			1
Northern Beaked Sedge	Carex utriculata	Χ								Х			I
Estuarine Sedge	Carex vacillans	Χ								X			I
Inflated Sedge	Carex vesicaria	Χ								X			
Inflated Sedge	Carex vesicaria var. jejuna	Χ								Х			
Fox Sedge	Carex vulpinoidea	Χ								Х			
	Carex vulpinoidea var.		 1		1								
Fox Sedge	vulpinoidea	Χ								Х			
Wiegand's Sedge	Carex wiegandii	Χ								Х			
Water Whorl Grass	Catabrosa aquatica	Χ	 							Х			I

	Catabrosa aquatica var.			1 1		1	ı	1 1	I	ı	1 1		i i
Water Whorl Grass	laurentiana	Χ								Χ			
Trace Trace	Chamaesyce												
Seaside Spurge	polygonifolia	Χ								Χ			
Red Pigweed	Chenopodium rubrum	X								X			
Broad-leaved Enchanter's	0.101100001011110010111												
Nightshade	Circaea lutetiana	Χ								Χ			
Broad-leaved Enchanter's	Circaea lutetiana ssp.												
Nightshade	canadensis	X								Χ			
Swamp Thistle	Cirsium muticum	Х								Χ			
Smooth Twigrush	Cladium mariscoides	Χ								Х			
Carolina Spring Beauty	Claytonia caroliniana	Х								X			
	Claytonia caroliniana var.												
Carolina Spring Beauty	caroliniana	Χ								Χ			
Virginia Clematis	Clematis virginiana	X								X			
Chinese Hemlock-parsley	Conioselinum chinense	X								X			
Spotted Coralroot	Corallorhiza maculata	X								X			
Early Coralroot	Corallorhiza trifida	Х								X			
Broom Crowberry	Corema conradii	Χ								X			
Round-leaved Dogwood	Cornus rugosa	X								X			
Pale Corydalis	Corydalis sempervirens	X								X			
Water Pygmyweed	Crassula aquatica	X								X			
Fireberry Hawthorn	Crataegus chrysocarpa	X								X			
	Crataegus chrysocarpa												
Fireberry Hawthorn	var. chrysocarpa	Χ								Χ			
Holmes' Hawthorn	Crataegus holmesiana	X								X			
Swamp Dodder	Cuscuta gronovii	X								X			
Swarrip Bodder	Cuscuta gronovii var.	^								^			
Swamp Dodder	gronovii	Χ								X			
Yellow Lady's-slipper	Cypripedium parviflorum	X								X			
Tonew Lady 5 Shipper	Cypripedium parviflorum									^			
Yellow Lady's-slipper	var. pubescens	Χ								Х			
Showy Lady's-Slipper	Cypripedium reginae	X								X			
A Bladderfern	Cystopteris tenuis	X								X			
Dewdrop	Dalibarda repens	X								X			
Flattened Oat Grass	Danthonia compressa	X								X		+	
Shrubby Cinquefoil	Dasiphora fruticosa	X						1		X		+	
ornabby ornaucion	Dasiphora fruticosa ssp.	 ^ 								//		+	
Shrubby Cinquefoil	floribunda	X								X			
Swamp Loosestrife	Decodon verticillatus	X								X			
Tufted Hair Grass	Deschampsia caespitosa	X								X		+	

Dutchman's Breeches	Dicentra cucullaria	Χ			 				Χ			
	Dichanthelium											
Starved Panic Grass	depauperatum	Χ							Χ			
	Dichanthelium											
Starved Panic Grass	depauperatum var. 1	Χ							Χ			
Salt Grass	Distichlis spicata	Χ							Χ			
Twisted Whitlow-grass	Draba incana	Χ							Х			
Spoon-Leaved Sundew	Drosera intermedia	Χ							Χ			
Male Fern	Dryopteris filix-mas	Χ							Х			
Three-Way Sedge	Dulichium arundinaceum	Χ							Х			
Small Waterwort	Elatine minima	Χ							Х			
Quill Spikerush	Eleocharis nitida	Χ							Х			
Ovate Spikerush	Eleocharis ovata	Χ					1		Х			+
Dwarf Spikerush	Eleocharis parvula	Χ					+ +		Х			
Few-flowered Spikerush	Eleocharis quinqueflora	X					+ +		X			
Slender Spikerush	Eleocharis tenuis	X							X			\top
ererraer e enter derr	Eleocharis tenuis var.	,							7.			+
Slender Spikerush	tenuis	Χ							X			
Nuttall's Waterweed	Elodea nuttallii	X							X			+
Slender Wild Rye	Elymus trachycaulus	X							X			
crement with a region	Elymus trachycaulus ssp.	,							7.			
Slender Wild Rye	trachycaulus	Χ							Χ			
Virginia Wild Rye	Elymus virginicus	Χ							Χ			
The grand Trace ray of	Elymus virginicus var.	,							7.			
Virginia Wild Rye	virginicus	Χ							Х			
Pink Crowberry	Empetrum eamesii	X							X			+
Think Grewberry	Empetrum eamesii ssp.											1
Pink Crowberry	atropurpureum	Χ							Х			
	Empetrum eamesii ssp.											+
Pink Crowberry	eamesii	Χ							Χ			
Purple-veined Willowherb	Epilobium coloratum	X							X			+
Downy Willowherb	Epilobium strictum	X					+ +		X			+
Dwarf Scouring-Rush	Equisetum scirpoides	X					+ +		X			+
Variegated Horsetail	Equisetum variegatum	X					+ +		X	<u> </u>		+
	Equisetum variegatum	· ·							1			\dagger
Variegated Horsetail	var. variegatum	X							X			
Annual Fleabane	Erigeron annuus	X					+ +		X	<u> </u>		+
Philadelphia Fleabane	Erigeron philadelphicus	X				+			X	<u> </u>		+
· · · · · · · · · · · · · · · · · · ·	Erigeron philadelphicus								, , , , , , , , , , , , , , , , , , ,	1		+
Philadelphia Fleabane	var. philadelphicus	X							X			
White Buttons	Eriocaulon aquaticum	X	1						X	+		+

Russet Cotton-Grass	Eriophorum chamissonis	Χ						Х		
Slender Cottongrass	Eriophorum gracile	Χ						Χ		
	Eriophorum gracile var.									
Slender Cottongrass	gracile	Χ						X		
Russet Cottongrass	Eriophorum russeolum	Χ						Х		
Russet Cotton-Grass	Eriophorum russeolum									
	var. russeolum	Χ						Х		
	Eriophorum									
Green-keeled Cottongrass	viridicarinatum	Χ						Χ		
Common Boneset	Eupatorium perfoliatum	Χ						Χ		
	Eupatorium perfoliatum									
Common Boneset	var. perfoliatum	Χ						Х		
Rand's Eyebright	Euphrasia randii	Χ						Х		
Large-leaved Aster	Eurybia macrophylla	Χ						Х		
Black Ash	Fraxinus nigra	Χ						Х		
Common Bedstraw	Galium aparine	Χ						Χ		
Northern Bedstraw	Galium boreale	Χ						Χ		
Labrador Bedstraw	Galium labradoricum	Χ						Χ		
Blunt-leaved Bedstraw	Galium obtusum	Χ						Χ		
Blunt-leaved Bedstraw	Galium obtusum ssp.									
	obtusum .	Χ						Χ		
Dwarf Huckleberry	Gaylussacia bigeloviana	Χ						Х		
Bicknell's Crane's-bill	Geranium bicknellii	Χ						Х		
White Avens	Geum canadense	Χ						Χ		
	Geum canadense var.									
White Avens	canadense	Χ						Χ		
Large-Leaved Avens	Geum macrophyllum	Χ						Χ		
	Geum macrophyllum var.									
Large-Leaved Avens	macrophyllum	Χ						Χ		
Northern Manna Grass	Glyceria borealis	Χ						Х		
Canada Manna Grass	Glyceria canadensis	Χ						Χ		
Northern Mannagrass	Glyceria laxa	Χ						Χ		
Menzies' Rattlesnake-										
plantain	Goodyera oblongifolia	Χ						Χ		
Lesser Rattlesnake-plantain	Goodyera repens	Χ						Х		
Checkered Rattlesnake-										
Plantain	Goodyera tesselata	Χ						Χ		
American Witch-Hazel	Hamamelis virginiana	Χ						Х		
Canada Hawkweed	Hieracium canadense	Χ						Х		
	Hieracium canadense var.								1	1
Canada Hawkweed	canadense	Χ						X		

Umbellate Hawkweed	Hieracium umbellatum	Χ							Χ	$\mathbf{I} = \mathbf{I}$		ĺ
Common Mare's-Tail	Hippuris vulgaris	Χ							Χ			
Seabeach Sandwort	Honckenya peploides	Χ							Χ			
	Honckenya peploides ssp.											
Seabeach Sandwort	robusta	Χ							Χ			
Pinebarren Golden Heather	Hudsonia ericoides	Χ							Χ			T
	Hudsonia tomentosa var.											
Woolly Beach-heath	intermedia	Χ							Χ			
	Humulus lupulus var.											
Common Hop	lupuloides	Χ							Χ			
Pale St John's-Wort	Hypericum ellipticum	Χ							Χ			
Large St John's-wort	Hypericum majus	Χ							Χ			
Dwarf St John's-wort	Hypericum mutilum	Χ							Χ			
Hooker's Iris	Iris setosa	Χ							Χ			
Hooker's Iris	Iris setosa var. canadensis	Χ							Χ			
Lake Quillwort	Isoetes lacustris	Χ							Χ			
Canada Rush	Juncus canadensis	Χ							Χ			T
Dudley's Rush	Juncus dudleyi	Χ							Χ			
Thread Rush	Juncus filiformis	Χ							Χ			Т
Greene's Rush	Juncus greenei	Χ							Χ			
Bayonet Rush	Juncus militaris	Χ							Χ			Т
	Juniperus communis var.											
Common Juniper	montana	Χ							Χ			
Creeping Juniper	Juniperus horizontalis	Χ							Χ			Т
Canada Wood Nettle	Laportea canadensis	Χ							Χ			
Beach Pinweed	Lechea maritima	Χ							Χ			
	Lechea maritima var.											
Beach Pinweed	subcylindrica	Χ			X	Χ			Χ			
Star Duckweed	Lemna trisulca	Χ							Χ			
Southern Mudwort	Limosella australis	Χ							Χ			
Yellow-seeded False												
Pimperel	Lindernia dubia	Χ							Χ			
Yellow-seeded False	Lindernia dubia var.											
Pimperel	dubia	Χ							Χ			
Loesel's Twayblade	Liparis loeselii	Χ							Χ			
Southern Twayblade	Listera australis	Χ							Χ			
Broad-Leaved Twayblade	Listera convallarioides	Χ							Χ			$oldsymbol{ol}}}}}}}}}}}}}}} $
Heart-leaved Twayblade	Listera cordata	Χ							Χ			
	Listera cordata var.											
Heart-leaved Twayblade	cordata	Χ							Χ			
Water Lobelia	Lobelia dortmanna	Χ						I	Χ			

Northern Bog Clubmoss	Lycopodiella inundata	Χ							ĺ	X			
	Lycopodium												
Northern Clubmoss	complanatum	Χ								Χ			
Hickey's Tree-clubmoss	Lycopodium hickeyi	Χ								Χ			
One-cone clubmoss	Lycopodium lagopus	Χ								Х			
Flat-branched Tree-													
clubmoss	Lycopodium obscurum	Χ								X			
Ground-Fir	Lycopodium sabinifolium	Χ								Χ			
Sitka Clubmoss	Lycopodium sitchense	Χ								Χ			
White Adder's-Mouth	Malaxis brachypoda	Χ								Χ			
Green Adder's-Mouth	Malaxis unifolia	Χ								Χ			
Tall Millet Grass	Milium effusum	Χ								Χ			
	Milium effusum var.												
Tall Millet Grass	cisatlanticum	Χ								X			
Square-stemmed													
Monkeyflower	Mimulus ringens	Χ								Χ			
Square-stemmed	Mimulus ringens var.												
Monkeyflower	ringens	Χ								Χ			
Partridgeberry	Mitchella repens	Χ								Χ			
Spiked Muhly	Muhlenbergia glomerata	Χ								Χ			
Mexican Muhly	Muhlenbergia mexicana	Χ								Χ			
Variable-leaved Water	Myriophyllum												
Milfoil	heterophyllum	Χ								Χ			
Andean Water Milfoil	Myriophyllum quitense	Χ								Χ			
Slender Water Milfoil	Myriophyllum tenellum	Χ								Χ			
Slender Naiad	Najas flexilis	Χ								Χ			
	Nuphar lutea ssp.												
Red-disked Yellow Pond-lily	rubrodisca	Χ								Χ			
Fragrant Water-lily	Nymphaea odorata	Χ								Χ			
	Nymphaea odorata ssp.												
Fragrant Water-lily	odorata	Χ								Χ			
Bog Aster	Oclemena nemoralis	Χ								Χ			
Oakes' Evening Primrose	Oenothera oakesiana	Χ								Χ			
Northern Adder's-tongue	Ophioglossum pusillum	Χ								Χ			
One-Flowered Broomrape	Orobanche uniflora	Χ								Χ			
White-grained Mountain]										
Rice	Oryzopsis asperifolia	Χ								Χ			
Hairy Sweet Cicely	Osmorhiza claytonii	Χ								Х			
Smooth Sweet Cicely	Osmorhiza longistylis	Χ								Х			
Ironwood	Ostrya virginiana	Χ								Χ			

	Ostrya virginiana var.		ĺ	ĺ	ĺ		Ì	ĺ		Ì	1			ĺ	1 1	
Ironwood	virginiana	Χ											X		1	
Golden Groundsel	Packera aurea	Χ											Х			
Schweinitz's Groundsel	Packera schweinitziana	Χ											Х			
Dwarf Ginseng	Panax trifolius	Х											Х			
Marsh Grass-Of-Parnassus	Parnassia palustris	Χ											Х			
	Parnassia palustris var.															
Marsh Grass-of-Parnassus	parviflora	Χ											X		1	
Northern Sweet Coltsfoot	Petasites frigidus	Χ											X			
	Petasites frigidus var.															
Northern Sweet Coltsfoot	palmatus	Χ											X		1	
Dwarf Clearweed	Pilea pumila	Χ											X			
Dwarf Clearweed	Pilea pumila var. pumila	Χ											Х			
Red Pine	Pinus resinosa	Χ											Х			
Tall Northern Green Orchid	Platanthera aquilonis	Χ											Х			
	Platanthera															
White Fringed Orchid	blephariglottis	Χ											X		1	
	Platanthera															
	blephariglottis var.														1	
White Fringed Orchid	blephariglottis	Χ											X			
Hooker's Orchid	Platanthera hookeri	Χ											Χ			
Blunt-leaved Orchid	Platanthera obtusata	Χ											Х			
Small Round-leaved Orchid	Platanthera orbiculata	Χ											Χ			
Grove Blue Grass	Poa alsodes	Χ											Х			
Rose Pogonia	Pogonia ophioglossoides	Χ											Х			
Blood Milkwort	Polygala sanguinea	Χ											Х			
	Polygonum amphibium														1	
Water Smartweed	var. emersum	Χ											Χ			
Halberd-leaved Tearthumb	Polygonum arifolium	Χ											Х		lacksquare	
Fowler's Knotweed	Polygonum fowleri	Χ											Χ			
	Polygonum														1	
Pennsylvania Smartweed	pensylvanicum	Χ											Х		$\sqcup \bot$	
Dotted Smartweed	Polygonum punctatum	Χ											Х		$\sqcup \bot$	
	Polygonum punctatum		1	1												
Dotted Smartweed	var. confertiflorum	X											Х		\vdash	
Sharp-fruited Knotweed	Polygonum raii	Χ											Х		\vdash	-
	Polygonum															
Bushy Knotweed	ramosissimum	Χ	1	ļ									Х		$\vdash \vdash$	
	Polygonum		1	1												
Duchy Knotyys!	ramosissimum var.	\ <u>\</u>														
Bushy Knotweed	ramosissimum	Χ					l						Х		$\perp \perp \perp$	

Climbing False Buckwheat	Polygonum scandens	Х	1	Ī			1	1		1 1	1	x		1 1
3	Polygonum scandens var.													
Climbing False Buckwheat	scandens	Χ										X		
	Polypodium													
Appalachian Polypody	appalachianum	X										X		
Rock Polypody	Polypodium virginianum	Х										Х		
Braun's Holly Fern	Polystichum braunii	Χ										Х		
Pickerelweed	Pontederia cordata	Χ										Х		
Balsam Poplar	Populus balsamifera	Χ										Х		
1	Populus balsamifera ssp.													
Balsam Poplar	balsamifera	Χ										X		
Alpine Pondweed	Potamogeton alpinus	Χ										X		
Ribbon-leaved Pondweed	Potamogeton epihydrus	X										X		
Oakes' Pondweed	Potamogeton oakesianus	X										X		
Blunt-leaved Pondweed	Potamogeton obtusifolius	X										X		+ +
Vasey's Pondweed	Potamogeton vaseyi	X										X		
. acoj er chawcou	Potamogeton													
Flat-stemmed Pondweed	zosteriformis	Χ										X		
That Sterrimed Forlawced	Pseudognaphalium	Λ												
Macoun's Cudweed	macounii	Χ										X		
Maccarra caavvoca	Pseudognaphalium	,,												
Eastern Cudweed	obtusifolium	Χ										X		
Edstern oddweed	Pseudognaphalium	Λ												
	obtusifolium ssp.													
Eastern Cudweed	obtusifolium	Χ										X		
Seaside Alkali Grass	Puccinellia americana	X										X		
Pink Pyrola	Pyrola asarifolia	X										X		
Tilliki yrold	Pyrola asarifolia ssp.								+					
Pink Pyrola	asarifolia	Χ										X		
Green-flowered Pyrola	Pyrola chlorantha	X										X		
Gmelin's Water Buttercup	Ranunculus gmelinii	X										X		
Pennsylvania Buttercup	Ranunculus pensylvanicus	X							+			X		
Hooked Buttercup	Ranunculus recurvatus	X				\vdash					+	X		
Hooked Buttercup	Ranunculus recurvatus	^										^		
Hooked Buttercup	var. recurvatus	Χ										X		
Cursed Buttercup	Ranunculus sceleratus	X					-			+		X		
Staghorn Sumac	Rhus typhina	X					-			+		X		+ +
Carolina Rose	Rosa carolina	X									+	X		+
		X										X		+ +
Claudhern	Rosa carolina var. carolina					 				+				+ +
Cloudberry	Rubus chamaemorus	X										X		+
Showy Blackberry	Rubus elegantulus	Χ										X		

Pennsylvania Blackberry	Rubus pensilvanicus	Χ			<u> </u>				X			
Vermont Blackberry	Rubus vermontanus	Χ							X			
Cut-Leaved Coneflower	Rudbeckia laciniata	Х							Х			
	Rudbeckia laciniata var.											
Cut-Leaved Coneflower	laciniata	Х							X			
Tierra del Fuego Dock	Rumex fueginus	Х							Х			
Sea-Side Dock	Rumex maritimus	Х							Х			
	Rumex maritimus var.											
Tierra del Fuego Dock	fueginus	Χ							X			
	Rumex maritimus var.											
Peach-leaved Dock	persicarioides	Χ							X			
Seabeach Dock	Rumex pallidus	Х							Х			
Knotted Pearlwort	Sagina nodosa	Χ							Х			
	Sagina nodosa ssp.											
Knotted Pearlwort	borealis	X							X			
Grass-leaved Arrowhead	Sagittaria graminea	Χ							Х			
	Sagittaria graminea var.											
Grass-leaved Arrowhead	graminea	Χ							X			
Sage Willow	Salix candida	Х							Х			Ī
Meadow Willow	Salix petiolaris	Х							Х			Ī
Seaside Brookweed	Samolus valerandi	Х							Х			
	Samolus valerandi ssp.											
Seaside Brookweed	parviflorus	Χ							X			
Purple Oat Grass	Schizachne purpurascens	Х							Х			Ī
	Schoenoplectus											
Water Bulrush	subterminalis	Χ							X			
Georgia Bulrush	Scirpus georgianus	Х							Х			Ī
Stalked Bulrush	Scirpus pedicellatus	Х							Х			Ī
Hanging Bulrush	Scirpus pendulus	Х							Х			Ī
Tall Goldenrod	Solidago altissima	Χ							Х			
Early Goldenrod	Solidago juncea	Χ							Х			
Large-leaved Goldenrod	Solidago macrophylla	Χ							Х			
American Burreed	Sparganium americanum	Χ							Х			
Floating Burreed	Sparganium fluctuans	Χ							Х			T
Small Burreed	Sparganium natans	Χ							Х			Γ
Slender Wedge Grass	Sphenopholis intermedia	Х							Х			T
Nodding Ladies'-Tresses	Spiranthes cernua	Χ							Х			T
Yellow Ladies'-tresses	Spiranthes ochroleuca	Х							X	1	1	T
Hooded Ladies'-Tresses	Spiranthes romanzoffiana	Χ							X			T
Trailing Stitchwort	Stellaria alsine	Х							X	1	1	T
Boreal Stitchwort	Stellaria borealis	Х	†						X	1	1	t

	Stellaria borealis ssp.		ĺ	1							1			1	1		
Boreal Stitchwort	borealis	Χ											X				
Saltmarsh Starwort	Stellaria humifusa	Χ											Х			1	
Thread-leaved Pondweed	Stuckenia filiformis	Χ											Х			1	
	Stuckenia filiformis ssp.															1	
Thread-leaved Pondweed	alpina	Χ											X				
Thread-leaved Pondweed	Stuckenia filiformis ssp.																
	occidentalis	Χ											X				
Horned Sea-blite	Suaeda calceoliformis	Χ											Х				
Boreal Aster	Symphyotrichum boreale	Χ											Х				
	Symphyotrichum																
Gulf of St Lawrence Aster	laurentianum	Χ					Х	Χ	Χ	Χ			Χ				
	Symphyotrichum																
Annual Saltmarsh Aster	subulatum	Χ											Х				
	Symphyotrichum																
	subulatum (non-Bathurst																
Annual Saltmarsh Aster	pop)	Χ											Χ			 <u> </u>	
Canada Germander	Teucrium canadense	Χ											Х			 <u> </u>	
	Teucrium canadense var.																
Canada Germander	canadense	Χ											Х			<u> </u>	
Northern Meadow-rue	Thalictrum venulosum	Χ											Х				
Alpine Clubrush	Trichophorum alpinum	Χ											Х				
	Trichophorum																
Tufted Clubrush	caespitosum	Χ											Х			<u> </u>	
Gaspé Arrowgrass	Triglochin gaspensis	Χ											Х			<u> </u>	
Marsh Arrowgrass	Triglochin palustris	Χ											Х				
Eastern Hemlock	Tsuga canadensis	Χ			Χ				Χ	Χ			Х				
Horned Bladderwort	Utricularia cornuta	Χ											Х				
Twin-stemmed Bladderwort	Utricularia geminiscapa	Χ											Χ			 <u> </u>	
Greater Bladderwort	Utricularia macrorhiza	Χ											Χ			 <u> </u>	
Lesser Bladderwort	Utricularia minor	Χ											Χ				
Alpine Bilberry	Vaccinium uliginosum	Χ											Χ				
Swamp Valerian	Valeriana uliginosa	Χ											Х				
Wild Celery	Vallisneria americana	Χ											Χ				
Blue Vervain	Verbena hastata	Χ											Х			<u> </u>	
	Verbena hastata var.		1														
Blue Vervain	hastata	Χ											Х			 <u> </u>	
Hobblebush	Viburnum lantanoides	Χ											Х			<u> </u>	
Lance-leaved Violet	Viola lanceolata	Χ											Х			<u> </u>	
	Viola lanceolata ssp.		1														
Lance-leaved Violet	lanceolata	Χ											Χ				

Northern Bog Violet	Viola nephrophylla	Χ						İ	X		. [1
Downy Yellow Violet	Viola pubescens	Χ							Х			
	Viola pubescens var.											
Downy Yellow Violet	scabriuscula	Χ							X		1	
Arrow-Leaved Violet	Viola sagittata	Χ							Х			
Arrow-Leaved Violet	Viola sagittata var. ovata	Χ							Х			
Virginia Chain Fern	Woodwardia virginica	Χ							Х			
Horned Pondweed	Zannichellia palustris	Χ							Х			
a Ground Beetle	Acupalpus canadensis	Χ							Х			
a Ground Beetle	Acupalpus pumilus	Χ							Χ			
Subarctic Darner	Aeshna subarctica	Χ							Х			
Milbert's Tortoiseshell	Aglais milberti	Χ							Х			
Milbert's Tortoise Shell	Aglais milberti milberti	Χ							Х			
a Ground Beetle	Agonum affine	Χ							Х			
a Ground Beetle	Agonum canadense	Χ							Χ			
a Ground Beetle	Agonum cupripennis	Χ							Х			
a Ground Beetle	Agonum metallescens	Χ							Χ			
a Ground Beetle	Agonum octopunctatum	Χ							Χ			
a Ground Beetle	Agonum propinquum	Χ							Χ			
a Ground Beetle	Agonum superioris	Χ							Χ			
a Ground Beetle	Agonum trigeminum	Χ							Χ			
a Ground Beetle	Amara avida	Χ							Χ			
a Ground Beetle	Amara cupreolata	Χ							Χ			
a Ground Beetle	Amara laevipennis	Χ							Χ			
a Ground Beetle	Amara lunicollis	Χ							Χ			
a Ground Beetle	Amara obesa	Χ							Χ			
a Ground Beetle	Amara patruelis	Χ							Χ			
a Ground Beetle	Amara quenseli	Χ							Χ			
a Ground Beetle	Anisodactylus kirbyi	Χ							Χ			
a Ground Beetle	Anisodactylus nigrita	Χ							Χ			
a Ground Beetle	Anisodactylus rusticus	Χ							Х			
a Ground Beetle	Badister grandiceps	Χ							Х			
a Ground Beetle	Badister ocularis	Χ							Χ			
Springtime Darner	Basiaeschna janata	Χ							Χ			
a Ground Beetle	Bembidion constrictum	Χ							Χ			
a Ground Beetle	Bembidion contractum	Χ							Χ			
a Ground Beetle	Bembidion fortestriatum	Χ							Χ			
a Ground Beetle	Bembidion frontale	Χ							Χ			
a Ground Beetle	Bembidion mimus	Χ							Χ		\perp	
a Ground Beetle	Bembidion nigripes	Χ							Χ			
a Ground Beetle	Bembidion nitidum	Χ							Χ		<u>, </u>	

a Ground Beetle	Bembidion obscurellum	Χ										Χ		1	
a Ground Beetle	Bembidion petrosum	Χ										Χ			
a Ground Beetle	Bembidion sejunctum	Χ										Χ			
a Ground Beetle	Blethisa hudsonica	Χ										Χ			
a Ground Beetle	Blethisa quadricollis	Χ										Χ			
Gypsy Cuckoo Bumble Bee	Bombus bohemicus	Χ					Х	Χ	Χ	Χ		Χ			
Yellow-banded Bumble bee	Bombus terricola	Χ			Χ		Х	Χ	Χ	Χ		Χ			
Ocellated Darner	Boyeria grafiana	Χ										Χ			
Fawn Darner	Boyeria vinosa	Χ										Χ			
Henry's Elfin	Callophrys henrici	Χ										Χ			
Henry's Elfin	Callophrys henrici henrici	Χ										Χ			
Bog Elfin	Callophrys lanoraieensis	Χ										Χ			
Eastern Pine Elfin	Callophrys niphon	Χ										Χ			
Eastern Pine Elfin	Callophrys niphon clarki	Χ										Х			
Hoary Elfin	Callophrys polios	Χ										Χ			
Ebony Jewelwing	Calopteryx maculata	Χ										Х			
a Ground Beetle	Calosoma calidum	Χ										Χ			
a Ground Beetle	Carabus maeander	Χ										Х			
a Ground Beetle	Carabus serratus	Χ										Χ			
Calico Pennant	Celithemis elisa	Χ										Χ			
a Ground Beetle	Chlaenius niger	Χ										Х			
a Ground Beetle	Chlaenius pennsylvanicus	Χ										Х			
Aurora Damsel	Chromagrion conditum	Χ										Χ			
	Coccinella														
Transverse Ladybird Beetle	transversoguttata	Χ										X			
	Coccinella														
	transversoguttata														
Transverse Lady Beetle	richardsoni	Χ										Χ			
Monarch	Danaus plexippus	Χ					Х	Χ				Χ			
	Danaus plexippus														
Monarch	plexippus	Χ										Χ			
a Ground Beetle	Diplocheila obtusus	Χ										Χ			
Petite Emerald	Dorocordulia lepida	Χ										Χ			
a Ground Beetle	Dromius piceus	Χ										Χ			
a Ground Beetle	Dyschirius globulosa	Χ										Χ			
a Ground Beetle	Dyschirius sellatus	Χ										Χ			
a Ground Beetle	Dyschirius sphaericollis	Χ										Χ			
a Ground Beetle	Elaphropus incurvus	Χ										Χ			
a Ground Beetle	Elaphrus americanus	Χ										Χ			
a Ground Beetle	Elaphrus clairvillei	Χ										Χ			
Azure Bluet	Enallagma aspersum	Χ				1						Χ			

Little Bluet	Enallagma minusculum	Χ]		Χ]
Early Hairstreak	Erora laeta	Χ						Χ		
Baltimore Checkerspot	Euphydryas phaeton	Χ						Х		
	Euphydryas phaeton									
Baltimore Checkerspot	phaeton	Χ						X		
Harvester	Feniseca tarquinius	Х						Х		
Harlequin Darner	Gomphaeschna furcillata	Х						Х		
Dusky Clubtail	Gomphus spicatus	Х						Х		
a Ground Beetle	Harpalus herbivagus	Х						Х		
a Ground Beetle	Harpalus laticeps	Х						Х		
a Ground Beetle	Harpalus pensylvanicus	Х						Х		
a Ground Beetle	Harpalus plenalis	Х						Χ		
a Ground Beetle	Lebia fuscata	Χ						Χ		
a Ground Beetle	Lebia pumila	Х						Χ		
a Ground Beetle	Lebia viridis	Χ						Χ		
Amber-Winged Spreadwing	Lestes eurinus	Χ						Χ		
Frosted Whiteface	Leucorrhinia frigida	Х						Χ		
Crimson-Ringed Whiteface	Leucorrhinia glacialis	Х						Х		
Salt Marsh Copper	Lycaena dospassosi	Х						Х		
a Ground Beetle	Notiophilus aeneus	Х						Х		
Compton Tortoiseshell	Nymphalis I-album	Х						Х		
	Nymphalis I-album j-									
Compton Tortoiseshell	album	Χ						Χ		
Jutta Arctic	Oeneis jutta	Χ						Χ		
Jutta Arctic	Oeneis jutta ascerta	Х						Х		
a Ground Beetle	Omophron tessellatum	Х						Х		
a Ground Beetle	Oxypselaphus pusillus	Х						Х		
Wandering Glider	Pantala flavescens	Х						Х		
a Ground Beetle	Platynus decens	Χ						Χ		
a Ground Beetle	Platynus tenuicollis	Х						Χ		
Northern Blue	Plebejus idas	Χ						Χ		
Crowberry Blue	Plebejus idas empetri	Χ						Χ		
Green Comma	Polygonia faunus	Х						Χ		
Green Comma	Polygonia faunus faunus	Χ						Χ		
Grey Comma	Polygonia progne	Χ						Χ		
Satyr Comma	Polygonia satyrus	Х						Χ		
a Ground Beetle	Pseudamara arenaria	Χ						Χ		
	Pterostichus									
a Ground Beetle	commutabilis	Χ						X		
a Ground Beetle	Pterostichus coracinus	Χ						Х		
a Ground Beetle	Pterostichus tristis	Χ						Х		

Acadian Hairstreak	Satyrium acadica	Χ													Х			
Acadian Hairstreak	Satyrium acadica acadica	Χ													Х			
Banded Hairstreak	Satyrium calanus	Χ													Х			
Banded Hairstreak	Satyrium calanus falacer	Χ													Χ			
Striped Hairstreak	Satyrium liparops	Χ													Х			
	Satyrium liparops																	
Striped Hairstreak	strigosum	Χ													Х			
Lake Emerald	Somatochlora cingulata	Χ													Χ			
Forcipate Emerald	Somatochlora forcipata	Χ													Χ			
Delicate Emerald	Somatochlora franklini	Χ													Х			
Incurvate Emerald	Somatochlora incurvata	Χ													Х			
Kennedy's Emerald	Somatochlora kennedyi	Χ													Χ			
Ocellated Emerald	Somatochlora minor	Χ													Х			
Aphrodite Fritillary	Speyeria aphrodite	Χ													Χ			
Aphrodite Fritillary	Speyeria aphrodite winni	Χ													Χ			
	Sphaeroderus																	
a Ground Beetle	stenostomus	Χ													Χ			
Black Meadowhawk	Sympetrum danae	Χ													Χ			
a Ground Beetle	Syntomus americanus	Χ													Χ			
a Ground Beetle	Xestonotus lugubris	Χ													Χ			
Atlantic Sturgeon	Acipenser oxyrinchus	Χ				Χ					Χ	Χ						
Skate, Thorny	Amblyraja radiata	Χ				Χ			Χ	Χ	Χ	Χ						
American Eel	Anguilla rostrata	Χ				Χ			Χ	Χ	Χ	Χ						
Slimy Sculpin	Cottus cognatus	Χ																
Skate, Smooth	Malacoraja senta	Χ				Χ			Χ	Χ	Χ	Χ						
Striped Bass	Morone saxatilis	Χ							Χ	Χ								
Northern Redbelly Dace	Phoxinus eos	Χ																
Atlantic Salmon	Salmo salar	Χ							Χ	Χ								
Large Sleeper Shark	Somniosus microcephalus	Χ				Χ					Χ	Χ						
Smooth Greensnake	Opheodrys vernalis	Χ						Χ	Χ	Χ								
Pickerel Frog	Lithobates palustris	Χ						Χ	Χ	Χ				Χ				
Sharp-shinned Hawk	Accipiter striatus			Χ			Χ		Χ		Χ		Χ				Χ	
Spotted Sandpiper	Actitis macularius			Χ			Χ	Χ			Χ		Χ				Χ	
Nelson's Sparrow	Ammodramus nelsoni			Χ			Χ		Χ		Χ		Χ				Χ	
Northern Pintail	Anas acuta		Χ	Χ				Χ									Χ	
Northern Shoveler	Anas clypeata		Χ	Χ				Χ										
Green-winged Teal	Anas crecca			Χ			Χ				Χ		Χ					
Blue-winged Teal	Anas discors			Χ				Χ									Χ	
Mallard	Anas platyrhynchos			Χ			Χ				Χ		Χ				Χ	
American Black Duck	Anas rubripes			Х			Χ				Χ		Χ				Χ	
Ruddy Turnstone	Arenaria interpres							Χ										

Short-eared Owl	Asio flammeus		Χ			Χ		Χ	Χ	Χ		Χ				Χ	
Long-eared Owl	Asio otus		Χ					Χ									
Ring-necked Duck	Aythya collaris		Χ			Χ				Х		Χ					
Upland Sandpiper	Bartramia longicauda		Χ					Χ								Χ	
Ruffed Grouse	Bonasa umbellus	Χ	Χ			Χ				Х		Χ					
American Bittern	Botaurus lentiginosus	Χ	Χ			Χ				Х		Χ					
Brant	Branta bernicla							Χ								Χ	
Canada Goose	Branta canadensis		Χ			Χ				Χ		Χ				Χ	
Common Goldeneye	Bucephala clangula		Χ			Χ				Х		Χ					
Barrow's Goldeneye	Bucephala islandica				Χ	Χ		Χ	Χ	Х		Χ					
Rough-legged Hawk	Buteo lagopus							Χ								Χ	
Broad-winged Hawk	Buteo platypterus		Χ					Χ									
Lapland Longspur	Calcarius Iapponicus							Χ								Χ	
Sanderling	Calidris alba			Χ		Χ		Χ		Х		Χ					
Dunlin	Calidris alpina			Χ		Χ				Х		Χ					
Red Knot	Calidris canutus			Χ		Χ		Χ	Χ	Х		Χ					
White-rumped Sandpiper	Calidris fuscicollis			Χ				Χ								Χ	
Purple Sandpiper	Calidris maritima			Χ		Χ		Χ		Х		Χ					
Pectoral Sandpiper	Calidris melanotos							Χ								Χ	
Least Sandpiper	Calidris minutilla			Χ		Χ		Χ		Х		Χ					
Semipalmated Sandpiper	Calidris pusilla			Χ		Χ		Χ	Χ	Χ		Χ					
Pine Siskin	Carduelis pinus	Χ	Χ					Χ								Χ	
Veery	Catharus fuscescens	Χ	Χ			Χ		Χ		Х		Χ					
Black Guillemot	Cepphus grylle		Χ					Χ									
Piping Plover	Charadrius melodus		Χ			Χ		Χ	Χ	Х		Χ					
Killdeer	Charadrius vociferus		Χ			Χ		Χ		Х		Χ				Χ	
Common Nighthawk	Chordeiles minor		Χ			Χ		Χ	Χ	Х		Χ					
Bonaparte's Gull	Chroicocephalus																
	philadelphia				Χ	Χ	Χ			Χ		Χ					
Long-tailed Duck	Clangula hyemalis				Χ	Χ				Χ		Χ					
	Coccothraustes																
Evening Grosbeak	vespertinus	Χ	Χ			Χ		Χ	Χ	Х		Χ					
	Coccyzus																
Black-billed Cuckoo	erythropthalmus		Χ			Χ		Χ				Χ					
Olive-sided Flycatcher	Contopus cooperi	Χ	Χ			Χ		Χ	Χ	Χ		Χ			Χ		Χ
Eastern Wood-Pewee	Contopus virens	Χ	Χ			Χ		Χ	Χ	Χ		Χ			Χ		
Bay-breasted Warbler	Dendroica castanea	Χ	Χ			Χ		Χ		Χ		Χ					
Cape May Warbler	Dendroica tigrina		Χ			Χ		Χ		Χ		Χ					
Black-throated Green	Dendroica virens	Χ	Χ														
Warbler						Χ				Χ		Χ					
Bobolink	Dolichonyx oryzivorus	Χ	Χ			Χ		Χ	Χ	Χ		Χ				Χ	

Pileated Woodpecker	Dryocopus pileatus	Χ	Х				X							
Gray Catbird	Dumetella carolinensis	Χ	Χ				X							
Yellow-bellied Flycatcher	Empidonax flaviventris	Χ	Χ				X							Χ
Horned Lark	Eremophila alpestris		Χ				X						Х	<
Rusty Blackbird	Euphagus carolinus		Χ			Х	X	Χ	Х	X				
American Coot	Fulica americana		Χ				X							
Wilson's Snipe	Gallinago delicata	Χ	Χ			X	X		Х	Χ			Х	(
Common Loon	Gavia immer	Χ	Χ			Х	X		Х	X				
Red-throated Loon	Gavia stellata				Х	Х	Х		Х	X				
Bald Eagle	Haliaeetus leucocephalus	Χ	Χ			Х			Х	X				
Barn Swallow	Hirundo rustica	Χ	Χ			Х	X	Χ	Х	X			Х	(
Harleguin Duck	Histrionicus histrionicus				Х		X							
Baltimore Oriole	Icterus galbula		Χ				X							
Herring Gull	Larus argentatus		Х				X						X	(
Ring-billed Gull	Larus delawarensis		Х				X						X	
Great Black-backed Gull	Larus marinus		Χ				X							
Short-billed Dowitcher	Limnodromus griseus						X						Х	,
Hudsonian Godwit	Limosa haemastica			Х		Х	X		Х	<				
Hooded Merganser	Lophodytes cucullatus		Х				X							
Red Crossbill	Loxia curvirostra		Х				X							
White-winged Crossbill	Loxia leucoptera	Χ	Χ				X							
Belted Kingfisher	Megaceryle alcyon	Χ	Χ			X			Х	Χ				
White-winged Scoter	Melanitta fusca				Х	Х			Х	X				
Black Scoter	Melanitta nigra				Х	X			Х	Χ				
Surf Scoter	Melanitta perspicillata				Х	Х			Х	X				
Red-breasted Merganser	Mergus serrator		Χ				X							
Northern Mockingbird	Mimus polyglottos		Х				X						Х	<
Brown-headed Cowbird	Molothrus ater		Χ			X	X		Х	Χ			Х	<
Eskimo Curlew	Numenius borealis							Χ	Х	X			Х	ζ
Hudsonian Whimbrel	Numenius phaeopus													
	hudsonicus			Χ		X			Χ	Χ .			X	<
Mourning Warbler	Oporornis philadelphia	Χ	Χ			Х			Χ	(
Ruddy Duck	Oxyura jamaicensis		Χ				X							
Osprey	Pandion haliaetus	Χ	Χ			Х			Χ	<				
Northern Parula	Parula americana	Χ	Χ			Х			Χ	(
Gray Jay	Perisoreus canadensis	Χ	Χ			Х	X		Χ	(
Great Cormorant	Phalacrocorax carbo		Χ			Х	X		Χ	(
Red-necked Phalarope	Phalaropus lobatus						Х	Χ						
Rose-breasted Grosbeak	Pheucticus Iudovicianus	Χ	Χ			Х	X		Х	X				
Black-backed Woodpecker	Picoides arcticus		Х				X							

American Three-toed								1 1											1	ſ
Woodpecker	Picoides dorsalis		Χ					Χ												ļ
Pine Grosbeak	Pinicola enucleator		Χ																	
American Golden-Plover	Pluvialis dominica			Χ		Х		Χ			Χ		Χ					Χ		
Black-bellied Plover	Pluvialis squatarola			Χ	Х		Х	Χ			Χ		Χ					Χ		
Horned Grebe	Podiceps auritus				Х	Х					Χ		Χ							
Red-necked Grebe	Podiceps grisegena				Х			Χ	Χ											
Pied-billed Grebe	Podilymbus podiceps		Χ			Х					Χ		Χ							
Boreal Chickadee	Poecile hudsonica		Χ			Χ		Χ			Χ		Χ							
Vesper Sparrow	Pooecetes gramineus		Χ					Χ										Χ		
Sora	Porzana carolina		Χ			Х					Χ		Χ					Χ		
Virginia Rail	Rallus limicola		Х			Χ		Χ			Χ		Χ							
Ruby-crowned Kinglet	Regulus calendula	Χ	Χ					Χ												
Bank Swallow	Riparia riparia	Χ	Χ			Χ		Χ	Χ		Χ		Χ							Χ
American Woodcock	Scolopax minor		Χ			Χ					Χ		Χ							
Northern Waterthrush	Seiurus noveboracensis	Χ	Х					Χ												
American Redstart	Setophaga ruticilla		Х			Χ														
Eastern Bluebird	Sialia sialis		Х					Χ	Χ									Χ		
White-breasted Nuthatch	Sitta carolinensis		Х					Χ												
Common Tern	Sterna hirundo	Χ	Х			Х		Χ	Χ		Χ		Χ							
Arctic Tern	Sterna paradisaea		Х					Χ												,
Tree Swallow	Tachycineta bicolor	Χ	Х					Χ										Χ		Χ
Lesser Yellowlegs	Tringa flavipes			Χ		Х		Χ			Χ		Χ							,
Greater Yellowlegs	Tringa melanoleuca		Х					Χ										Χ		
Willet	Tringa semipalmata	Χ	Χ			Χ					Χ		Χ							
Solitary Sandpiper	Tringa solitaria			Χ		Χ					Χ		Χ							
Eastern Kingbird	Tyrannus tyrannus		Χ			Χ		Χ										Χ		
Tennessee Warbler	Vermivora peregrina	Χ	Χ			Χ		S			Χ		Χ							
Philadelphia Vireo	Vireo philadelphicus	Χ	Χ					Χ										Χ		
Canada Warbler	Wilsonia canadensis	Χ	Χ			Χ		Χ	Χ		Χ		Χ				Χ			
Wilson's Warbler	Wilsonia pusilla	Χ	Χ			Χ														
White-throated Sparrow	Zonotrichia albicollis	Χ	Χ			Х					Χ		Χ					Χ		
Little Brown Myotis	Myotis lucifugus								Χ	Χ	Χ	Χ		Χ						
Northern Long-eared																				
Myotis	Myotis septentrionalis								Χ	Χ	Χ	Χ		Χ						
Atlantic Walrus	Odobenus rosmarus rosmarus								Х	Χ				Χ						
American Pygmy Shrew	Sorex hoyi							Χ						Χ						-
American Water Shrew	Sorex palustris													Χ						

Appendix I: Summary of wetlands by watershed

During a partners meeting on June 4, 2014, several partner organizations requested further investigation into the amount and type of wetlands found within the Bioregion. While the total spatial extent of wetlands on the bioregion scale is useful for tracking the gain or loss of wetlands over time, there was concern that a landscape scale measure may be biased by the spatial clustering of wetlands within the bioregion. To supplement this analysis, the total amount and composition of wetlands within the bioregion was determined at the watershed scale. The results are summarized in the table below. Due to differences between the source datasets, some wetlands may fall outside of watershed boundaries (e.g. salt marshes) and not be attributed to any particular watershed. Therefore this summary is provided as supplementary information, and may underestimate the actual wetland extents.

Table I1: The amount and composition of all wetlands within each provincially delineated watershed according to the 2000 corporate landuse inventory. All values are in hectares (ha).

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other	Salt Marsh	Brackish Marsh	Sand Dune	Total
Abrams Village	11.0	2.7											13.7
Albion			0.6				1.8			0.0	0.8	1.6	4.8
Alexandra	34.6	0.1	17.7	10.9		2.7	1.8			5.0		5.9	78.7
Anglo Tignish												1.5	1.5
Appletree Creek			0.3	1.2		0.7				8.1			10.3
Argyle Shore	3.1	8.2	24.8	5.0		7.1	4.2	4.3		1.7		1.5	59.7
Augustine Cove	0.4		1.1	2.7		0.1	1.7	3.1		4.1		0.5	13.8
Bains Creek		0.8		3.4			58.6					0.1	62.9
Baltic River	0.1	0.7	7.3	11.1		1.8	4.7			3.1		26.2	54.9
Barbara Weit River		5.8	22.1	8.2		11.6	24.3	2.6		0.2	6.1	0.2	81.0
Bayview	2.0		2.1	4.4		0.2	3.4			0.3	1.7		14.1
Bear River	11.6	39.3	1.2				13.5	3.3				1.3	70.1
Beatons Creek	176.6	71.0					18.3	48.5	0.6	15.4	12.6	17.8	360.9
Belle River	50.0	8.4	8.1	26.9		0.2	3.4	2.6		0.1		1.7	101.4
Bells Creek	23.9		6.2	28.7		1.7	12.9	26.1		13.5	1.5		114.6
Bentick Cove	0.9	1.9	17.7	12.2		1.9	62.6	40.5		0.2	2.4		140.4
Bideford River	209.4	38.2	14.4	7.7		0.8	15.7	74.0		1.8	2.7		364.7
Big Pierre Jacques River	45.5	11.1	7.9	11.5		3.1	11.0	1.6		0.0		22.0	113.7
Bird Island			0.5							11.6		1.6	13.7
Black Banks	392.5	22.3	4.0	3.8		0.7	15.1			4.7	3.1	10.8	456.9
Black Brook	5.5	1.9	1.2				1.4			41.5			51.5
Black Marsh	18.6	3.1	10.5	11.0				1.2		32.6		14.9	91.9
Black Pond	7.2	0.2	5.9	40.0		3.4	2.9					42.8	102.4
Black Pond Brook	4.1	7.3	1.3	0.6		1.8	39.1	3.7			13.5	2.1	73.6

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other	Salt Marsh	Brackish Marsh	Sand Dune	Total
Black River	12.1	0.3	5.6	2.6			1.7	13.1		6.9	0.2		42.5
Black River (Donaldston)	16.0	30.6	2.7	1.7		2.0	0.3			0.0		1.1	54.4
Blacketts Creek	96.2	10.6	0.6	8.2		0.0	21.9	3.1		0.0	2.7	2.6	145.9
Boughton Island				4.2							3.2	21.2	28.6
Boughton River	27.4	231.7	45.9	98.4		8.4	80.2	13.9		0.0	2.7	0.3	508.9
Bradshaw River	8.3	0.6	18.2	24.8		12.6	21.1	6.1		0.1	46.7		138.4
Brae River	50.8	17.8	16.5	6.5		0.7	10.1	11.2		12.0		1.9	127.4
Bristol Creek	131.5	24.2	21.4	11.6		15.4	40.7	5.4			12.6	72.7	335.4
Brockton			3.5										3.5
Brooks River	51.1	22.3	5.9	26.9		12.9	5.5			0.9	7.1		132.6
Browns Creek		1.2	6.4			0.3	1.8			0.0	3.7	0.6	14.0
Brudenell River	53.6	13.5	22.2	37.9		2.2	19.3	20.5		0.1	3.3	3.0	175.5
Byrnes Creek	8.4		1.3	4.1		0.3	6.1	4.6		0.0		0.2	25.1
Cablehead	82.2	37.5	12.6	2.7		1.2	23.3					26.5	186.0
Campbells Cove	24.9		20.0	2.9			18.7	5.3				1.4	73.2
Campbells Pond		23.6	1.9	19.3		1.2	0.6					8.9	55.5
Campbellton	2.2		2.7	0.7			23.2	1.4	0.5				30.7
Cape Gage	1.1	1.1	1.3	1.6			1.3					2.1	8.4
Cape Kildaire	3.9	8.5	2.0	0.6									14.9
Cape Traverse River			13.3	4.5		0.4	5.7	19.3		0.2	15.9	3.6	62.9
Cardigan River	44.4	31.9	4.8	29.7		7.7	30.0	11.2		2.0	4.6	10.9	177.2
Carrs Pond	2.2	0.4	2.1	2.9						0.0	4.9	0.4	12.9
Cascumpec Sand Hills										0.1	0.3	179.6	180.0
Cavendish		1.2											1.2
Chapel Creek			2.1	2.1			0.3	2.6		0.1			7.2
Charlottetown				0.2			2.0						2.2
Cheese Factory Creek	4.6	0.3	2.2	8.7		2.1	13.6	9.2		58.3			99.1
Chepstow	1.2		3.5					1.1					5.8
Cherry Island										0.0		2.4	2.4
Churchill		1.3	0.8	0.9						30.7	0.1		33.7
Clarks Brook	98.9	21.8	1.9	115.7			140.3	49.8		30.7			459.2
Clyde River		6.3	29.3	0.6		3.9	2.2	2.4		24.8	6.8		76.3

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other Salt Marsh	Brackish Marsh	Sand Dune	Total
Conway Sand Hills									0.1		259.7	259.9
Courtin Island						0.3					0.9	1.2
Cousins Pond	1.9		3.4	29.1		0.3	2.3				4.4	41.3
Cow Creek	42.9	35.6	2.6	29.0			44.6	42.2				196.9
Cranberry Point	2.1	1.3	3.7			31.0		14.2	0.0			52.4
Crooked River	15.8		1.2				18.1				0.0	35.1
Cross River	36.2	2.7	26.8	25.7			54.0	7.1			2.3	154.9
Crossmans Brook				0.2			4.4				0.4	5.0
Cymbria		0.2							0.1	0.5		0.8
Daltons Brook	2.6	0.2	0.2	0.5			10.8					14.3
Dalvay Lake	54.8	4.1	7.2	122.2		3.1	6.0		17.4	9.5	134.6	359.0
Deroche Pond	94.7	30.2	4.3	249.3		4.7	24.8	20.7		27.5	239.6	695.8
Desable River		0.6	10.1	2.6		2.0	4.7	3.9	18.9	3.6	1.6	48.0
Dock River	14.2	0.4	1.2	11.9			4.5	1.9	1.5	0.8	9.7	46.2
Dunk River	21.5	41.7	35.5	47.4		16.7	97.5	46.8	0.0	12.8		319.9
Durant Creek			5.1						1.7	3.3		10.1
Earnscliffe		1.0	24.0	4.8			7.3	1.6	2.9		8.1	49.6
East Lake Creek	17.2	0.4	12.5	46.0			10.9	0.6			44.1	131.7
Enmore River	101.6	115.8	8.6	42.9		2.8	48.5	83.4	12.0	1.0	0.7	417.4
Fairview	2.7	0.6	7.5	5.4					4.1	4.2	0.2	24.7
Feehans Shore		42.9	1.6	5.5		1.3	8.5				181.8	241.6
Flat River	2.6	2.8	11.8	13.5		0.5	6.9		0.1			38.3
Foleys Pond		0.4	7.9	0.7			16.0	1.0		17.8	0.4	44.3
Fortune River	306.2	66.6	12.1	104.5		10.9	478.1	7.3	6.0	48.9	9.1	1,049.7
Founds River			1.5			1.5	8.1	5.1	0.0	2.4	1.6	20.2
Fox River	42.9	0.2		9.4			0.2	20.4	0.1		1.5	74.7
Foxley River	568.2	117.6	1.2	11.2		0.5	59.7	15.8	2.7	24.9	0.3	802.2
Freeland Creek	2.3	17.8	7.7	13.5		0.9			0.0	1.4		43.6
French River		0.8	1.8	1.2		0.2			0.0			4.0
Fullertons Creek	39.7	9.3	25.9	29.4		0.4	21.4	14.5	87.1	0.8		228.6
Gascoigne Cove		11.7	4.5	5.6		0.1	3.9		0.1		13.2	39.2
Gaspereaux Shore	210.8	7.2	2.3	54.1		20.4	5.2	77.5	2.3	1.8	48.3	430.0

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other	Salt Marsh	Brackish Marsh	Sand Dune	Total
George Island	1.5		2.4					3.1		0.0	1.9	0.7	9.6
Georgetown	3.2		2.6	5.2			4.4			0.0	0.6	2.5	18.6
Glenfinnan Island										4.0			4.0
Glenfinnan River	106.9	95.2	3.6	56.4			35.5	13.9		117.7			429.3
Goose River	66.8	1.7	0.7			11.3	37.6	15.5					133.6
Gordons Creek		0.3	4.7	0.8			2.3	1.0		0.0		0.8	10.0
Gordons Island			0.0			0.3		1.2		0.0		1.3	2.9
Grahams Creek			1.3				0.2			0.1	7.5	108.0	117.0
Grand Digue Shore	24.7	0.3					5.5	40.2				0.1	70.8
Grand River	12.1	9.6	20.9	6.1		0.3	58.9	160.4		94.0	11.8		374.1
Granville Creek		1.9	5.5	7.6		0.0	10.3				0.6		26.0
Graystone Creek	4.3			0.4			28.8	7.4					41.0
Greek River	104.3	13.5		32.6		1.1	6.8			5.4	4.7	0.5	168.9
Greenwich		30.0	3.8	60.5		1.7	3.3					164.6	263.9
Haldimand River	7.6	32.9	18.4	14.9		1.0	49.9	68.9		40.6		6.5	240.7
Harding Creek			5.6	0.2						3.0	2.3		11.0
Hay River	42.7	15.1	3.8	31.8			7.2						100.6
Hebron	25.5	9.1	13.7	1.3				5.5		1.2	7.2	33.8	97.4
Herring Island										0.0		1.6	1.6
Hills River	2.1		4.1	1.2		3.0	1.2	7.1		3.6	4.2	0.3	26.7
Hillsborough River	102.4	36.1	1.6	29.0		153.9	28.4	20.5			0.2		372.0
Hog Island						1.2				6.0	3.9	447.7	458.8
Hollow River	5.0		9.7	2.5			5.4	1.6				8.9	33.2
Hope River	0.1		1.1	0.4			5.7	2.7		0.0	0.3		10.3
Hornes Creek 1	0.7		2.9	1.9			7.1	3.2		0.4	0.5		16.6
Hornes Creek 2	3.2		3.6	13.9			1.0	6.8		4.8			33.3
Howards Cove	1.8	0.7	4.7	7.6			6.2						21.1
Howe Bay	70.6		16.1	2.2		2.1	23.9	4.5		0.2	4.2	35.3	159.1
Hunter River			18.0	37.6			10.6	0.2		11.8	1.7	21.8	101.7
Huntley River	1.2	2.8	11.7	7.1			21.0	3.8		1.8	0.8	0.2	50.4
Hyde Creek	2.7	1.0	4.0	6.0		1.4	8.0	4.1		11.3	0.5		39.0
Indian River		7.2	9.7	36.2		0.3	11.9			0.1		0.5	65.9

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other	Salt Marsh	Brackish Marsh	Sand Dune	Total
Indian Sand Hills	17.7	0.3					17.6	9.7		0.1		6.1	51.4
Jacques River	6.3	3.0	5.9	17.2		2.2	20.8	22.8		0.2		0.2	78.5
Johnstons River	92.0	152.3	25.4	40.3		0.4	44.0	37.3		75.0	0.3		467.1
Josephine Shore	116.4	4.9	3.9	3.7			2.4			0.1	2.3		133.6
Kellys Point										0.0			0.0
Kildaire River		0.2	5.1	12.5		0.5	8.0	4.7	0.1	3.0	2.5	93.2	129.8
Lake Of Shining Waters			0.8	47.3			2.2			0.0		18.4	68.8
Launching	14.8	0.3	5.5	11.2		9.3	9.2	10.9		0.2	0.8	14.9	77.1
Lennox Island	67.1		13.7					1.0		2.4	4.2		88.5
Little Courtin Island										8.6			8.6
Little Harbour	6.8		2.6	0.4						1.2	1.6	7.0	19.6
Little Miminegash River	1.0	10.4	4.6	12.4			28.7	11.0			39.1	2.1	109.3
Little Pierre Jacques River	52.3	15.7	11.9	9.5		2.3	0.9	4.1			0.7		97.4
Little Sands Shore	219.9	5.2	19.6	9.2		3.8	40.0	151.7		3.4	13.7	15.3	481.9
Little Tignish River		2.8	1.4	21.2			40.5	3.6		0.1	40.5	10.7	120.8
Little Trout River	7.8	30.5	1.4	1.2		0.8	21.9	12.3		16.9			92.8
Llewellyns Creek	10.6	2.3	1.8	0.3			10.3	14.2		0.0	3.5	0.8	43.9
Long Creek		0.3	6.3	0.1				1.7		32.1	0.6		41.0
Long River				3.0						0.7			3.7
Lower Montague		3.1					1.6				0.6	1.0	6.3
Lower New Annan			5.7	0.2			0.6			0.0	6.8	0.3	13.6
Lukes Creek			0.1				4.9			0.0		18.3	23.4
Macfaydens Creek				0.9						11.1	0.1		12.0
Macintyres Creek	2.9		1.9							0.2	2.3		7.2
Macivors Point			0.6	0.2				2.2					2.9
Mackies Pond	0.0			14.3							4.1		18.4
Mackinnon Point						2.2	13.3					28.8	44.3
Maclaughlins Creek						0.6				5.9	0.0		6.5
Maclaurins Creek	4.7	5.5	0.3	1.3		1.8	1.2	2.4		0.1			17.3
Macleods Creek				0.1						1.0	1.1		2.2
Macwilliams Brook	2.3		1.5		3.0	0.8	8.4	1.9				0.1	17.9
Marie River	17.7	36.5	6.9	28.5			43.7	78.8		7.7		0.9	220.6

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other Salt Marsh	Brackish Marsh	Sand Dune	Total
Mccallum Creek	1.1	6.3	2.2	6.0		0.6	7.3	9.9	119.7	3.4	202.7	359.3
Mcphee Creek				0.5		0.3			7.1	0.0		7.9
Midgell River	152.9	103.6	10.6	82.1		10.2	273.4	31.0	0.9	6.6		671.2
Mill Creek			3.9	4.4			5.7	4.5	0.0			18.5
Mill River	170.3	35.5	28.8	31.7		1.3	183.9	42.7	0.4 1.4	0.8	0.2	497.0
Millers Creek	17.7	0.6	8.4	44.2		2.3	4.8	0.6	92.8			171.5
Mills Point		3.6							0.0	9.4	0.5	13.5
Miminegash River	51.9	24.3	3.5	37.5		11.8	54.7	10.8	15.6	2.0	5.1	217.2
Mitchell River	9.0	11.0	0.3	11.5		12.8	15.5		0.1		0.7	60.9
Montague-Valleyfield	55.8	15.7	16.1	71.5		1.9	112.8	106.8	2.2	0.4	4.7	388.0
Morell River	282.0	376.9	41.5	42.6		10.5	309.3	168.6	2.8	3.6	0.5	1,238.3
Morrison Pond	11.8	4.4	1.2	7.9			2.1		0.0	0.4	7.2	35.0
Murray River	214.2	0.6	2.2	85.9		2.7	29.9	5.2	0.2	4.5	7.9	353.3
Nail Head			9.2					10.6			4.5	24.3
Nail Pond	11.6	0.2	3.2	165.0		0.7	29.8				17.1	227.6
Narrows Creek	19.3	29.6	11.0	0.5		0.8	43.6	13.0	0.2	1.0	0.5	119.5
Naufrage River	87.0	172.5	15.9	0.8		0.6	70.1	4.9	2.0	6.1	15.2	375.1
Nebraska Creek	45.7	9.3	7.5	5.0		3.7	5.2	235.5	20.9	7.0	0.8	340.5
Newtown River		5.4	7.5	1.0					0.9			14.9
Nicolle Point	14.4			0.2			1.2		0.0		1.5	17.3
Norris Pond	5.0		5.2	4.2			0.8					15.2
North Lake Creek	212.2	1.6	16.2	6.1			49.8	12.4		6.8	1.0	306.1
North River	3.6	13.6	26.6	13.4		5.5	25.1	14.2	14.7	27.8	0.7	145.1
North Shore											0.1	0.1
Orwell Cove			0.9		0.0				1.2		0.4	2.5
Orwell River	10.8	0.1	9.3	3.7			9.1	14.5	2.0			49.5
Oultons Island			3.7	0.4				0.9	0.0	0.1		5.2
Oyster Bed Bridge									0.0			0.0
Oyster Cove		10.8	14.6	4.4		13.6	4.4		0.2	6.0	3.4	57.3
Paynters Creek		0.7	1.6	0.1					0.0	5.4		7.8
Percival River	111.3	95.9	8.9	43.6		6.1	56.3	191.3	0.5	8.0	1.8	523.7
Pinette River			14.8	14.0		5.5	2.6		19.7	0.0	0.3	56.9

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other Salt Marsh	Brackish Marsh	Sand Dune	Total
Pipers Creek	84.5	14.3	1.4	1.8			3.2	2.4	0.1	1.5	0.3	109.6
Pisquid River	142.5	5.9	2.2	63.4		12.6	59.5	6.2	103.9	0.0		396.1
Platte River		2.3	17.6	3.6		16.1	42.1		0.1	6.9	4.0	92.8
Point Prim		1.4	14.4	6.4			8.9		6.1	10.2	7.5	54.9
Pollard Brook			2.3					1.1				3.3
Poplar Point	14.2	4.4	5.7	3.0			4.2	10.0	0.4	1.0	1.0	44.1
Poverty Beach									1.2		9.7	10.8
Pownal	21.3	0.6	13.5	4.7		21.5	7.6	2.9	0.9			73.2
Prevost Cove	2.4		0.6			5.9			0.0		0.0	9.0
Priest Pond Creek	15.7		5.5	23.0			20.2	0.4			10.1	74.9
Princetown Point			1.2				1.9	4.4	0.1		1.2	8.8
Ram Island				0.1								0.1
Rayners Creek		0.2	1.2	0.7		0.9	4.2		0.0	0.8	0.5	8.4
Rayners Pond	1.2			11.1					0.0		9.8	22.1
Reynolds Island									0.0		0.9	1.0
Richard Point	28.4		4.3	5.2			2.2	12.9	0.0	6.1		59.2
Riverside			0.4							10.2		10.6
Rochford Pond		2.7	0.1	31.7			27.7		0.0	6.7	1.9	70.9
Rock Barra	11.2		0.5	1.5			25.1				0.1	38.5
Rollings Pond	1.2		4.0	5.5			7.5	1.4				19.7
Rollo Bay	9.7	2.4	4.3	6.9				35.8	0.7		5.1	64.8
Rosebank		0.0	0.5	5.9		0.4	1.5		0.0			8.4
Round Pond		3.1		37.5			3.9	4.7			4.7	53.9
Savage Harbour	25.0	16.9	7.2	28.3		18.6	9.0		12.0	2.8	109.2	228.9
Schooner Creek	133.9	57.8	4.7	33.1			31.6	10.5			57.8	329.5
Scotchfort	4.0		0.9	0.6		19.3	1.6		100.9	0.0		127.3
Scotts Creek			0.7	2.4			0.8	0.4	16.4			20.7
Seacow Pond	184.3		1.6	3.8		1.3	13.6	0.6				205.2
Seal River (Cardigan)	13.1	36.1	5.1	5.1			52.2	3.4	4.0	1.5	2.4	122.7
Seal River (Vernon)	7.0	4.5	8.9	5.5		3.9	54.8	5.2	1.9			91.7
Seaview			19.0	36.4			7.3				15.0	77.6
Seven Mile Bay	1.0	75.4	7.2	15.1		10.2	7.5	5.2	1.0	28.0	15.2	165.8

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other Salt Marsh	Brackish Marsh	Sand Dune	Total
Sheep River	15.8	14.4	12.4	14.8			5.5	26.3	0.6		0.5	90.1
Shipwreck Point			0.5									0.5
Shipyard Creek		12.1	17.5	0.4		1.0	3.9		0.6	10.2	3.0	48.6
Shipyard River			15.2	2.6			0.5		1.2			19.5
Skinners Pond			8.3	0.2		0.2	5.0		2.9		16.7	33.4
Souris River	52.2	19.9	21.7	12.1		2.5	39.2	1.8	8.0	2.7	10.9	171.1
South Lake	32.7	8.4	10.6	5.3		21.0	4.3	25.4	42.7	1.9	229.4	381.6
South River	136.0		7.1	28.5		2.7	6.3	38.7	0.0	16.5	2.4	238.2
Southwest River			7.1	12.8		1.2		3.2	28.8			53.2
St. Chrysostome	14.7	9.0	7.6	3.7		15.6	10.9	3.2		23.5	1.5	89.8
St. Lawrence			1.1				12.4					13.5
St. Margarets Shore											0.0	0.0
St. Peters Harbour				2.7			7.7		2.5	9.4	45.1	67.4
St. Peters Island		2.8	1.1				4.3		0.0		0.8	9.0
St. Peters River	26.2	43.2	7.6	1.1		5.5	130.3	54.4	1.6	0.6	10.2	280.9
St. Philip			1.0	0.3			9.1			0.4	2.8	13.6
Stewarts Creek	27.8	13.1	4.9	1.7		0.9	4.0	14.3	0.0	13.9	1.5	82.1
Sturgeon River	35.7	0.8	4.3	37.1		2.1	7.3	15.4				102.8
Sunbury Cove	191.5	26.7	42.7	6.2		3.1	76.5	290.1	2.1	10.6	5.6	654.9
Surveyor Point			2.2	16.8			22.2				21.1	62.3
Sutherland Creek			3.4					1.2	0.0			4.6
Thomas Island									0.0		1.0	1.1
Thompson Creek	14.6	2.6	1.7	6.6		0.4	0.2	24.8	0.1	2.0	3.3	56.1
Tignish River	4.3	1.4	2.4	15.6		6.7	106.3	7.5	42.3	0.0	14.4	200.9
Trout River (Millvale)			6.1	6.9		0.0	5.0			6.1		24.1
Trout River (Roxbury)	186.0	134.1	33.6	20.7	8.1	1.8	103.4	135.2	33.1	12.8	0.2	669.0
Trout River (Tyne Valley)	39.0	50.6	46.5	16.1		1.2	59.0	65.8	0.2	2.6	0.7	281.6
Tryon River	17.5	27.1	26.2	4.1		0.5	33.8	21.3	39.6		1.7	171.8
Tuplin Creek		0.4	19.8			0.6	4.1		2.0	1.8		28.7
Vernon River	233.3	4.2	51.1	50.7		2.1	125.2	28.9	0.5	10.1		506.2
Victoria	13.6	4.2	3.4	0.6			1.2	0.6	0.0		0.3	23.8
Waites Creek		0.1	39.8				0.5		0.0		0.8	41.3

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Other	Salt Marsh	Brackish Marsh	Sand Dune	Total
Waterford							4.0						4.0
West Cape		11.9	5.3	0.1		4.7	35.3	8.5				29.5	95.4
West River	2.6	6.8	11.6	16.2		0.6	58.3	1.9		0.5	15.1		113.6
Westmorland River	0.2	9.9	9.5	7.9		0.7	3.1	3.5		27.0			61.8
Wheatley River	0.1	0.6	13.2	14.4		1.4	10.4	5.4		10.0	3.5		59.0
Whites Cove		0.1	2.0	0.2		0.2	5.2	0.5					8.3
Wight Point							1.3	7.4					8.7
Wilmot River	17.0	0.7	39.6	10.7		15.8	92.8	11.9		16.5	1.7		206.8
Winter River	56.0	11.4	8.3	57.3		5.9	36.6	16.3		0.2	2.4	1.6	196.0
Wrights Creek			4.9	5.1				1.7		26.8			38.5
Grand Total	7,834.0	3,318.9	1,849.4	3,483.0	11.1	709.0	5,144.5	3,298.3	1.6	1,789.2	820.9	3,446.5	31,706.4

Table I2: The amount and composition of all wetlands within each provincially delineated watershed according to the 2010 corporate landuse inventory. All values are in hectares (ha).

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Abrams Village	10.7	2.4					'				0.0	13.1
Albion			1.0				1.8		0.3	1.0	1.2	5.3
Alexandra	34.2	7.9	19.2	3.0		2.7	9.0	1.6	11.8	1.9	5.4	96.8
Anglo Tignish											1.4	1.4
Appletree Creek		0.0	0.8	0.7		0.7			8.1			10.4
Argyle Shore	3.3	8.0	28.0	3.3		5.6	3.2	5.1	2.8		1.3	60.7
Augustine Cove	0.4		1.0	4.8			1.6	3.2	4.1		0.4	15.5
Bains Creek				0.7			61.5	0.8		3.3	0.5	66.7
Baltic River			13.4	12.2			5.2	0.0	4.6		26.6	62.0
Barbara Weit River			20.5	14.6		11.6	27.3	3.1	0.2	6.2	0.2	83.6
Bayview			6.5	0.2			2.9		1.0	2.0	0.1	12.7
Bear River	9.4	20.6		12.5			28.3	6.3			1.5	78.5
Beatons Creek	173.0	91.6	0.2	0.0			17.8	90.3	31.8		14.0	418.6
Belle River	46.6	8.4	6.2	26.4		0.2	0.5	4.7	1.2	0.6	1.7	96.5
Bells Creek	16.5	0.6	11.6	29.0		1.5	23.2	38.8	13.7	1.5		136.6
Bentick Cove	0.9	6.7	32.4	9.6		1.8	77.5	55.0	3.6	2.3	1.4	191.3

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Bideford River	206.2	93.8	5.9	23.9		4.2	28.5	73.5	2.0	2.7	0.0	440.6
Big Pierre Jacques River	42.7	12.4	10.7	12.8		0.4	31.3	3.7	2.0		13.8	129.7
Bird Island				0.5			4.4		12.0		1.4	18.3
Black Banks	259.3	29.9	4.9				26.6	69.0	17.2	6.9	9.1	423.0
Black Brook	4.7	2.0	1.2				4.9	1.6	41.5			56.0
Black Marsh	19.3	3.2	10.9	9.2				1.0	1.3	36.6	9.0	90.6
Black Pond			4.3	41.4		3.4	3.0	7.6			43.9	103.5
Black Pond Brook	3.3	8.6	4.5			0.7	42.5	1.5		13.6	2.2	77.0
Black River	7.2	1.6	9.4	3.4		0.1	10.6	20.9	6.9	0.2		60.3
Black River (Donaldston)	15.5	31.4	1.4	2.4		3.0	18.7	2.6	0.1		1.1	76.0
Blacketts Creek	83.8	10.6	16.4	6.6			3.5		0.6	3.2	1.9	126.6
Boughton Island				4.2						2.9	19.6	26.7
Boughton River	29.3	217.4	35.0	110.6		6.7	87.7	25.3	2.0	1.0	0.3	515.2
Bradshaw River		0.7	23.2	32.5		14.0	23.7	25.4	1.0	46.7		167.3
Brae River	75.3	22.4	15.7	4.5			20.0	3.5	12.7	0.5	2.6	157.1
Bristol Creek	128.8	28.3	15.8	28.6		14.4	33.9	19.6		14.1	71.5	355.0
Brockton			3.2									3.2
Brooks River	52.8	21.7	18.1	29.3		3.8	68.3	10.0	0.6	8.0		212.6
Browns Creek		2.0	6.4			0.3	1.9		1.1	3.7	1.1	16.4
Brudenell River	54.0	23.9	26.5	29.2		1.9	25.6	21.8	1.6	3.7	2.3	190.4
Byrnes Creek	6.0		0.7	4.3			6.4	5.2	0.0		0.2	23.0
Cablehead	73.3	31.5	7.5	0.2		2.5	39.1	10.1			27.7	191.8
Campbells Cove	2.3		16.5	0.1			17.7	29.5			1.1	67.2
Campbells Pond			4.2	19.2		1.2	24.8				7.9	57.3
Campbellton	1.8		2.5	1.9			17.7	3.7				27.5
Cape Gage	0.6	1.1	1.3	1.2							1.5	5.7
Cape Kildaire	3.8	8.2	1.1	0.6			1.1					14.8
Cape Traverse River			16.9	8.7		0.4	10.0	19.9	0.3	16.2	3.3	75.7
Cardigan River	11.4	46.0	2.2	27.2		8.3	29.0	55.2	4.5	2.5	6.3	192.9
Carrs Pond		1.6	2.0	3.0				2.2	0.2	4.9	3.2	17.0
Cascumpec Sand Hills									1.6	0.3	164.7	166.6
Cavendish			2.1									2.1

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Chapel Creek		1.1	3.9	1.1		1.7	7.4	2.8	0.1			18.1
Charlottetown		0.1		1.1			2.3					3.5
Cheese Factory Creek	1.1	1.5	2.2	9.7		2.0	13.2	15.8	59.4			104.8
Chepstow			2.8					3.0				5.8
Cherry Island									0.0		2.4	2.4
Churchill		0.5	1.3	1.0					30.6			33.4
Clarks Brook	46.7	23.5	1.9	125.8			144.9	110.7	30.7			484.3
Clyde River		6.4	21.7	0.4		4.7	5.2	2.7	26.5	6.2		73.9
Conway Sand Hills									11.0		207.0	218.0
Courtin Island						0.3					0.9	1.2
Cousins Pond			4.9	29.5			2.9	2.1			1.9	41.3
Cow Creek	27.2	34.5	2.7	29.3			48.5	68.4				210.6
Cranberry Point		1.7		0.1		29.0	5.0	16.6	3.2			55.5
Crooked River	10.3		3.5	1.0			17.1	6.2				38.1
Cross River	21.4	16.9	15.9	23.5			59.5	25.3			1.3	163.8
Crossmans Brook			0.2				3.3	0.5			0.4	4.4
Cymbria		0.2							1.0	1.0		2.2
Daltons Brook	2.6		0.2				13.0					15.8
Dalvay Lake	23.0	6.8	8.9	128.1		4.0	9.9	35.3	26.8		121.1	363.9
Deroche Pond	95.5	80.7	1.8	190.6		3.8	48.4	30.5	1.4	23.9	221.3	697.9
Desable River			13.9	0.7		0.8	5.0	3.9	18.8	3.7	0.8	47.6
Dock River	13.0	1.1	0.2	12.1		0.3	4.0	1.0	9.6	1.3	8.6	51.2
Dunk River	10.7	44.0	77.9	20.4		15.1	78.2	88.9	8.3	5.3		348.8
Durant Creek			5.6						1.5	3.1		10.2
Earnscliffe		1.2	35.9	2.7			18.2	2.0	7.7		4.7	72.5
East Lake Creek	9.9		13.9	52.0		0.2	1.5	10.1			42.5	130.0
Enmore River	107.7	210.3	9.2	26.9		2.4	113.2	99.2	13.7	1.0	0.6	584.3
Fairview		0.6	6.7	4.8				2.7	6.1	3.2	0.2	24.3
Feehans Shore		63.1	0.7	7.2		2.9	3.2	1.3		0.2	165.3	243.9
Flat River	3.6	3.1	3.3	13.4		0.5	1.3	5.2	8.7			39.1
Foleys Pond		0.4	8.5	0.6		0.3	7.7	11.4		17.7	0.8	47.3
Fortune River	302.9	166.2	7.5	13.6		9.9	418.8	34.5	6.1	48.6	7.5	1,015.7

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Founds River			3.4			1.0	13.0	5.2	0.2	2.6	1.5	27.0
Fox River	23.0			5.8		4.3	0.2	44.5	0.1		1.5	79.3
Foxley River	392.8	189.0		11.8		0.3	71.5	145.9	12.1	22.8	0.5	846.6
Freeland Creek	0.2	30.3	6.1	7.5		0.6	14.5	4.8	0.9	1.4		66.2
French River			6.2	1.1					0.4			7.6
Fullertons Creek	24.2	31.2	14.9	6.4		3.8	22.1	17.0	89.7	1.4		210.8
Gascoigne Cove		11.5	3.3	5.9			6.4		2.2		10.4	39.7
Gaspereaux Shore	199.5	22.2	2.7	52.3		6.8	4.3	99.6	3.0	1.8	35.9	428.1
George Island							3.2	1.0	0.4	1.5	0.5	6.6
Georgetown	2.2		0.3	2.2			7.5	2.8	2.0	0.6	1.9	19.5
Glenfinnan Island									3.8			3.8
Glenfinnan River	95.1	100.8	3.7	61.0		0.2	40.5	55.9	96.5	24.2		477.8
Goose River	47.4	3.9	2.0	1.9		8.4	39.8	26.0				129.3
Gordons Creek		1.3	4.5	0.1			1.9	1.2	0.5		1.0	10.5
Gordons Island			0.0			0.3		2.0	0.0		1.3	3.6
Governors Island											0.2	0.2
Grahams Creek			1.3				0.2		0.2	7.7	75.5	84.9
Grand Digue Shore	19.5	32.8		5.4			8.2	8.9			0.4	75.3
Grand River	14.6	16.7	32.8	22.6		0.6	116.6	203.7	91.5	20.0		519.1
Granville Creek			6.1	9.4		0.4	12.3		0.0	0.9		29.1
Graystone Creek	5.4			3.2			30.4	7.2	0.2			46.5
Greek River	82.6	13.6		14.6		0.8	7.3	18.3	0.8	28.6	0.4	166.9
Greenwich		33.3	3.9	68.5		0.2	3.1				153.7	262.7
Haldimand River	6.1	52.3	19.1	19.4		0.4	52.2	94.2	42.3		4.0	290.0
Harding Creek			3.3	2.7		0.3			3.8	2.4		12.5
Hay River	26.4	15.8	8.6	14.0			26.6	16.9				108.3
Hebron	27.1	14.0	20.1	0.7				8.3	0.9	3.6	25.2	100.0
Herring Island									0.0		1.6	1.6
Hills River	1.8		8.3	0.9			1.7	5.3	6.8	1.4	0.3	26.5
Hillsborough River	66.5	8.9	0.3	39.0		132.9	37.4	110.7		1.4		397.2
Hog Island									18.6	5.0	413.8	437.4
Hollow River	2.1	3.0	14.6				1.4	4.4				25.5

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Hope River	0.1		0.8	0.3			8.6	0.6	1.1	0.3		11.7
Hornes Creek 1	0.7		6.7	2.2			3.4	3.8	0.5	0.5		17.9
Hornes Creek 2	3.2	0.0	4.5	16.1				6.9	5.0			35.7
Howards Cove			1.6				10.3	7.6				19.5
Howe Bay	52.4		17.0	1.9		2.4	19.2	3.5	2.0	4.0	30.3	132.6
Hunter River		4.5	9.5	39.9		3.4	13.7	1.0	14.6	2.3	16.6	105.4
Huntley River	1.2	2.8	12.6	7.2			21.5		1.2	1.6	0.4	48.5
Hyde Creek	3.7	0.7	3.7	6.2		1.0	8.2	4.1	12.9	0.5		41.0
Indian River			19.0	36.0			17.0	1.1	0.3		0.1	73.5
Indian Sand Hills	17.3	6.0				16.5	5.6	20.6	0.3		0.7	67.0
Jacques River	3.1	27.6	12.9	24.3		0.4	41.1	35.8	0.2		0.1	145.5
Johnstons River	49.4	201.6	14.8	30.7		0.1	29.1	100.7	77.1	0.3		503.7
Josephine Shore	113.4	8.8	4.8	9.0			3.4		5.0		0.7	145.1
Kellys Point									0.0			0.0
Kildaire River		1.1	8.0	10.8			21.2	12.7	3.3	5.2	81.8	144.0
Lake Of Shining Waters	1.7		3.0	47.7				0.7			19.3	72.4
Launching	13.2	2.8	6.2	11.9		9.5	20.8	20.6	1.1	0.8	12.6	99.4
Lennox Island	71.2		10.1				0.2	1.3	8.6	2.3		93.8
Little Courtin Island									8.6			8.6
Little Harbour	6.4		2.1			0.4		1.7	1.1	2.2	6.1	20.0
Little Miminegash River	7.9	9.9	8.7	18.2			32.1	0.3		42.7	2.1	121.9
Little Pierre Jacques River	56.7	20.5	8.5	7.7		1.8	11.4	5.0	0.9			112.5
Little Sands Shore	159.4	0.6	22.6	14.8		3.2	27.3	203.9	3.4	13.7	13.6	462.6
Little Tignish River		3.6	3.7	23.1		0.3	48.3	1.2	44.8		9.6	134.6
Little Trout River		41.5	3.0	1.0		10.9	18.4	38.6	8.8			122.1
Llewellyns Creek	6.3	2.7	1.8	1.9			5.0	25.9	0.4	3.5	0.6	48.1
Long Creek		0.2	6.1	0.1				1.7	28.4	4.3		40.9
Long River			0.4	2.6			0.0		1.0			4.0
Lower Montague		3.7					1.6		0.1		0.7	6.1
Lower New Annan			8.5	0.2				0.6	0.4	7.0		16.7
Lukes Creek			0.5				6.6		0.7		17.5	25.3
Macfaydens Creek				0.9					11.2			12.1

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Macintyres Creek	2.1		4.7				•	1.6	0.4	2.3		11.0
Macivors Point			0.6	0.2				3.0				3.8
Mackies Pond	0.0			13.7					0.1	4.0		17.7
Mackinnon Point		13.7		0.1		2.2		0.0			30.4	46.4
Maclaughlins Creek			0.5						6.1			6.6
Maclaurins Creek	3.8	3.1	0.5	6.5		1.7	0.9	3.7	0.7			20.9
Macleods Creek				0.1					1.0	1.1		2.2
Macwilliams Brook	2.3	1.3	1.7	0.1	3.3	0.3	9.3	3.7			0.1	22.0
Marie River	8.9	98.2	4.5	4.1		1.7	104.4	9.0	0.2	7.7	0.8	239.6
Mccallum Creek	3.8	7.2	7.3	9.2			4.0	21.7	122.9	2.9	168.3	347.2
Mcphee Creek				0.2		0.7			7.1			8.0
Midgell River	120.3	78.5	11.0	96.7		7.6	272.6	62.1	0.9	6.8		656.5
Mill Creek		1.2	4.3	1.2			8.4	7.7	0.2		0.2	23.1
Mill River	120.1	25.6	25.8	34.3		1.7	122.6	164.2	2.5	1.1	0.2	498.0
Millers Creek	9.5	47.2	12.4	0.6		2.3	3.7	10.3	99.1			185.0
Mills Point		3.0							0.1	9.2	0.1	12.4
Miminegash River	50.7	38.9	4.0	29.7		11.1	113.1	4.2	17.5		5.0	274.3
Mitchell River	9.7	50.9	0.2			0.7	6.5	1.9	0.8	2.8	0.1	73.6
Montague-Valleyfield	32.5	39.4	30.4	69.0		5.1	140.0	169.7	0.5	1.6	1.6	489.7
Morell River	142.7	90.6	270.4	60.7		14.3	349.3	376.5	1.4	6.6	0.6	1,313.2
Morrison Pond	4.6	6.6		4.5			7.1	14.7	0.2	0.5	5.0	43.2
Murray River	198.0	0.8	1.9	86.1		2.0	25.8	19.7	0.2	4.4	7.4	346.3
Nail Head			18.2	0.7			26.0				5.1	50.0
Nail Pond	9.4	0.8	0.1	168.9			27.0	20.6			19.2	246.2
Narrows Creek	18.5	28.8	10.8	1.6		1.1	42.3	19.8	1.1	0.3	0.4	124.8
Naufrage River	69.0	64.9	17.7	5.4		0.2	155.3	52.0	2.1	6.1	13.6	386.3
Nebraska Creek	35.4	13.9	17.6	5.3		2.1	12.2	253.9	23.0	6.1	1.3	370.8
Newtown River		5.7	12.2	1.0			1.7		0.9			21.5
Nicolle Point	9.3			0.2			1.1	4.8	0.0		1.5	16.9
Norris Pond			6.3	3.9				6.0				16.2
North Lake Creek	166.8	0.3	5.0	8.4			47.8	70.6	5.3		0.2	304.4
North River	4.7	9.8	34.8	14.4		7.1	22.1	19.1	16.4	34.2	0.3	162.9

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat S	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
North Shore											0.1	0.1
Orwell Cove			0.9						2.6		0.4	4.0
Orwell River	11.8	5.1	11.9	2.8			9.4	22.2	2.0			65.3
Oultons Island			4.0	0.4					0.0	0.6		5.0
Oyster Bed Bridge									0.0			0.0
Oyster Cove		10.1	21.7			10.9	4.5		3.0	5.0	1.3	56.5
Paynters Creek			0.6	0.1					0.9	6.2	0.2	8.1
Percival River	89.8	167.8	32.3	27.3		8.8	47.6	226.8	7.9	7.7	1.3	617.2
Pinette River		4.1	10.3	11.4		5.8	2.0		22.9	0.6		57.1
Pipers Creek	65.6	18.3	3.0	4.9			2.5	33.1	1.1	1.5		129.9
Pisquid River	114.4	7.1	7.3	62.5		13.6	49.7	59.1	103.5	0.6		417.7
Platte River		2.1	26.7	3.3		4.0	62.6		0.1	6.9	4.0	109.7
Point Prim		4.9	15.8	8.0		4.9	2.3		7.7	10.6	5.0	59.2
Pollard Brook			1.1					1.1				2.2
Poplar Point	15.3	3.4	2.3	2.9		9.8	5.1	20.8	0.4	5.1	0.0	65.1
Poverty Beach									1.0		5.6	6.6
Pownal	10.0	1.1	12.5	30.2		0.4	10.8	16.6	1.3			82.9
Prevost Cove	2.4		0.0	0.5		6.4			0.0		0.0	9.4
Priest Pond Creek	0.5	2.5	5.3	15.7			19.0	17.2			10.1	70.4
Princetown Point			1.9				1.1	5.0	0.7		0.5	9.2
Ram Island											16.9	16.9
Rayners Creek		0.2	2.1	0.7		0.7	6.3		0.0	0.8	0.5	11.4
Rayners Pond				0.0			22.2	1.2	0.0		8.6	32.1
Reynolds Island									0.0		0.7	0.7
Richard Point	13.1		8.0	8.9			5.2	24.9	0.2	6.0		66.3
Riverside		0.2	0.4						11.2			11.8
Rochford Pond		2.3	0.8	30.4			30.4	0.5	1.7	7.9	1.3	75.3
Rock Barra	11.2		0.5	1.0			12.5	9.9			0.1	35.4
Rollings Pond	1.3		5.5	5.6			6.7	2.7				21.7
Rollo Bay	20.6	2.4	3.8	7.2				6.0	0.7		5.0	45.6
Rosebank			2.3	6.7		0.4			0.2		0.1	9.7
Round Pond		17.5		27.3			10.8	17.0			4.4	77.0

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Savage Harbour	30.8	12.5	2.5	33.4		22.3	7.1	4.0	27.6	3.3	101.3	244.7
Schooner Creek	127.9	64.8	1.4	39.1			33.8	9.3			57.6	333.9
Scotchfort	4.0		1.3	0.6		19.8	2.5	1.5	102.3	0.0		132.0
Scotts Creek	0.8		1.4	3.0		0.1			16.7			21.9
Seacow Pond	187.5	0.4	1.3	2.1		0.0	14.6	12.7				218.6
Seal River (Cardigan)	11.2	42.7	4.7	5.7			69.4	4.0	6.5	1.0	1.3	146.4
Seal River (Vernon)	6.4	11.1	13.4	4.2		3.9	66.7	9.3	1.3			116.4
Seaview			28.6	33.3			6.7				14.4	83.0
Seven Mile Bay	0.7	71.7	15.3	19.1		3.4	15.8	4.8	30.0	19.2	12.7	192.7
Sheep River	7.2	26.0	10.3	14.1		2.8	14.8	48.1	2.3		0.3	125.9
Shipwreck Point			0.5									0.5
Shipyard Creek		12.5	15.0	0.2		1.0	7.3	5.1	2.0	10.4	2.8	56.4
Shipyard River			16.0				0.5	10.3	1.9			28.7
Skinners Pond		0.0	5.1			1.3	12.5	1.7	16.6		15.4	52.7
Souris River	51.2	21.3	20.9	13.4		0.7	37.2	5.9	10.5	2.2	11.2	174.4
South Lake	26.5	3.8	7.1	1.7		24.8	2.7	33.9	27.9	46.1	194.4	368.9
South River	115.4		8.5	28.8		1.3	6.2	57.8	0.2	16.5	2.3	237.2
Southwest River			20.7	4.7			11.2	4.6	30.8			71.9
St. Chrysostome	2.7	10.8	4.7	11.1		15.4	15.4	17.6		22.3	2.8	102.7
St. Lawrence							3.8	13.6				17.4
St. Margarets Shore											0.0	0.0
St. Peters Harbour				6.0			2.2		0.0	15.0	39.3	62.5
St. Peters Island			7.7					3.7	0.4		0.8	12.6
St. Peters River	22.8	24.0	2.4	8.2		16.3	160.0	25.2		1.1	11.0	271.1
St. Philip	0.6		0.7	0.4			8.8			0.3	2.7	13.5
Stewarts Creek	38.0	31.9	3.3	1.9		3.5	4.2	2.6	0.1	7.3	1.4	94.1
Sturgeon River	33.2	3.5	8.1	46.2		2.1	29.2	15.4				137.7
Sunbury Cove	193.2	28.4	16.4	14.6		1.8	166.4	370.8	27.7	10.0	2.8	832.2
Surveyor Point			2.2	17.7			5.4	16.3	0.6		21.0	63.3
Sutherland Creek			3.5					1.2	0.2			4.9
Thomas Island									0.2		1.0	1.3
Thompson Creek	6.8	2.3	3.6	6.4			4.1	32.6	1.9	1.5	2.9	62.0

Watershed	Bog	Deep Marsh	Meadow	Open Water	Seasonally Flooded Flat	Shallow Marsh	Shrub Swamp	Wooded Swamp	Salt Marsh	Brackish Marsh	Sand Dune	Total
Tignish River	3.8	7.1	2.9	3.0		0.5	141.6	32.9	41.3	5.9	15.5	254.7
Trout River (Millvale)			4.2	7.0		0.4		4.7	0.0	8.0		24.2
Trout River (Roxbury)	141.3	158.8	44.2	30.5	8.9	2.4	117.6	188.3	38.4	10.0	0.1	740.6
Trout River (Tyne Valley)	16.0	39.6	16.3	49.9		1.2	83.9	123.2	3.1	3.6	1.5	338.3
Tryon River	1.9	27.5	31.7	16.8		0.2	9.0	53.1	44.1		0.7	184.9
Tuplin Creek			12.0	1.4			13.5		2.3	1.8		31.0
Vernon River	209.5	29.1	35.8	34.9		2.8	141.8	96.4	21.0	17.0		588.4
Victoria	11.0	4.2	3.2	0.6			1.6	2.5	0.0		0.1	23.2
Waites Creek		0.1	40.1						0.0		1.9	42.2
Waterford							7.9					7.9
West Cape		15.3	3.0			1.0	55.7	21.0		0.5	53.4	149.9
West River		5.7	14.8	15.9			53.6	11.5	0.7	14.9		117.1
Westmorland River		4.9	6.3	6.6		0.3	13.4	5.7	25.8	0.5		63.5
Wheatley River	0.1	2.6	25.7	16.7		0.4	12.7	8.8	7.5	5.7		80.2
Whites Cove		0.1	2.0	0.2			2.5	3.1				7.9
Wight Point							1.1	9.5				10.6
Wilmot River		0.7	38.8	12.3		17.5	65.2	67.1	3.6	17.5		222.8
Winter River	33.8	24.9	18.6	58.8		3.1	35.8	76.6	2.5	1.7	0.3	256.2
Wrights Creek			3.6	6.2			2.2	1.7	26.0			39.8
Grand Total	6,318.3	3,896.0	2,246.0	3,350.5	12.2	656.6	6,050.6	5,788.1	2,088.2	920.3	3,081.4	34,408.3

Appendix J: Summary of landuse within 60 metres of rivers and streams

During a partners meeting on June 4, 2014, several partner organizations requested further investigation into landuse within the riparian zone surrounding rivers and streams in the Bioregion. The primary concern was that a landscape scale assessment may be misleading due to the spatial aggregation of intact watersheds within the bioregion. To supplement this analysis, the total amount and composition of landuse within 60 m of all rivers and streams in the bioregion was determined at the watershed scale. The results are summarized in the table below.

Table J1: The amount and composition of landuse the 60 m of rivers and streams summarized by provincially delineated watersheds according to the 2010 corporate landuse inventory. All values are in hectares (ha).

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Albion	3.3	0.0	0.4	29.7		0.3	1.0	3.0		1.6	1.8		4.9	46.1
Alexandra	24.6			32.5			1.7	21.1	5.3	5.0	2.6	2.6	11.6	107.0
Appletree Creek	12.5			13.0			0.5			0.7	0.6		5.1	32.3
Argyle Shore	67.3			92.5	0.1	0.3	6.3	17.7	4.0	20.9	6.2		24.0	239.1
Augustine Cove	24.2			25.7				0.8		2.0	4.3		8.9	66.0
Bains Creek	21.6			131.2			0.4	2.7		3.5	2.1		42.1	203.7
Baltic River	56.5			36.5			1.2	15.4		6.6	5.2		26.5	147.9
Barbara Weit River	47.7			81.7	2.2		0.9	14.3	0.7	7.6	7.1	6.6	39.1	207.8
Bayview	23.5			55.9			1.1	2.8	6.6		0.8		8.4	99.2
Bear River	1.5			147.6		0.2	0.3	0.7		1.2	2.0		62.9	216.5
Beatons Creek	13.6	0.2		128.2			3.2	2.3	0.0	1.4	1.6		93.3	243.8
Belle River	1.7			95.9	1.5			1.6		2.0	5.1		33.1	140.9
Bells Creek	42.8			202.1	4.1		2.6	16.8	1.0	10.6	5.6		68.8	354.4
Bentick Cove	54.1			75.4	2.1		1.2	42.0		1.8	8.6	0.1	74.5	259.8
Bideford River	43.7		1.7	197.5	1.2	0.9	2.4	10.6	2.3	7.1	12.2	3.5	86.7	369.8
Big Pierre Jacques River	65.1			221.3		0.4	1.0	9.0		1.8	5.0		46.6	350.1
Black Banks	0.2			70.0	0.2		1.8	0.3		0.0	1.5		53.2	127.2
Black Brook	3.5			40.3	0.1		0.7	0.3		0.2	2.0		18.0	65.2
Black Marsh	3.6			11.2			0.4	0.5					23.5	39.2
Black Pond	16.1			123.6	0.3			7.9		1.4	3.7		41.3	194.2

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Black Pond Brook	9.3			224.7	1.4	0.4	0.1	15.6		4.7	4.2		55.0	315.4
Black River	42.1			95.7			2.4	8.4	0.2	3.6	2.4		27.1	182.0
Black River (Donaldston)	22.4			43.6				2.9		0.8	0.5		11.3	81.5
Blacketts Creek	0.6			103.2		0.1	1.4	2.3		3.1	1.3		35.2	147.2
Boughton River	39.7			324.0	1.4		3.2	24.5	1.3	2.5	11.6	0.5	241.7	650.3
Bradshaw River	130.9		1.2	175.7	1.5		1.3	26.4		6.0	19.3		87.9	450.3
Brae River	52.9			77.5	0.0	0.7	2.6	13.3		3.2	6.7		53.2	210.1
Bristol Creek	15.1			269.8	0.0		0.5	2.5	4.2	7.8	6.9		82.3	389.0
Brockton				2.4			0.6	0.2		0.5	0.2			3.9
Brooks River	41.5	0.4		169.9	0.4		2.4	9.2		1.7	4.9		69.2	299.6
Browns Creek	4.6			12.5			0.4	2.0		0.5	0.6		4.3	24.9
Brudenell River	28.2		0.0	333.7	1.2		7.7	25.5	30.7	11.0	15.4	1.2	78.5	533.1
Byrnes Creek	4.6			87.4			0.1	0.3		0.6	0.7		10.0	103.7
Cablehead	7.3			80.5			4.2	17.1		2.1	3.6		60.0	174.8
Campbells Cove	11.2			114.2		0.1	3.8	4.9		3.8	1.7		23.6	163.3
Campbells Pond	18.9			48.2			1.2	6.7		0.7	0.9		32.1	108.6
Campbellton	42.7			108.7			2.0	18.3		3.1	3.9		18.6	197.3
Cape Gage	3.8			37.2			1.9	3.5		1.1	0.8		1.3	49.6
Cape Kildaire	3.3			62.5	0.8		3.4	1.0		1.7	1.8		9.9	84.3
Cape Traverse River	57.9			59.8	0.5		0.2	16.3		1.8	4.1		36.3	176.9
Cardigan River	25.8		2.2	329.7	1.5	0.4	3.0	16.0		20.1	22.1	0.4	69.0	490.3
Carrs Pond	17.5			18.3			0.6	2.4		0.3	0.5		5.1	44.7
Cavendish	4.2			1.9			1.4	2.0		0.4	0.8		0.9	11.5
Chapel Creek	22.3		0.0	16.1			0.0	12.3		3.8	2.5		13.5	70.6
Cheese Factory Creek	20.8			62.5			1.5	4.5		3.4	1.3		40.3	134.2
Chepstow	0.3			7.1			1.6	1.4		1.2	0.3		0.9	12.8
Churchill	22.1			95.5	1.2			9.9	3.9	0.3	1.3		11.3	145.5
Clarks Brook	19.6			248.2	0.8		0.1	7.0		3.1	14.7		168.3	461.6

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Clyde River	138.2			143.4	1.9	0.1	1.3	25.9	7.8	7.3	9.2		32.3	367.4
Cousins Pond	41.1			84.4			0.1	8.5		0.9	3.8		31.8	170.5
Cow Creek	3.5			198.4			0.4	1.2		0.1	2.0		98.8	304.4
Cranberry Point				16.6				1.1					1.5	19.1
Crooked River	2.8			63.1			1.6	3.3		2.2	2.2		10.3	85.5
Cross River	6.6			446.6			0.5	3.2		1.5	6.9		97.7	562.9
Crossmans Brook	7.4			36.3			0.6	5.4		0.8	0.8		3.7	55.0
Cymbria			0.0				0.3	0.5		0.1			0.5	1.5
Daltons Brook	30.6			74.3			0.4	8.7		0.0	1.2		11.4	126.6
Dalvay Lake	0.6			28.6			1.6	2.4		1.9	1.7		56.1	92.8
Deroche Pond	20.8			128.4	0.0		1.0	1.3		0.0	3.5		164.9	319.9
Desable River	94.0		0.3	435.0		0.6	0.8	33.4	0.4	6.1	11.2		36.6	618.5
Dock River	15.0	0.1	0.1	61.1	0.9	0.1	1.9	5.7		4.9	4.8	8.9	16.1	119.4
Dunk River	618.8		1.3	933.5	6.8	0.0	1.1	82.5		34.7	49.0	2.8	239.9	1,970.4
Durant Creek	24.5			10.8			0.7	6.5		0.6	1.3		8.3	52.7
Earnscliffe	98.2			31.7	0.9		2.4	45.5		2.2	4.2		25.2	210.4
East Lake Creek	0.3			128.0			0.0	2.0			0.5		30.9	161.7
Enmore River	18.8	0.1		423.6	1.5		3.9	26.5		17.2	15.7		229.8	737.0
Fairview	42.5			55.9			1.3	9.4	1.6	6.4	2.9		14.7	134.7
Flat River	11.0			126.0	1.1			3.1		1.6	3.3		28.9	174.8
Foleys Pond	20.9			109.3			0.6	7.4		1.7	3.5		36.1	179.4
Fortune River	47.0	0.0		526.2	0.7		5.3	12.0		9.1	17.1		445.4	1,062.6
Founds River	53.5			43.3			1.0	12.9		4.3	3.8		24.8	143.6
Fox River	0.3		0.1	86.3	0.4		1.3	1.1		1.4	3.3		24.1	118.2
Foxley River	32.9	3.4		335.7		0.7	7.5	4.5		3.2	8.4		206.8	603.1
Freeland Creek	17.4	0.1		103.3	5.6	0.5	1.4	4.4		5.0	5.1		34.8	177.5
French River	8.1			3.7				0.7		3.2	1.4		4.3	21.4
Fullertons Creek	55.9			87.6	0.6		0.8	36.8		8.6	4.7		62.1	257.1

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Gascoigne Cove	6.9			5.4			0.6	0.5		0.1	0.4		12.7	26.5
Gaspereaux Shore	9.7			135.3	0.3		5.9	4.1		7.9	4.8		97.6	265.7
Georgetown	0.5			9.2			1.6	0.5		0.4	1.2	0.8	3.4	17.6
Glenfinnan River	28.5			173.7			0.4	10.1		3.1	3.3		123.8	343.0
Goose River	4.4			82.7			0.7	1.2		0.6	2.0		53.2	144.8
Gordons Creek	8.7			16.0			0.8	0.6	0.0	1.1	0.9		7.1	35.3
Grahams Creek	4.8		3.0	13.4			0.2	2.7	3.2		0.8		5.4	33.4
Grand Digue Shore				1.8			0.5				0.3		6.8	9.3
Grand River	64.9		1.3	406.4	2.3	0.2	0.7	20.3	0.4	12.7	15.0	6.7	138.2	669.1
Granville Creek	106.8			229.1		0.3	0.1	22.6		7.9	7.4		26.7	400.8
Graystone Creek	9.4			44.4				7.5		1.5	2.0		26.3	91.0
Greek River	4.8			239.1	1.5		1.2	0.2		3.8	5.4		40.1	296.2
Haldimand River	9.6			156.7			2.6	5.7		2.0	1.4		56.3	234.3
Harding Creek	17.7			12.3	6.0		0.9	13.4	3.0	4.6	2.9		8.7	69.6
Hay River	0.4			239.0			0.5	0.7		1.3	2.4		59.7	304.0
Hebron	43.3	0.1		81.1	0.6		11.0	22.3	1.0	0.6	4.5		24.2	188.7
Hills River	20.3			52.6	4.0		1.3	3.6		4.1	3.4		11.4	100.6
Hillsborough River	35.5		0.3	286.9	0.5			10.0		2.5	10.4		143.7	489.8
Hollow River	12.7			47.3			3.0	8.1		1.8	1.1		16.8	90.8
Hope River	58.7			159.2	0.5		1.1	7.6		6.1	6.1		8.7	248.1
Hornes Creek 1	17.8			23.3			0.7	9.3		3.2	1.0		5.8	61.2
Hornes Creek 2	25.4			27.0			0.3	8.2		2.4	1.7		16.1	81.0
Howards Cove	21.3			69.2	1.4		2.2	17.0		4.0	2.6		15.5	133.3
Howe Bay	31.0	0.1		117.8			3.2	15.8		3.7	5.5		35.5	212.5
Hunter River	334.7			613.9	0.7	0.8	3.3	88.3	1.5	20.6	25.3	9.5	65.6	1,164.1
Huntley River	89.6		0.0	160.9	4.4		1.3	20.9		7.5	8.7	2.9	35.3	331.5
Hyde Creek	22.9			10.7			0.8	6.5		1.8	2.1	17.5	13.0	75.2
Indian River	47.7			77.3	0.7		0.3	14.1		4.8	2.2	2.1	51.6	200.5

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Indian Sand Hills	6.3			19.0			0.5	6.1		0.4	0.3		7.8	40.4
Jacques River	53.9			271.8	3.9		0.1	22.2	1.0	7.9	8.4	0.1	72.3	441.6
Johnstons River	62.4			132.5	0.0		0.8	22.6		3.0	6.1		162.2	389.5
Josephine Shore			0.2	12.6			0.2	0.2		0.3	0.4		5.4	19.4
Kellys Point							0.3	0.3		1.7			0.2	2.6
Kildaire River	89.8			211.4	1.4		4.0	18.3		2.1	7.4		33.8	368.1
Lake Of Shining Waters	5.9		1.8	12.1	0.0			3.8	22.5	5.5	2.2		28.6	82.5
Launching	5.6			105.9			4.6	1.9		1.9	2.9		51.9	174.7
Lennox Island	0.5	0.0		19.0	0.7		4.0	2.2		1.5	1.7	5.1	16.6	51.4
Little Harbour	11.3			56.2			9.0	7.3		0.3	1.9		5.3	91.3
Little Miminegash River	71.7			317.3	0.1		1.7	17.7		3.7	6.9		89.2	508.3
Little Pierre Jacques River	36.3			195.9	0.2	0.3	1.3	13.1		1.6	5.6		26.4	280.8
Little Sands Shore	17.9			329.7		0.3	9.7	34.6		18.0	11.6	2.2	110.7	534.6
Little Tignish River	49.2			163.4	6.4			10.3		6.0	7.2		92.5	335.1
Little Trout River	17.4		0.2	192.8	2.0		0.6	6.9		5.5	7.2		52.3	284.9
Llewellyns Creek	3.3			97.3		0.0	0.0	0.8		2.0	0.9		12.8	117.1
Long Creek	27.7		0.0	19.4			2.5	9.8		2.9	1.9		22.1	86.3
Long River	6.2			3.6				1.3		0.3	0.5		3.1	14.9
Lower New Annan	3.2			11.5			0.5	0.9	0.2	1.6	0.6		8.8	27.3
Lukes Creek	6.5			2.8				1.2			0.7		5.7	16.9
Macfaydens Creek	11.4			22.6				0.1		0.0	0.2		7.4	41.8
Macintyres Creek	14.7			25.7			0.1	4.8		0.4	0.9		5.0	51.5
Mackies Pond	5.1			14.6	1.3		0.5	0.9			0.7		14.6	37.6
Maclaughlins Creek	22.0			16.4				3.4		1.4	1.6		6.1	51.0
Maclaurins Creek	17.4			115.1	2.3		0.0	12.9		3.4	3.2		10.7	164.9
Macleods Creek	8.1			1.6			1.2	3.3		2.0	0.5		1.1	17.8
Macwilliams Brook	11.9			71.2	1.2		0.6	3.6			0.5		14.2	103.2
Marie River	7.1			153.4			0.6	3.5		0.7	5.3		139.8	310.4

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Mccallum Creek	8.6		0.5	50.1			1.3	1.7		2.4	1.6		17.0	83.1
Mcphee Creek	5.2			18.6	0.1			2.1		0.3	0.7		4.9	31.8
Midgell River	21.1			523.9			1.9	3.3		0.9	9.2		330.1	890.4
Mill Creek	26.2			48.7	0.6		0.2	5.2		1.0	2.6		12.5	96.9
Mill River	194.4	0.0	2.1	753.4	5.8		4.7	52.5	22.9	17.4	36.7		207.3	1,297.2
Millers Creek	7.7			76.7	1.3		1.5	1.6		3.8	3.9		37.1	133.6
Miminegash River	68.5		0.5	596.1	1.8		2.1	25.1	0.0	14.5	13.0	7.1	149.6	878.3
Mitchell River	7.4			140.1			0.0	1.8		1.6	4.1		43.5	198.4
Montague-Valleyfield	132.1		2.1	1,454.2	4.7		29.3	62.7		22.3	38.1	9.5	294.9	2,049.8
Morell River	106.9		0.1	1,283.6	6.2		5.7	44.8	8.2	12.5	36.9		567.6	2,072.4
Morrison Pond	1.0			85.6			0.4	0.3		0.6	1.7		15.3	104.8
Murray River	23.0			413.6	9.1		13.9	9.6	0.2	11.9	16.7	6.6	104.2	608.8
Nail Head	1.2			21.1	3.7		2.7	11.2		1.0	0.5		17.6	59.1
Nail Pond	24.1			87.6	5.4		1.2	12.1		3.1	3.4		91.7	228.6
Narrows Creek	14.2		0.6	154.4	0.0	0.0	0.6	4.3		0.6	4.4		79.5	258.7
Naufrage River	4.0			438.4			8.4	5.6	0.3	2.4	13.4		219.6	692.0
Nebraska Creek	43.7			119.3	0.1		2.3	9.0		4.1	3.1		72.2	253.7
Newtown River	78.3			151.5				22.2		4.4	7.5		21.9	285.8
Nicolle Point	0.1			0.0			0.5			0.1	0.1		0.5	1.2
Norris Pond	9.5			45.2	1.3		0.5	6.7		0.3	0.8	1.0	8.8	74.3
North Lake Creek	10.8			422.0	0.6			8.9		2.3	11.9		77.6	534.2
North River	171.7		0.8	257.4	2.2	2.2	2.9	93.8	2.0	22.3	18.6	24.0	63.5	661.3
North Shore	0.3			0.8			0.6	2.3		0.2	0.7		0.3	5.2
Orwell Cove	7.6			2.0				5.2		0.0	0.8		1.0	16.7
Orwell River	44.9		0.0	162.8	0.4		0.1	25.2	0.1	2.3	10.4		32.7	278.7
Oyster Cove	9.4			19.4			1.5	6.5		0.3	0.7		17.3	55.0
Paynters Creek	25.5			22.3			1.6	14.4		0.9	1.7		6.8	73.2
Percival River	0.0			120.0				0.3		0.0	5.6		126.3	252.3

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Pinette River	40.6			439.3	0.6		1.8	6.6		3.7	4.4		37.9	535.0
Pipers Creek	18.5			116.9			0.6	4.7		1.3	4.6		42.7	189.3
Pisquid River	34.3			297.0	1.0		1.5	2.9		1.1	7.6		122.4	467.8
Platte River	22.0		2.3	18.5	0.1	0.3	0.4	20.3		1.1	5.8	0.4	48.4	119.6
Point Prim	34.6		0.7	35.0	1.2		4.0	29.9		2.4	2.2		36.9	147.0
Pollard Brook	2.1			15.9	0.5		0.6	1.1		0.9	0.3		1.1	22.5
Poplar Point	10.8	0.1		67.0			1.6	4.9		5.0	3.2		22.3	114.8
Pownal	30.6		0.3	74.7	1.1		0.4	18.4		4.5	2.6		34.0	166.5
Prevost Cove	0.9			8.2							0.3		0.1	9.5
Priest Pond Creek	5.9			248.1	0.2		0.9	4.1		1.6	2.9		39.8	303.5
Princetown Point	3.9			2.0			1.1	2.7		0.6			1.4	11.8
Rayners Creek	25.0			11.6			0.1	15.8		6.2	3.0		7.0	68.7
Rayners Pond				33.3			0.7		0.0	0.2	1.5		14.3	49.9
Richard Point	14.4		0.1	20.7			2.1			0.7	0.3		16.1	54.4
Rochford Pond	6.1			5.7			1.1	2.0		0.3	1.3		16.3	32.8
Rock Barra	13.2			22.2			2.4	11.5		4.2	1.9		10.1	65.5
Rollings Pond	16.3		0.0	40.8			1.3	5.0		0.6	1.9	0.0	11.8	77.6
Rollo Bay	14.6			107.6			1.7	20.4	1.6	3.2	2.7		19.9	171.8
Rosebank	0.7			4.8			0.7	0.4	7.4		1.5	20.2	5.9	41.6
Round Pond	3.2			90.1	0.7			0.0	1.1	1.1	1.9		37.8	135.9
Savage Harbour	9.7			104.5	0.1		2.3	2.7		1.7	5.9		39.2	166.0
Schooner Creek	5.0			142.5			0.1	12.7		0.1	1.7		124.9	287.1
Scotchfort	5.6			14.6		0.6	1.0	2.3	0.4	3.3	5.4		19.3	52.4
Scotts Creek	12.4			14.3	0.3		1.7	8.3		0.1	0.2		8.8	46.1
Seacow Pond	16.4			57.9	3.2		3.6	7.7		4.2	3.5		5.3	101.8
Seal River (Cardigan)	18.4			206.8			20.3	0.9		3.4	3.3		88.2	341.3
Seal River (Vernon)	47.6			100.5				31.2		2.8	3.8		56.8	242.8
Seaview	23.1			37.5			1.5	12.7	0.5	9.2	3.1		51.5	139.1

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Seven Mile Bay	42.4			145.4	2.4		7.3	22.6		13.6	5.9	3.0	57.3	299.9
Sheep River	44.5			241.3	0.4		0.7	16.9		4.8	5.7		64.1	378.3
Shipyard Creek	63.6			116.0	0.1		14.7	28.0		4.8	8.0		27.1	262.4
Shipyard River	20.1			12.7				6.7		0.4	1.3		13.3	54.4
Skinners Pond	28.2			79.3			2.0	54.4		6.5	3.6		27.5	201.4
Souris River	52.9			347.9	1.6		2.8	26.5		4.9	15.8		65.6	518.1
South Lake	39.9			113.5	0.7		4.9	23.1	0.0	8.3	2.9		29.8	223.2
South River	7.7			163.7	0.1		0.5	7.8		6.6	7.8	2.5	63.1	259.7
Southwest River	103.5			75.1	0.1		1.7	9.9	0.5	3.3	4.1		37.7	235.8
St. Chrysostome	25.3			128.5	0.6		1.2	11.3		2.4	3.0		47.0	219.4
St. Lawrence	0.9			0.0			1.2	0.8		0.1	0.2		0.6	3.9
St. Peters River	37.8			306.0	7.3		2.1	14.6	0.5	4.8	9.8	3.5	157.6	544.1
St. Philip	6.4			7.7			0.7	0.0		3.2	0.2		0.3	18.5
Stewarts Creek	14.8			101.9	1.2		1.8	5.3		0.3	1.8		32.6	159.7
Sturgeon River	35.9			593.2	0.5		0.4	8.6		10.2	9.7		76.2	734.7
Sunbury Cove	24.8		6.2	369.2	1.5		8.9	28.2	17.3	9.5	15.0	4.0	147.8	632.5
Surveyor Point	6.1			18.3	0.7		0.9	3.3		1.4	1.6		22.5	54.8
Sutherland Creek	7.5			19.4				1.8		0.0	0.3		3.5	32.5
Thompson Creek	4.5			118.7			0.6	0.4		0.5	2.2		15.7	142.6
Tignish River	74.2		0.3	273.2	0.2		1.7	25.0		22.8	18.7	0.8	130.3	547.2
Trout River (Millvale)	178.4			508.5			2.2	37.8	10.0	10.4	15.2		18.4	780.9
Trout River (Roxbury)	138.0	0.2	0.3	459.4	5.7	0.4	5.3	46.5	0.2	8.0	19.9	0.8	252.3	936.9
Trout River (Tyne Valley)	163.3	0.0	0.4	349.8	2.5		1.8	30.5	2.8	6.6	15.6	4.2	191.6	769.1
Tryon River	172.8		1.7	175.3		0.3	0.3	10.1		6.0	9.1	0.1	104.0	479.5
Tuplin Creek	30.9			11.9			0.7	12.7		9.7	4.0		26.3	96.2
Vernon River	96.7			485.1	0.3		7.4	28.9	2.9	7.3	15.0		191.4	835.0
Victoria	2.5			0.4	0.3			1.8			0.3		2.1	7.4
Waites Creek	4.2		0.0	0.2				2.1		1.1	0.6		9.6	17.9

Watershed	Agriculture	Aquaculture	Commercial	Forestry	Industrial	Institutional	Marine	Non-evident	Recreation	Residential	Transportation	Urban	Wetland	Total
Waterford	0.6			13.8			1.9	13.0	3.3	2.3	0.8		3.0	38.6
West Cape	14.4			10.9	0.1		4.8	3.4		3.0	1.5		11.1	49.3
West River	272.9		2.0	1,218.1	1.5	0.4		86.4	11.9	19.3	41.2		88.8	1,742.6
Westmorland River	100.1			351.6	0.0		0.6	30.9		9.3	9.3	6.3	38.9	546.9
Wheatley River	197.5			229.1	0.3	0.1	4.0	52.8	0.6	13.0	11.8		56.4	565.4
Whites Cove	11.7			12.4			3.2	12.7		2.3	1.5		4.5	48.2
Wight Point				7.1			0.5	0.1					0.2	7.9
Wilmot River	286.2		0.7	210.6	4.0	0.4	0.4	55.1	0.9	12.4	16.2	6.6	125.3	718.8
Winter River	44.8			376.5	5.1		3.1	18.9	0.0	16.6	11.5	0.3	87.4	564.2
Wrights Creek	12.0		0.7	21.7	0.2		0.6	17.6	0.5	1.0	6.2	12.7	11.4	84.6
Grand Total	8,069.2	4.9	36.8	33,309.1	175.0	12.3	428.2	2,741.6	199.0	910.4	1,219.0	187.2	11,896.5	59,189.0

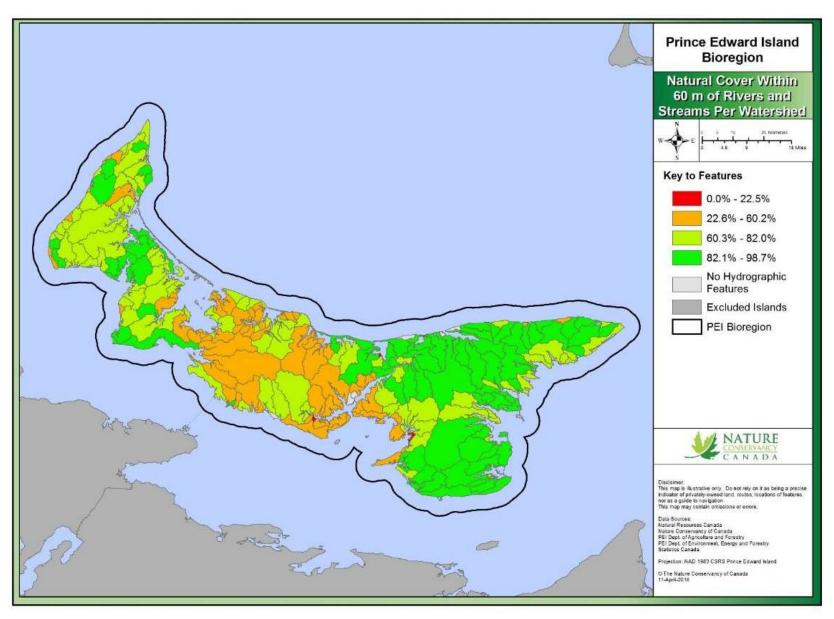


Figure J1: The percent natural cover within 60 m of rivers and streams summarized by provincially delineated watersheds according to the 2010 corporate land use inventory

Target 1	Acadian Forest Mosaic
200	
KEA 1	Interior Forest Habitat
Туре	Landscape Context
Comments	

△ Indicator 1.1	Percent Interior Forest habitat per watershed
Details	The proportion of the watershed that is forest cover and 100m or further from the forest edge should be greater than 10% (Environment Canada, 2013a). Local studies have reported that in order to conserve interior habitat within upland hardwood Acadian forests on PEI, a distance of 160 m from the forest edge should be used (MacQuarrie and Lacroix, 2003). When 19 coastal island watersheds were excluded from analysis, the mean proportion of interior forest per watershed was 7.83%. A total of 75 out of 241 watersheds (31.1%) had interior forest communities comprising greater than 10% of the watershed area. When forest sub-uses classified as clearcut or plantation were excluded, the mean proportion of interior forest per watershed was 2.69%. A total of 11 out of 241 watersheds (4.56%) had interior forest cover comprise greater than 10% of the watershed. Environment Canada (2013a) How Much Habitat is Enough? Third Edition. Environment Canada, Toronto, Ontario. MacQuarrie, K. and Lacroix, C. (2003) The upland hardwood component of Prince Edward Island's remnant Acadian forest: determination of depth of edge and patterns of exotic plant invasion. Canadian Journal of Botany 81: 1113-1128.
Comments	

Poor	Value Range <5% Measurement (2.7%)
Fair	Value Range 5-10%
Good	Value Range 10-15%
Very Good	Value Range >15%
Rating Source	Onsite Research
Comments	When 19 coastal island watersheds were excluded from analysis, the mean proportion of interior forest cover per watershed was 7.83%. A total of 75 out of 241 watersheds (31.1%) had interior forest cover comprising greater than or equal to 10% of the watershed area. When forest sub-uses classified as clear-cut or plantation were excluded from analysis, the mean proportion of interior forest cover per watershed was 2.69%. A total of 11 out of 241 watersheds (4.56%) had interior forest cover comprising greater than or equal to 10%.

KEA 2	Forest Habitat
Туре	Landscape Context
Comments	

△ Indicator 2.1	Percent forest cover per watershed
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Details	A 30% forest cover at the watershed scale is the minimum forest cover threshold to support healthy levels of forest flora and fauna. This equates to a high-risk approach that may only support less than half of the potential species richness, and marginally healthy aquatic systems. A Forest cover of 40% equates to a medium-risk approach, while forest cover of 50% or more equates to a low-risk approach that is likely to support most of the potential species, and healthy aquatic systems (Environment Canada, 2013a). When 19 coastal island watersheds were excluded from analysis, the mean forest cover per watershed was 40.2%. A total of 91 out of 241 watersheds (37.8%) had percent forest cover >=50%. When forest sub-uses classified as clearcut or plantation were excluded, the mean forest cover per watershed was 32.0%. A total of 40 out of 241 watersheds (16.6%) had percent natural forest cover >=50%.
	Environment Canada (2013a) How Much Habitat Is Enough? Third Edition. Environment Canada, Toronto, Ontario.
Comments	

Poor	Value Range 0%- 29%
Fair	Value Range 30% - 39% Measurement (32.1%)
Good	Value Range 40%-49%
Very Good	Value Range > 50%
Rating Source	Rough Guess
Comments	When 19 coastal island watersheds were excluded from analysis, the mean forest cover at the watershed scale was 40.2%. A total of 91 out of 241 watersheds (37.8%) had forest cover comprising greater than or equal to 50% of the watershed area. When forest sub-uses classified as clear-cut or plantation were excluded, the mean forest cover per watershed was 32.1%. A total of 40 out of 241 watersheds (16.6%) had natural forest cover comprising greater than or equal to 50% of the watershed area.

Target 2	Beaches and Dunes
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KEA 1	Connectivity
Туре	Landscape Context
Comments	

△ Indicator 1.1	Percent natural cover within 275m of sand dunes
Details	A 275 m buffer surrounding land classified as sand dune was considered in an effort to protect the ecological function and integrity of dune habitat, as well as maintain nesting areas for wildlife (e.g. waterfowl; CWS, OMNR and OME, 1998). When considering a 275 m buffer around land classified as sand dune, 81.1% of landuse was classified as forest, wetland, or marine (i.e. natural cover). When forest and wetland sub-uses classified as clearcut, plantation, cottage, reservoir, and sewage were excluded, 80.0% of landuse was classified as forest, wetland, or marine.
	Canadian Wildlife Service, Ontario Ministry of Natural Resources and Ontario Ministry of Environment. 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Public Works and Government Services of Canada. Toronto, Ontario.
Comments	

Threshold 1.1:

Poor	Value Range 0-24%
Fair	Value Range 25-49%

Good	Value Range 50-89% Measurement 81.1%
Very Good	Value Range 90-100%
Rating Source	Rough Guess
Comments	Divided into even quarterlies to define thresholds, where 50% is considered the starting point for 'good'.

KEA 2	Sand dune size
Туре	Size
Comments	

△ Indicator 2.1	Total area (ha) of land classified as sand dune
Details	The total area of sand dunes within the province, with a goal of no net loss as calculated from the 2000 corporate land use inventory was suggested as the best threshold measure of sand dune health within the province (B. Potter, personal communication, June 25, 2015). In 2000, 3,488 ha of land was classified as sand dune, while in 2010, 3,498 ha of land was classified as sand dune. This represents a 0.29% increase in total area over this time period.
Comments	

Fair	Value Range < 3	3,488 ha
Good	>= 3,488 ha	Measurement 3,498 ha
Rating Source	Rough Guess	
Comments		

Coastal Islands

KEA 1	Habitat suitability (intactness)
Туре	Condition
Comments	

△ Indicator 1.1	Percent natural cover within island boundaries
Details	Nineteen offshore islands are identified in the Subdivision and Development Regulations pursuant to sections 8 and 8.1 of the Planning Act (R.S.P.E.I., 1988): Glenfinnan Island, Governor's Island, St. Peter's Island, Holman Island, Reynolds Island, Herring Island, Cherry Island, Thomas Island, Gordon's Island, Boughton Island, Grover (Ram) Island, Little Courtin Island, Bunbury Island, Bird Island, Oulton's Island, Cascumpeque Sand Hills, Conway Sand Hills, Hog Island Sand Hills, George Island.

Comments	R.S.P.E.I. 1988. Planning Act Subdivision and Development Regulations. Cap. P-8.

Poor	Value Range 0-24%
Fair	Value Range 25-49%
Good	Value Range 50-89% Measurement 81.1%
Very Good	Value Range 90-100% Measurement 96.5%
Rating Source	Rough Guess
Comments	

Target 4 Freshwater Wetlands

KEA 1	Connectivity
Туре	Landscape Context
Comments	

△ Indicator 1.1	Percent natural cover within 275m of freshwater wetlands
Details	A 275 m buffer surrounding land classified as freshwater wetland was considered in an effort to protect the ecological function and integrity of wetland habitat, as well as maintain nesting areas for wildlife (e.g. waterfowl; CWS, OMNR and OME, 1998). Canadian Wildlife Service, Ontario Ministry of Natural Resources and Ontario Ministry of Environment. 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Public Works and Government Services of Canada. Toronto, Ontario.
Comments	

Thresholds 1.1:

Poor	Value Range 0-24%
Fair	Value Range 25-49%
Good	Value Range 50-89% Measurement 57.5%
Very Good	Value Range 90-100%
Rating Source	Rough Guess
Comments	When considering a 275 m buffer around land classified as freshwater wetland, 57.5% of landuse was classified as forest, wetland, or marine. When forest, wetland, and marine sub-uses classified as clear-cut, plantation, cottage, excavation pit, reservoir, and sewage were excluded, 46.2% of landuse was classified as forest, wetland, or marine.

KEA 2	Freshwater wetland size
Туре	Size
Comments	

△ Indicator 2.1	Total area of land (ha) classified as freshwater wetland
Details	The total area of freshwater wetlands within the province, with a goal of no net loss as calculated from the 2000 corporate land use inventory was suggested as the best measure of wetland health within the province (B. Potter, personal communication, June 25, 2015). In 2000, 25,732 ha of land was classified as freshwater wetland, while 28,392 ha of land was classified as freshwater wetland in 2010. This represents a 9.4% increase in total wetland extent over this time period.
Comments	

Thresholds 1.2:

Fair	Value Range <25,732 ha
Good	Value Range >= 25,732 ha Measurement 28, 392 ha
Rating Source	Not specified
Comments	The total area of freshwater wetlands within the province, with a goal of no net loss as calculated from the 2000 corporate land use inventory was suggested as the best measure of wetland health within the province (B. Potter, personal communication, June 25, 2015). In 2000, 25,732 ha of land was classified as freshwater wetland, while 28,392 ha of land was classified as freshwater wetland in 2010. This represents a 9.4% increase in total wetland extent over this time period.

Target 5 Agro-Ecosystems

KEA 1	Agro-ecosystem habitat
Туре	Size
Comments	

△ Indicator 1.1	Summerfallow land
Details	Although agricultural fields are not optimal breeding habitats, a small group of bird species including grassland endemics, are able to productively utilize certain crops. A study of occurrence and productivity of songbird in farmland found that abundance of most bird species was greatest in summerfallow (Martin and Forsyth, 2003). The total amount of agricultural land under cultivation in Canada (cropland, summerfallow, and tame or seeded pasture) increased by 14% between 1951 and 1976, and by another approximately 6% from 1976 to 2001. Conversely the amount of summerfallow (cultivated grassland) declined by 48% during this time (Statistics Canada, 2005). Summerfallow land on PEI has decreased from 997 ha in 1991 to 79 ha in 2011, a loss of approximately 92% (Statistics Canada, 2012). Martin, P.A. & Forsyth, D.J. (2003). Occurrence and productivity of songbirds in prairie farmland under conventional versus minimum tillage regimes. Agriculture, Ecosystems and Environment 96, 107-117.
Comments	

Thresholds 1.1:

Fair	Value Range <997 ha Measurement 376 ha
Good	Value Range >= 997 ha
Rating Source	Not specified
Comments	The total amount of agricultural land under cultivation in Canada (cropland, summerfallow, and tame or seeded pasture) increased by 14% between 1951 and 1976, and by another approximately 6% from 1976 to 2001. Conversely the amount of summerfallow (cultivated grassland) declined by 48% during this time (Statistics Canada, 2005). Summerfallow land on PEI has decreased from 997 ha in 1991 to 79 ha in 2011, a loss of approximately 92% (Statistics Canada, 2012).
	Statistics Canada. (2012) Table 004-0002 Census of Agriculture, total area of farms and use of farm land, Canada and provinces, every 5 years. Retrieved from http://www5.statcan.gc.ca/cansim/a26?lang=eng&retrLang=eng&id=0040002&pattern=004-0001004-0017&tabMode=dataTable&srchLan=-1&p1=-1&p2=31

KEA 2	Fledgling Success
Туре	Condition
Comments	

△ Indicator 2.1	Bobolink fledgling
Details	During the October 20, 2015 partners meeting, it was suggested that fledgling success would be a better indicator of Bobolink breeding success than the number of breeding squares continuing to have confirmed breeding evidence (D. Mazerolle, P. Giroux, personal communication). Reproductive success is one of the most commonly measured variables in ornithological research. However, the number of young that survive to become breeding adults in a population (i.e. fitness) is difficult to measure due to the time involved, and the fact that many fledglings disperse before they mature. A feasible alternative is to determine the number of young that leave the nest (i.e. fledging success). This relies on the assumption that the number of young that fledge is a good index of the number of young that are recruited into the population as breeding adults (Weatherhead and Dufour, 2000). Weatherhead, P.J. and Dufour, K.W. (2000) Fledging success as an index of recruitment in Red-Winged Blackbirds. The Auk 117(3), 627-633.
Comments	

Fair	Value Range <8 chicks fledged Measurement 3 chicks
Good	Value Range >= 8 chicks fledged
Rating Source	Not specified
Comments	The number of squares with breeding evidence of fledged for Bobolink on Prince Edward Island decreased from eight squares during the 1986-1990 period, to three squares in the 2006-2010 period (Bird Studies Canada, Environment Canada - Canadian Wildlife Service, New Brunswick Department of Natural Resources, Nova Scotia Department of Natural Resources, Prince Edward Island Department of Agriculture and Forestry, 2012). Bird Studies Canada, Environment Canada - Canadian Wildlife Service, New Brunswick Department of Natural Resources, Nova Scotia Department of Natural Resources & Prince Edward Island Department of Agriculture and Forestry. (2012).

Maritimes Breeding Bird Atlas Database. Data accessed from the Maritimes Breeding Bird Atlas website and/or NatureCounts, a node of the Avian Knowledge Network, Bird Studies Canada. Available: http://www.naturecounts.ca/.

Target 6 Rivers, Streams, and Riparian Areas

KEA 1	Compatible Land use
Туре	Landscape Context
Comments	

△ Indicator 1.1	Percent natural cover per watershed
Details	Maintaining watersheds with 30% natural cover equates to a high-risk approach that may only support marginally healthy aquatic systems, while natural cover of 40% equates to a medium-risk approach, and natural cover of 50% or more equates to a low-risk approach that is likely to support healthy aquatic systems (Environment Canada, 2013a). When 19 coastal island watersheds were excluded from analysis, the mean proportion of forest, wetland, and marine landuse per watershed was 47.1%. A total of 112 out of 241 watersheds (46.5%) had compatible landuse comprising greater than 50% of the watershed area. When forest and wetland sub-uses classified as clearcut, plantation, cottage, excavation pit, reservoir, and sewage were excluded, the mean proportion of forest, wetland, and marine landuse per watershed was 39.0%. A total of 70 out of 241 watersheds (29.0%) had compatible landuse comprising greater than 50% of the watershed area. Environment Canada (2013a) How Much Habitat Is Enough? Third Edition. Environment Canada,
	Toronto, Ontario.
Comments	

Thresholds 1:1

Poor	Value Range 0-29%
Fair	Value Range 30-49% Measurement 47.1%
Good	Value Range 50-60%
Very Good	Value Range 61-100%
Rating Source	Rough Guess
Comments	When 19 coastal island watersheds were excluded from analysis, the mean forest, wetland, and marine cover per watershed was 47.1%. A total of 112 out of 241 watersheds (46.5%) had compatible landuse greater than or equal to 50% of the watershed area. When forest and wetland sub-uses classified as clear-cut, plantation, cottage, excavation pit, reservoir, and sewage were excluded from analysis, the mean proportion of forest, wetland, and marine landuse per watershed was 39.0%. A total of 70 out of 241 watersheds (29.0%) had compatible landuse comprise greater than or equal to 50% of the watershed area.

KEA 2	Riparian buffer intactness
Туре	Condition
Comments	

△ Indicator 2.1	Percent natural cover within 60m riparian buffer
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	To achieve substantial reduction in pesticides and nutrients, a minimum 30-m buffer is required for successful trapping of both sediment-adsorbed and dissolved phase contaminants (Dunn et al., 2011). Several communities are implementing a 60 m minimum riparian buffer (e.g. Morell River, North Lake and Priest Pond watersheds). Partners suggested that 60m was an adequate buffer length, but a higher percentage cover threshold in the range of 85-90% is required (A. Lush; M. Harris personal communication, June 4, 2015).
Comments	

Fair	Value Range <85% Measurement 71.6%
Good	Value Range >=85%
Rating Source	Not specified
Comments	When 19 coastal island watersheds, as well as 15 additional watersheds that drain directly into the Gulf of St. Lawrence (i.e. have no hydrographic features) were excluded from the analysis, the mean proportion of the 60 m riparian area at the watershed scale that was classified as forest, wetland, or marine was 71.6%. A total of 67 out of 226 watersheds (29.7%) had compatible landuse comprising greater than or equal to 85% of the watershed area. When forest and wetland sub-uses classified as clear-cut, plantation, excavation pit, reservoir, and sewage were excluded, the mean proportion of the 60 m riparian area at the watershed scale that was classified as forest, wetland, or marine was 65.9%. A total of 24 out of 226 watersheds (10.6%) had compatible landuse comprise greater than or equal to 85% of the watershed area.

Target 7 Saltmarshes and Estuaries

KEA 1	Connectivity
Туре	Condition
Comments	

△ Indicator 1.1	Percent natural cover within 275m of salt marsh
Details	A 275 m buffer surrounding land classified as brackish or salt marsh was considered in an effort to protect the ecological function and integrity of marsh habitat, as well as maintain nesting areas for wildlife (e.g. waterfowl; CWS, OMNR and OME, 1998). Canadian Wildlife Service, Ontario Ministry of Natural Resources and Ontario Ministry of
	Environment. 1998. A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. Public Works and Government Services of Canada. Toronto, Ontario.
Comments	

Poor	Value Range 0-24%
Fair	Value Range 25-49%
Good	Value Range 50-89% Measurement 59.6%
Very Good	Value Range 90-100%
Rating Source	Not specified
Comments	When considering a 275 m buffer around land classified as salt marsh, 59.6% of landuse was classified as forest, wetland, or marine. When forest and wetland sub-uses classified as clear-cut, plantation, reservoir, and sewage were excluded from analysis, 55.8% of landuse was classified

as forest, wetland, or marine.

KEA 2	Saltmarsh size
Туре	Size
Comments	

△ Indicator 2.1	Total area (ha) of land classified as salt marsh
Details	The total area of salt and brackish marsh within the province, with a goal of no net loss as calculated from the 2000 corporate land use inventory was suggested as the best measure of salt marsh health within the province (B. Potter, personal communication, June 25, 2015). In 2000, 6,988 ha of land was classified as brackish or salt marsh. In 2010, this value increased to 7,592 ha. This represents a 8.64% increase in total brackish and saltmarsh extent over this time period.
Comments	

	ha
Fair	Value Range <6,988 ha
Good	Value Range >= 6,988 ha Measurement 7,592 ha
Rating Source	Not specified
Comments	When considering a 275 m buffer around land classified as salt marsh, 59.6% of landuse was classified as forest, wetland, or marine. When forest and wetland sub-uses classified as clear-cut, plantation, reservoir, and sewage were excluded from analysis, 55.8% of landuse was classified as forest, wetland, or marine.