



Environment
Canada

Environnement
Canada



**Bird Conservation Strategy for Bird Conservation Region 14
in Prince Edward Island and Marine Biogeographic Unit 12:
Atlantic Northern Forest and Gulf of St. Lawrence**

June 2013



Cat. No.: CW66-320/3-2012E-PDF

ISBN: 978-1-100-21083-4

Information contained in this publication or product may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified.

You are asked to:

- Exercise due diligence in ensuring the accuracy of the materials reproduced;
- Indicate both the complete title of the materials reproduced, as well as the author organization; and
- Indicate that the reproduction is a copy of an official work that is published by the Government of Canada and that the reproduction has not been produced in affiliation with or with the endorsement of the Government of Canada.

Commercial reproduction and distribution is prohibited except with written permission from the Government of Canada's copyright administrator, Public Works and Government Services of Canada (PWGSC). For more information, please contact PWGSC at 613-996-6886 or at droitdauteur.copyright@tpsgc-pwgsc.gc.ca.

Cover photos: © photos.com

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2013

Aussi disponible en français

Preface

Environment Canada led the development of all-bird conservation strategies in each of Canada's Bird Conservation Regions (BCRs) by drafting new strategies and integrating new and existing strategies into an all-bird framework. These integrated all-bird conservation strategies will serve as a basis for implementing bird conservation across Canada, and will also guide Canadian support for conservation work in other countries important to Canada's migrant birds. Input to the strategies from Environment Canada's conservation partners is as essential as their collaboration in implementing their recommendations.

Environment Canada has developed national standards for strategies to ensure consistency of approach across BCRs. Bird Conservation Strategies will provide the context from which specific implementation plans can be developed for each BCR, building on the programs currently in place through Joint Ventures or other partnerships. Landowners including Aboriginal peoples will be consulted prior to implementation.

Conservation objectives and recommended actions from the conservation strategies will be used as the biological basis to develop guidelines and beneficial management practices that support compliance with regulations under the *Migratory Birds Convention Act, 1994*.

Acknowledgements

This document follows templates developed by Alaine Camfield, Judith Kennedy and Elsie Krebs with the help of the BCR planners in each of the Canadian Wildlife Service regions throughout Canada. However, work of this scope cannot be accomplished without the contribution of many colleagues who provided or validated technical information, commented on earlier draft versions of the strategy, and supported the planning process. We would like to extend a sincere thank-you to Doug Bliss, Andrew Boyne, Paul Chamberland, Kevin Davidson, Carina Gjerdrum, Alan Hanson, Christie MacDonald, Bryan Martin, Keith McAloney, Bruce Pollard, Martin Raillard, Isabelle Robichaud, Dane Stuckel, Kyle Wellband, Becky Whittam, and other reviewers.

Recommended citation:

Environment Canada. 2013. *Bird Conservation Strategy for Bird Conservation Region 14 in Prince Edward Island and Marine Biogeographic Unit 12: Atlantic Northern Forest and Gulf of St. Lawrence*. Canadian Wildlife Service, Environment Canada. Sackville, New Brunswick. iv + 159 pp. + appendices.

Bird Conservation Strategy for Bird Conservation Region 14 in Prince Edward Island and Marine Biogeographic Unit 12: Atlantic Northern Forest and Gulf of St. Lawrence

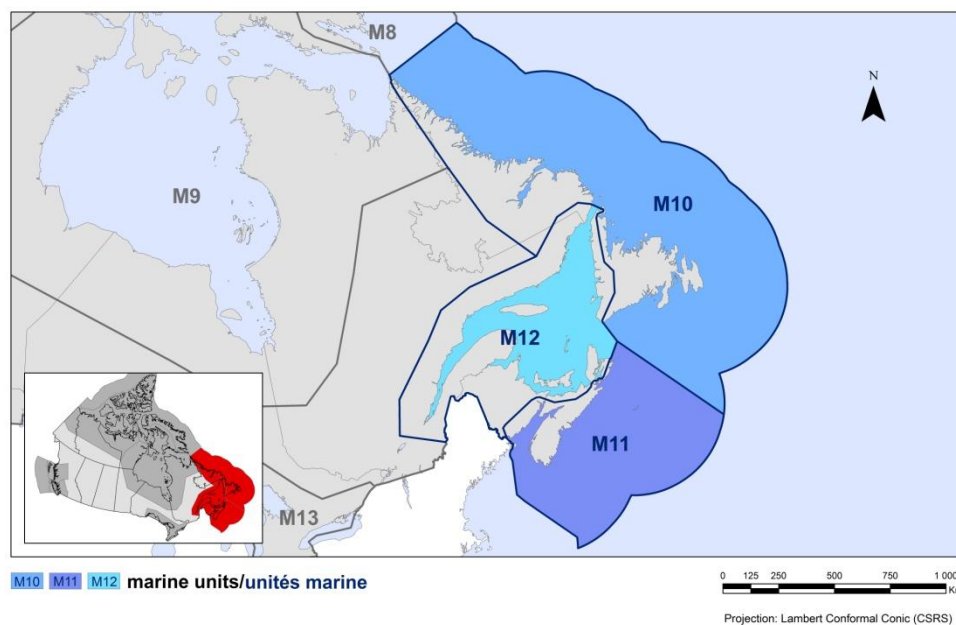
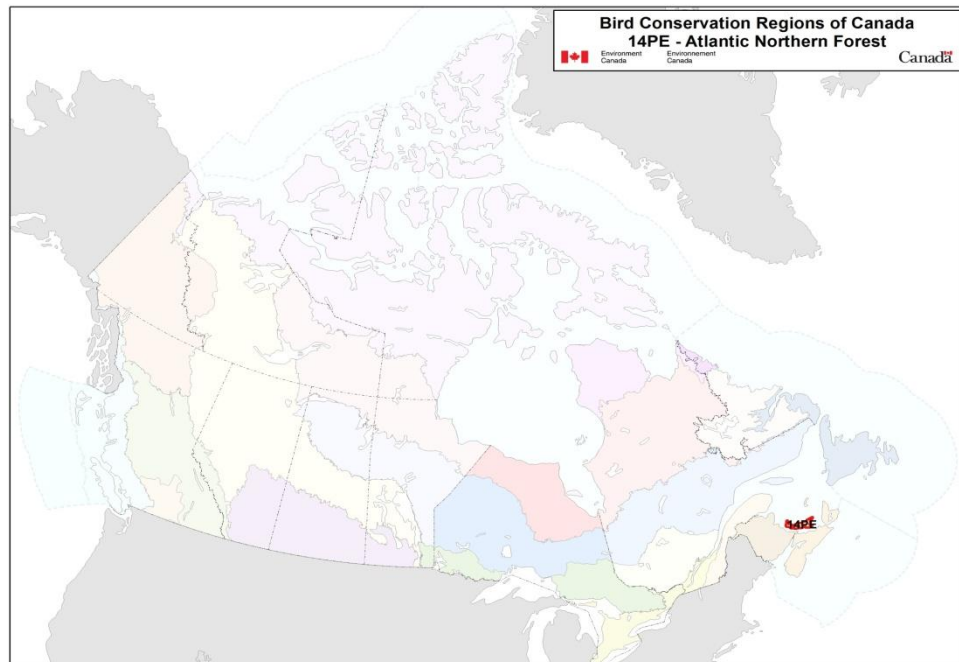


Table of Contents

Preface	i
Acknowledgements	i
Executive Summary.....	1
Introduction: Bird Conservation Strategies	4
Context.....	4
Strategy Structure	5
Characteristics of Bird Conservation Region 14: Atlantic Northern Forest in Prince Edward Island.....	6
Characteristics of Marine Biogeographic Unit 12: Gulf of St. Lawrence of Prince Edward Island.....	11
Section 1: Summary of Results – All Birds, All Habitats	13
Element 1: Priority Species Assessment	13
Element 2: Habitats Important to Priority Species	21
Element 3: Population Objectives.....	23
Element 4: Threat Assessment for Priority Species	25
Element 5: Conservation Objectives	29
Element 6: Recommended Actions.....	31
Section 2: Conservation Needs by Habitat	34
Coniferous	34
Deciduous.....	42
Mixed Wood.....	49
Shrub/Early Successional	57
Herbaceous	63
Cultivated and Managed Areas.....	68
Urban (artificial surfaces and bare areas).....	75
Wetlands	82
Riparian	90
Inland Waterbodies.....	97
Marine Waters – Gulf of St. Lawrence.....	105
Coastal – Above High Tide	111
Coastal – Intertidal – Gulf of St. Lawrence.....	121
Section 3: Additional Issues.....	128
Widespread Issues	128
Collisions	128
Predation by Domestic Cats.....	131
Pollution	131
Climate Change	141
Research and Population Monitoring Needs.....	145
Population Monitoring.....	145
Research.....	148

Threats Outside Canada.....	150
Next Steps	153
References.....	154
Appendix 1	160
List of All Bird Species (or population management unit) in Prince Edward Island’s BCR 14 and MBU 12	160
List of Priority Bird Species Associated with Each Habitat Class in BCR 14 PEI and MBU 12 PEI.....	172
List of All Regional Threats in BCR 14 PEI and MBU 12 PEI.....	176
Appendix 2	185
General Methodology for Compiling the Six Standard Elements	185
Element 1: Species Assessment to Identify Priority Species	185
Element 2: Habitat Important to Priority Species.....	187
Element 3: Population Objectives for Priority Species	188
Element 4: Threat Assessment for Priority Species	189
Element 5: Conservation Objectives	190
Element 6: Recommended Actions.....	191
Appendix 3	193
IUCN Threat Categories.....	193
IUCN Conservation Action Categories	196

Executive Summary

Prince Edward Island is dominated by a low-lying landscape that is only slightly above sea level in the west, is hilly in the central region and has gently rolling hills in the east. Almost half of the area is cultivated, while most of the other half is dominated by mixed temperate forests. The vast majority of the land (90%) is privately owned.

The Island is famous for its agriculture (potatoes, soybeans and blueberries are the main crops), and as a tourist destination. It is relatively densely populated with few areas remaining untouched by human disturbance. Aquaculture is increasingly important along the coastline.

Within the terrestrial portion of Bird Conservation Region 14 on Prince Edward Island (BCR 14 PEI), there are 52 priority bird species. Wetlands are used by the greatest number of priority bird species (46%), while mixed wood forests are used by 33%, coniferous forests by 27% and deciduous forests by 17%. An additional 33% of priority species use cultivated areas.

No threats to priority birds of Prince Edward Island have been ranked as very high, and most are ranked medium or low. The most frequently identified threats on land in Prince Edward Island are related to agricultural and forestry practices: early haying, extensive use of pesticides, fungicides and insecticides. Other threats identified are related to tourism and recreational activities, such as cottage development along the shorelines and intensive use of beaches, but these threats are not thought to limit populations.

Given the importance of the agricultural industry and the extent of land used for agriculture on Prince Edward Island, key conservation actions for priority birds address issues related to this industry. For example, recommended conservation actions include: increasing awareness of the impacts of agricultural practices on priority bird species, developing beneficial management practices and encouraging bird-friendly practices through economic and other incentives.

Agricultural lands have displaced old-growth forests on Prince Edward Island. While it is important to focus on conservation actions relating to the agricultural industry, which dominates the landscape, key conservation actions for forestry-related activities focus on protecting areas of existing old-growth and late-successional forest habitat, and developing beneficial management practices and guidelines to limit degradation of habitat features that are important to priority birds.

Prince Edward Island has 1100 km of coastline deeply indented by marine estuaries along the Gulf of St. Lawrence and the Northumberland Strait. The shoreline generally alternates between headlands of steep sandstone bluffs and extensive sandy beaches. Coastal habitats are treated in both the terrestrial and marine components of this strategy.

The threats most often identified for priority bird species in the coastal habitats of both marine planning units and the terrestrial planning unit include: disturbance due to recreational and commercial activities (ATVs, dogs off-leash, beach access to aquaculture leases, disturbances to roost and nesting sites), habitat loss from residential developments (cottages and shoreline armouring), mortality from ocean oil-spill events, and contamination from agricultural runoff.

Recommended actions to address threats to priority species in coastal habitat include managing recreational activities to minimize disturbance of birds, and securing and managing key coastal habitat through the creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements. Pesticides and other biocides should be used for agriculture only when necessary and should be replaced by alternative products to minimize exposure of birds to potentially toxic chemicals. It is also important to raise public awareness about shorebirds and their habitat needs as well as the impacts of disturbance in coastal areas. Management of coastal off-bottom oyster aquaculture activities to minimize disturbance to priority birds is also recommended.

The Gulf of St. Lawrence marine unit (Marine Biogeographic Unit 12 Prince Edward Island – MBU 12 PEI) surrounding Prince Edward Island is part of one of the largest and most productive estuaries in Canada. It is highly influenced by humans, as it is downstream to some of the largest urban and industrial centres and emitters of industrial and agricultural contaminants. This area is significantly warmer and shallower than the rest of the Gulf of St. Lawrence, although in winter this portion of the Gulf is predominantly ice-covered.

Thirty priority bird species were identified in MBU 12 PEI. The most frequently identified and highest ranked threats to the 16 priority bird species that use the marine waters of Prince Edward Island are: mortality of birds due to oil spills and discharge from shipping activities; decreases in prey availability due to oil spills and discharge, and other heavy metal contamination; and the decrease in diet quality and health of priority birds due to heavy metal contamination of their food sources. In addition, these birds must compete with aquaculture operations for access to foraging areas.

Key recommended actions in marine habitats focus on managing the aquaculture industry to minimize the degradation and loss of priority habitat for aquatic species.

Recommended actions include monitoring and enforcing compliance with laws, policies and regulations regarding the release of oil, oily waste and garbage into the ocean, and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize the occurrence and potential impacts of accidental oil discharges on priority birds.

This conservation strategy builds on existing bird conservation strategies and complements those created for the other Bird Conservation Regions across Canada. Collectively, the strategies will serve as a framework for implementing bird conservation nationally, and also identify international conservation issues for Canada's priority birds. Strategies are not highly prescriptive, but rather are intended to guide future implementation efforts undertaken by various partners and stakeholders. More specifically, information presented in this document is based on an extensive and systematic literature review, which in turn was reviewed by key regional experts on bird conservation. Planning and implementing conservation actions for priority birds on Prince Edward Island will necessitate further discussion and work in order to prioritize the recommended actions with key partners.

Introduction: Bird Conservation Strategies

Context

This document is one of a suite of Bird Conservation Region Strategies (BCR strategies) that have been drafted by Environment Canada for all regions of Canada. These strategies respond to Environment Canada's need for integrated and clearly articulated bird conservation priorities to support the implementation of Canada's migratory birds program, both domestically and internationally. This suite of strategies builds on existing conservation plans for the four "bird groups" (waterfowl,¹ waterbirds,² shorebirds,³ and landbirds⁴) in most regions of Canada, as well as on national and continental plans, and includes birds under provincial/territorial jurisdiction. These new strategies also establish standard conservation planning methods across Canada, and fill gaps, as previous regional plans do not cover all areas of Canada or all bird groups.

These strategies present a compendium of required actions based on the general philosophy of achieving scientifically based desired population levels as promoted by the four pillar initiatives of bird conservation. Desired population levels are not necessarily the same as minimum viable or sustainable populations, but represent the state of the habitat/landscape at a time prior to recent dramatic population declines in many species from threats known and unknown. The threats identified in these strategies were compiled using currently available scientific information and expert opinion. The corresponding conservation objectives and actions will contribute to stabilizing populations at desired levels.

The BCR strategies are not highly prescriptive. In most cases, practitioners will need to consult additional information sources at local scales to provide sufficient detail to implement the recommendations of the strategies. Tools such as beneficial management practices will also be helpful in guiding implementation. Partners interested in participating in the implementation of these strategies, such as those involved in the habitat Joint Ventures established under the North American Waterfowl Management Plan (NAWMP), are familiar with the type of detailed implementation planning required to coordinate and undertake on-the-ground activities.

¹ NAWMP Plan Committee 2004

² Milko et al. 2003

³ Donaldson et al. 2000

⁴ Rich et al. 2004

Strategy Structure

This strategy includes two distinct planning units, the Bird Conservation Region 14 in Prince Edward Island (BCR 14 PEI) as well as the Marine Biogeographic Unit 12 around Prince Edward Island (MBU 12 PEI). Both units have their own list of priority bird species. Given that MBU 12 PEI has two habitat classes (the waterbodies, snow and ice habitat class, and the coastal habitat class), and to distinguish these from the equivalent habitat classes in BCR 14 PEI, they are renamed marine waters and coastal (intertidal). These habitat classes in BCR 14 PEI are renamed inland waterbodies and coastal (above high tide).

Section 1 of this strategy presents general information about the BCR, the MBU and the subregion, with an overview of the six elements⁵ that provide a summary of the state of bird conservation at the sub-regional level. Section 2 provides more detail on the threats, objectives and actions for priority species grouped by each of the broad habitat types in the subregion. Section 3 presents additional widespread conservation issues that are not specific to a particular habitat or were not captured by the threat assessment for individual species, as well as research and monitoring needs, and threats to migratory birds while they are outside of Canada. The approach and methodology are summarized in the appendices, but details are available in a separate document (Kennedy et al. 2012). A national database houses all the underlying information summarized in this strategy and is available from [Environment Canada](#).

⁵ The six elements are: Element 1 – priority species assessment; Element 2 – habitats important to priority species; Element 3 – population objectives; Element 4 – threat assessment; Element 5 – conservation objectives; Element 6 – recommended actions.

Characteristics of Bird Conservation Region 14: Atlantic Northern Forest in Prince Edward Island

Bird Conservation Region 14 (Atlantic Northern Forest; BCR 14) encompasses an area greater than 356 000 km² and includes the Maritime provinces, and Quebec's Gaspé Peninsula and Eastern Townships in Canada, and most of the states of Maine, New Hampshire and Vermont, and parts of New York, Massachusetts and Connecticut in the United States. Most of this BCR is low-mountainous or open hilly country interspersed with valleys and plains, and nearly 85% of it is classified as some type of forest (including regenerating forest) (Dettmers 2006). Geologically, BCR 14 (or the Atlantic Maritime Ecozone) is a mix of sedimentary and igneous bedrock (Canadian Heritage 2012).

The portion of BCR 14 in the province of Prince Edward Island extends over 5656 km² and differs somewhat from the rest of the Atlantic Northern Forest (Fig. 1). The land surface of the Island ranges from nearly sea level in the west to hilly in the central region and to gently rolling hills in the east. The coastal lowlands overlying sedimentary bedrock are far more accessible, have better soils for agriculture and a milder climate than the inhospitable igneous highlands, with acid soils supporting vast forest that are poor for agriculture (Canadian Heritage 2012).

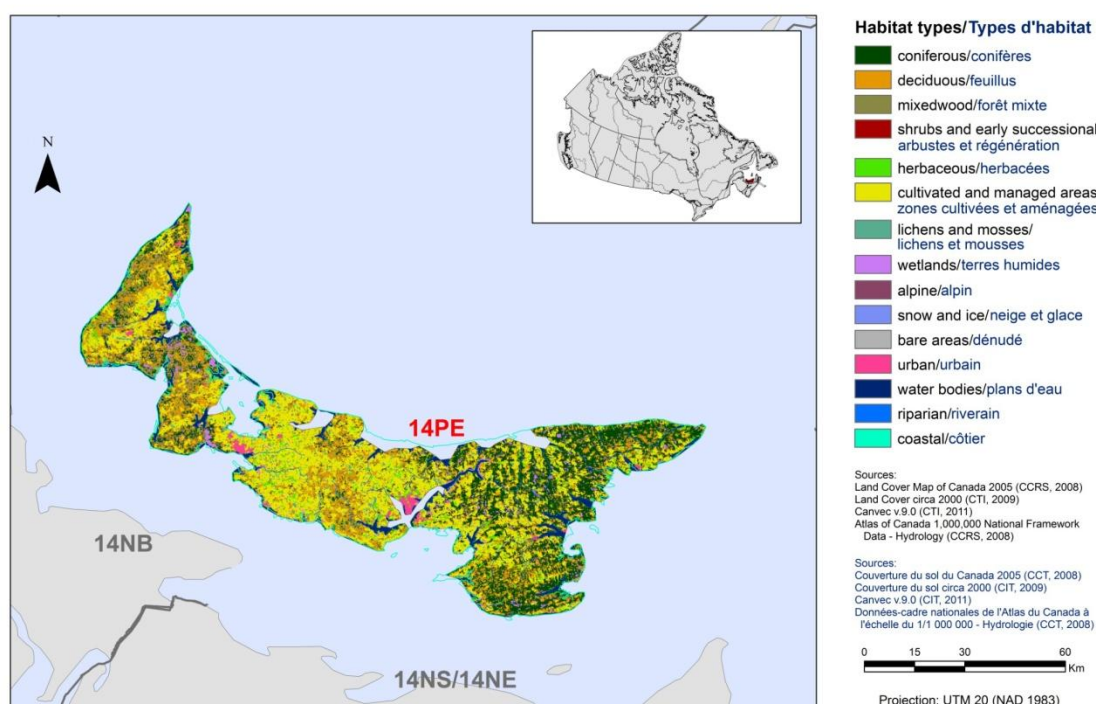


Figure 1. Landcover in BCR 14 PEI: Atlantic Northern Forest (labeled 14PE).

While the maps in this document are drawn at scales and resolutions that differ from the land cover percentages provided, Dettmers (2006) has estimated 15 different land cover types in all of BCR 14 and within each province and state. While these estimates may not be current, they do provide a relative idea of the importance (in terms of size) of a particular habitat type within the BCR 14 PEI.

Unlike the other Maritimes provinces, on Prince Edward Island, agricultural and cultivated lands (2263 km²) share the landscape in equal proportion with northern temperate forests (2322 km²). Mixed deciduous-coniferous forest is the most predominant forest type (1145 km²), followed by northern hardwood forest (722 km²) and spruce-fir conifer forest (455 km²). The bulk of Prince Edward Island's forested habitat (90%) is privately owned. Only 300 km² of forest are publicly owned (Hutchinson 2012). Shrub and early successional habitat is another predominant habitat type, including regenerating forests (342 km²) and natural shrublands (126 km²). Prince Edward Island also encompasses wetland habitats, including 1107 km of coastline (e.g., emergent saltmarsh, mud flats, sandy beaches, and rocky shoreline, open water areas associated with estuaries and bays), freshwater emergent marshes (85 km²), freshwater forested wetlands (216 km²), and open freshwater lakes, streams and rivers (52 km²) (Dettmers 2006).

Prince Edward Island's climate is typified by large seasonal temperature differences, with warm (and often humid) summers and cold winters. However, the Northumberland Strait running along the south and west coasts and the Gulf of St. Lawrence encompassing the north and east portions of the Island have a moderating impact on the Island's climate.

In BCR 14 PEI there are approximately 345 km² of urban habitat (Dettmers 2006). The major urban centre on Prince Edward Island is the provincial capital of Charlottetown (58 625 inhabitants in the metropolitan area). Summerside, the next-largest city, has a population of 14 500 inhabitants. Prince Edward Island is the most densely populated province in Canada (23 persons per km²), with an estimated population of 141 232 in 2010 (Statistics Canada 2011a). In spite of its high population density, it is the second-most rural province in the nation (after Nunavut). However, 44.8% of the population is classed as urban. Prince Edward Island is highly praised and valued for its beaches, which attract a large number of users each summer (reported peak of 1.2 million visitors in 1997 by the Prince Edward Island Tourism department) (Prince Edward Island 2012a). Recreational activity on beaches is at its highest during July and August, which overlaps with the incubation and chick rearing period for a number of priority bird species (e.g., Piping Plover (*melodus*), Common Tern).

In Prince Edward Island, there are fewer but bigger farms in 2011 than there were in 2006: the number of farms and the total farmed area decreased by 12% and 4%, respectively, while the average area per farm increased to 1.6 km² (Statistics Canada

2011b). Prince Edward Island (and New Brunswick) farmers were the only ones in Canada to report a decrease in gross farm receipts (products sold, program payments and custom work). For Prince Edward Island, there was a 15% decrease from 2005 to 2010, or a loss of \$76.5 million (Statistics Canada 2011b).

In 2011, more than 69% of the total farmed area was cropland, and Prince Edward Island continued to report the largest area cultivated for potatoes in Canada with 350 km² (Statistics Canada 2011b). The agricultural area used for soybeans increased 350% since 2006 to 207 km², making it one of the major field crops in the province and accounts for 72% of the Maritimes province's total for soybean production in 2011 (Statistics Canada 2011b). The area used for blueberry production also increased 25% between 2006 and 2011 to 50 km² (Statistics Canada 2011b). Increased prices for cash crops coupled with declining beef cattle (34% decrease) and pig (56% decrease) numbers led to a shift from forage and crops traditionally used for feed to more profitable cash crops (Statistics Canada 2011b). The number of dairy cows increased (0.2%) as well as the sheep flock (104%) since 2006 (Statistics Canada 2011b). According to the Agricultural Census 2011, 3% of Prince Edward Island farms have certified organic (or in transition to become organic) production of field crops, fruits, vegetables and greenhouse products.

Early successional habitat is fairly common and widespread, occurring whenever disturbances such as agricultural clearings have created successional openings within forests. Generally, this habitat type is lost as succession continues and young forests mature. Given the changes in land tenure and agricultural practices, the shrub and early successional habitat in agricultural areas is declining and reverting to forest habitats.

Little is left of the original Acadian (mixedwood) forests of the Island; three centuries of clearing for agriculture and shipbuilding, as well as fire and disease, have radically transformed the forests of Prince Edward Island (MacDonald 2001). A large-scale forest harvesting industry is relatively undeveloped on the Island, mainly because the bulk of forested land is privately owned and managed. The government of Prince Edward Island has made a number of policy and legislative efforts to increase its forestry cover, such as the *Agricultural Rehabilitation Development Act* (1950s) and the Canada–PEI Forestry Agreements (ended in 1990s), all of which raised the overall forest cover on the Island to nearly 50% (MacDonald 2001). Effort has been made to protect remaining forests on unploughed land, which are important sources of native soils and seeds, and which account for much of the remnant Acadian forest species including American beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), sugar maple (*Acer saccharum*), eastern hemlock (*Tsuga canadensis*), white cedar (*Thuja occidentalis*) and black ash (*Fraxinus nigra*) (Prince Edward Island 2004; Prince Edward Island Department of Environment, Energy and Forestry 2004). These forest management efforts will positively influence bird populations (Hutchinson 2012).

Since 1800, an estimated 200 000 km², almost 15% of Canada's total wetland base, has been drained or lost. In the Maritimes, 65% of coastal salt marshes have been converted to non-wetland functions (North American Wetlands Conservation Council). Many of Prince Edward Island's salt marshes and coastal wetlands have been lost through drainage, flooding and infilling for urban, industrial or agricultural purposes, and salt marshes continue to be threatened by coastal developments, particularly cottage subdivisions. Three of the Island's largest bogs at Black Banks, Bideford and Miscouche are being mined commercially for peat moss. Additional pressures have been exerted through interest in developing bogs for cranberry (*Vaccinium (Oxycoccus)*) production (Prince Edward Island 2003). As a result of such interests, areas under cranberry production increased 47% since 2006 to 0.45 km² in 2011 (Statistics Canada 2011b).

Historically, most streams in Prince Edward Island were dammed to serve industry (grist mill, lumber, power, etc.) and over time, many of these mill sites were redeveloped for recreational, cultural, and aesthetic or wildlife enhancement purposes (Prince Edward Island 2012b).

There are two First Nation reserves on Prince Edward Island: Lennox Island and Abegweit. Prince Edward Island is within the traditional Mi'kmaq territory (Aboriginal Affairs and Northern Development 2013). In fact, the traditional Mi'kmaq territory covers much of the BCR 14. At the time prior to European contact, the Mi'kmaq were semi-nomadic and harvested the wildlife available to them: seafood, large and small mammals, fish, seabirds and their eggs. While the current traditions of the Mi'kmaq have changed and evolved over time, much of it through French and British colonization of what is now Canada (McMillan 1995), they hold dear and precious all wildlife and life forms within and beyond their territory (Berneshawi 1997). The Mi'kmaq of Prince Edward Island have been concerned over an apparent loss of their traditions such as waterfowl hunting (Gerald MacDougall, personal observation). As demonstrated by Benoît (2007), the Maritimes Aboriginal harvest for waterfowl has decreased dramatically and is now a peripheral activity.

There are a variety of current and potential threats to the region's avifauna. Many of these threats are related to land uses and, in particular, agricultural activities: early haying; extensive use of pesticides, fungicides and insecticides; and mainly the extensive transformation of the landscape to cultivated and managed lands. In addition to these threats, tourism and recreational activities have significant effects on the coastal habitats of priority birds of BCR 14 PEI and of MBU 12 PEI. Threats related to tourism and recreational activities include the increase of visitors attracted to the Island for its beaches and the summer cottage development along the shorelines, coupled with coastal erosion that leads to further degradation of the shorelines as a result of armoured to protect roads and dwellings.

Prince Edward Island has nearly 3% of its land area designated as protected areas (Canadian Council on Ecological Areas 2011; Fig. 2). Environment Canada manages one Migratory Bird Sanctuary, Black Pond (1.3 km²), which protects fall staging habitat for waterfowl. Parks Canada Agency manages the Prince Edward Island National Park (18 km²). However, the bulk (in both numbers and total surface area) of the protected areas, 97 km² (terrestrial) and 15 km² (marine), are provincially managed. The ability of governments to establish protected areas is limited by the amount and location of Crown land. On Prince Edward Island, nearly 92% of the land base is privately owned. In addition to government-protected areas, there are a number of environmental non-governmental organizations engaged in the securement and management of conservation lands, such as:

- Ducks Unlimited Canada, with 55 km² of waterfowl habitat either owned or with restrictive covenants;
- Island Nature Trust, with 12 km²; and
- Nature Conservancy Canada owns six properties, totalling 1.8 km².

In addition, designations that recognize ecological uniqueness have elevated public awareness and promoted the conservation of ecologically significant habitats such as:

- The Malpeque Bay (and Provincial Wildlife Management Area), which is recognized as a Ramsar site under the Ramsar Convention on Wetlands of International Importance: 244 km²; and
- Two Important Bird Areas: Malpeque Bay (570 km²) and Prince Edward Island National Park (114 km²).

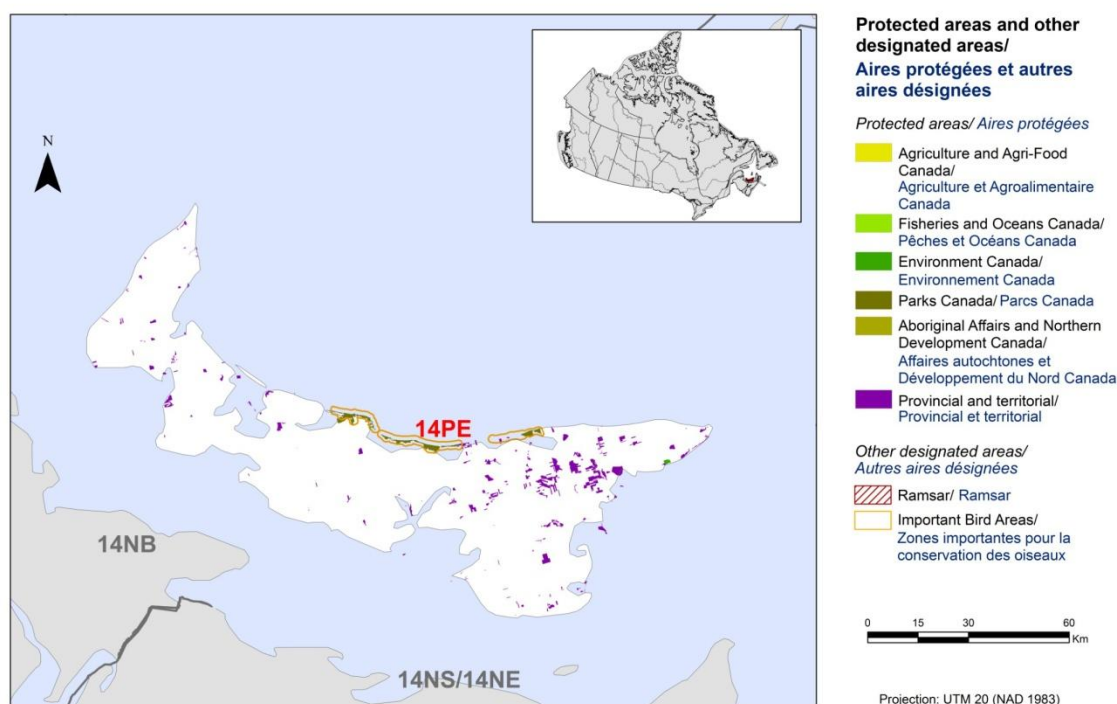


Figure 2. Map of protected and designated areas in BCR 14 PEI (14PE).

Characteristics of Marine Biogeographic Unit 12: Gulf of St. Lawrence of Prince Edward Island

The Estuary and Gulf of Saint Lawrence (corresponding to M12 in Fig. 3) represent one of the largest and most productive estuarine/marine ecosystems in Canada, and in the world (total area of approximately 247 000 km²) (Therriault 1991). With a drainage basin that includes the Great Lakes, the St. Lawrence marine ecosystem receives more than half of the freshwater inputs from the Atlantic Coast of North America. This ecosystem is also strongly influenced by ocean and climate variability in the North Atlantic, of both Arctic (Labrador Current) and tropical (Gulf Stream) origin. As a result, this area exhibits large spatial and temporal variations in environmental conditions and oceanographic processes (Benoît et al. 2012). This unique setting provides the conditions for a highly diverse and productive biological community and trophic structure (Benoît et al. 2012).

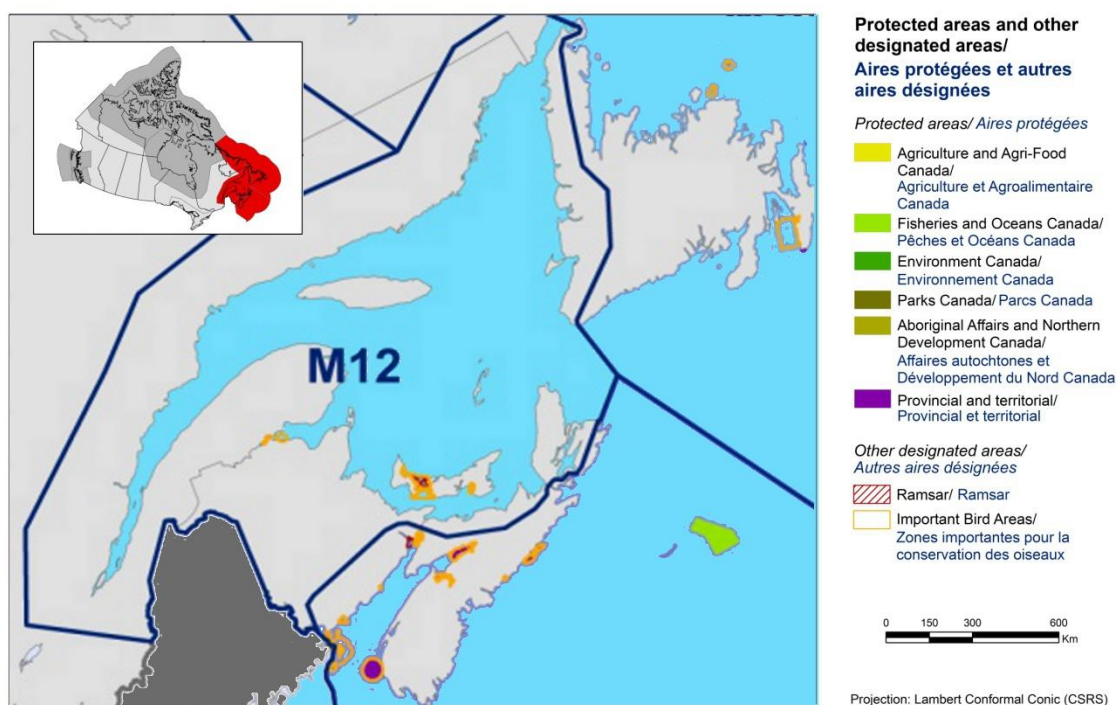


Figure 3. Map of MBU 12 (M12) and its marine protected and designated areas.

MBU 12 is situated downstream of some of the largest urban and industrial centres, areas of pronounced development on the continent and emitters of industrial and agricultural-based contaminants (Benoît et al. 2012). The massive influx of fresh water, especially during springtime and summer wet seasons, lowers salinity levels in the Gulf and Estuary. Increasing commercial, ecotouristic and recreational navigation are vectors for the propagation of aquatic invasive species (Benoît et al. 2012). Shoreline development and associated nutrient and sediment loading as well as a large and

expanding shellfish aquaculture industry have transformed large portions of the coast, the estuarine and lagoon waters into farms (Benoît et al. 2012). Benoît et al. (2012) reviewed evidence that suggested important aspects of the food-web in MBU 12 changed in the early 1990s. Also, increasing average sea-surface temperature and hypoxia, partly as a result of climate change and coastal zone deterioration related to anthropogenic pressures (e.g., coastal eutrophication), may be causing physiological stress in marine organisms (Benoît et al. 2012).

The Prince Edward Island portion of MBU 12 encompasses an area of approximately 21 400 km² (Fig. 3). This system is strongly influenced by ocean and climate variability. While colder, low saline Arctic waters (Labrador Current) enter the Gulf from the north and east, prevailing west and southwest winds moderate the influence of ocean on climate. This moderated influence in conjunction with shallower waters surrounding Prince Edward Island can lead to significantly warmer ocean temperatures. In winter, this portion of the Gulf is predominantly ice-covered. MBU 12 PEI exhibits complex coastlines, which are the result of glacial processes and include extensive sand beaches, exposed bedrock, but are largely lacking in cliffs. These features are interspersed with large estuaries hosting salt marshes and wetlands of varying size and influence. Spatial and temporal variation in environmental conditions and oceanographic processes result in diverse and productive biological communities and trophic structure. The high productivity in estuaries and lagoons has attracted and continues to attract shellfish aquaculture industries in Prince Edward Island.

There are a variety of present and potential threats to the region's avifauna. Current threats in MBU 12 PEI include oil pollution from shipping and other boat traffic, drifting of agricultural effluents in the marine waters, and competition for foraging and roosting areas with the aquaculture industry in many of Prince Edward Island's estuaries. As a whole, these likely encompass the most important anthropogenic threats to avian survival in the Gulf of St. Lawrence surrounding Prince Edward Island.

There are few protected areas in MBU 12 PEI (Fig. 3). The Department of Fisheries and Oceans established the Basin Head Marine Protected Area in 2005 (9 km²) because of its unique biodiversity, including a unique form of Irish Moss (Fisheries and Oceans Canada 2008). It is a shallow coastal lagoon, approximately 5 km long, located on the eastern tip of Prince Edward Island. This is the only federally protected area in MBU 12 PEI (Canadian Council on Ecological Areas 2011). The Province of Prince Edward Island manages a 15 km² marine area, which it protects under several legislative tools (Canadian Council on Ecological Areas 2011).

Section 1: Summary of Results – All Birds, All Habitats

Element 1: Priority Species Assessment

These Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each BCR subregion (see [Appendix 1](#)). Species that are vulnerable due to population size, distribution, population trend, abundance and threats are included because of their “conservation concern”. Some widely distributed and abundant “stewardship” species are also included. Stewardship species are 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 subregion; many of these species have some conservation concern, while others may not require specific conservation effort at this time. Species of management concern are also included as priority species when they are at (or above) their desired population objectives but require ongoing management because of their socio-economic importance as game species or because of their impacts on other species or habitats (see Appendix 2).

The purpose of the prioritization exercise is to focus implementation efforts on the issues of greatest significance for Canadian avifauna. Table 1 provides a full list of all priority species in BCR 14 PEI and MBU 12 PEI and their reason for inclusion. Tables 2 and 3 summarize the number of priority species by bird group and by the reason for priority status.

In BCR 14 PEI, there are 52 priority species, most of which are landbirds (31 species). The list also includes shorebirds (9 species), waterbirds (6 species) and waterfowl (6 species; Table 2). However, 35% of all shorebirds and 32% of waterbirds found in BCR 14 in PEI are priority species, compared to only 26% of waterfowl and 26% of landbirds (Table 2). Fourteen percent (14%) of the priority species are formally protected under the federal *Species at Risk Act* (SARA; Species at Risk Public Registry 2012), most of which are landbirds (Table 3). The most frequent reasons for considering landbirds as priority species for BCR 14 PEI are because of regional concerns or stewardship, whereas the reasons for considering shorebirds or waterbirds as priority species are almost always because of national or continental concerns (Table 3). The main reason for this difference is due to a lack of information at the regional level for many of the shorebirds and waterbirds. Waterfowl are included as priority species when designated as a “key waterfowl species” in the PEI Eastern Habitat Joint Venture (EHJV) Implementation Plan (2008), or when ranked “high” or “highest” in terms of conservation/monitoring needs under the North American Waterfowl Management Plan (NAWMP Plan Committee 2004; Table 3).

In MBU 12 PEI, there are 30 priority species. The list includes 13 species of shorebirds, 7 species of waterbirds and 10 species of waterfowl. However, 50% of all shorebirds found

in MBU 12 PEI are priority species compared to 18% of waterbirds and 33% of waterfowl. There are 4 priority species that are protected under the federal SARA (Species at Risk Public Registry 2012), 2 shorebirds, one waterbird and 1 waterfowl (Table 3). 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 when ranked “high” or “highest” in terms of conservation/monitoring needs under the NAWMP (Table 3).

Table 1. Priority bird species in BCR 14 PEI and MBU 12 PEI, population objective, and the reason for their priority status.

BCR 14-PE	MBU 12-PE	Priority Species	Bird Group	Population Objective ¹	SARA ²	COSEWIC ³	National/Continental Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl ⁴	Expert Review ⁵
Y		American Redstart	Landbird	Maintain current						Y		
Y		Bald Eagle	Landbird	Maintain current								Added (working group)
Y		Bank Swallow	Landbird	Increase 50%								Added (working group)
Y		Barn Swallow	Landbird	Increase 50%		TH						Added (working group)
Y		Bay-breasted Warbler	Landbird	Increase 100%					Y			
Y		Belted Kingfisher	Landbird	Assess/Maintain					Y	Y		
Y		Black-billed Cuckoo	Landbird	Assess/Maintain			Y		Y			
Y		Black-throated Green Warbler	Landbird	Maintain current				Y		Y		
Y		Bobolink	Landbird	Increase 50%		TH	Y		Y	Y		
Y		Boreal Chickadee	Landbird	Assess/Maintain					Y			

¹ Population objectives apply in all units where the species is priority (BCR 14-PE and/or MBU 12-PE) unless otherwise indicated.

² Species listed on Schedule 1 under the *Species at Risk Act* as Endangered (EN), Threatened (TH) or Special Concern (SC) (Species at Risk Public Registry 2012)

³ Species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2012) as Endangered (EN), Threatened (TH) or Special Concern (SC).

⁴ Waterfowl identified as "key species" in the PEI Eastern Habitat Joint Venture (EHJV) 5-year Implementation Plan (2008), or ranked as "High" or "Highest" in either the breeding or non-breeding conservation/monitoring needs category for Waterfowl Conservation Region 14 (analogous to BCR 14) in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004).

⁵ Species added by the Provincial Technical Working Group or upon expert review.

Table 1 continued

BCR 14-PE	MBU 12-PE	Priority Species	Bird Group	Population Objective ¹	SARA ²	COSEWIC ³	National/Continental Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl ⁴	Expert Review ⁵
Y		Brown-headed Cowbird	Landbird	Increase 100%								Added (working group)
Y		Canada Warbler	Landbird	Increase 50%†	TH	TH	Y		Y			
Y		Cape May Warbler	Landbird	Increase 50%					Y	Y		
Y		Common Nighthawk	Landbird	Increase 100%†	TH	TH						
Y		Eastern Kingbird	Landbird	Increase 100%					Y			
Y		Eastern Wood-Pewee	Landbird	Increase 50%					Y			
Y		Evening Grosbeak	Landbird	Increase 100%					Y			
Y		Gray Jay	Landbird	Assess/Maintain								Added (on review)
Y		Mourning Warbler	Landbird	Maintain current						Y		
Y		Nelson's Sparrow	Landbird	Maintain current			Y		Y	Y		
Y		Northern Parula	Landbird	Maintain current						Y		
Y		Olive-sided Flycatcher	Landbird	Increase 50%†	TH	TH	Y		Y			
Y		Osprey	Landbird	Maintain current						Y		
Y		Rose-breasted Grosbeak	Landbird	Maintain current						Y		
Y		Ruffed Grouse	Landbird	Increase 50%					Y			
Y		Rusty Blackbird	Landbird	Increase 100%†	SC	SC			Y			
Y		Sharp-shinned Hawk	Landbird	Maintain current						Y		

† The interim population objective for this species will be replaced with the official recovery objective when recovery documents are published under the *Species at Risk Act*.

Table 1 continued

BCR 14-PE	MBU 12-PE	Priority Species	Bird Group	Population Objective ¹	SARA ²	COSEWIC ³	National/Continental Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl ⁴	Expert Review ⁵
Y		Short-eared Owl	Landbird	Assess/Maintain†	SC	SC						
Y		Tennessee Warbler	Landbird	Increase 100%								Added (working group)
Y		Veery	Landbird	Assess/Maintain					Y			
Y		White-throated Sparrow	Landbird	Maintain current				Y				
Y		American Golden-Plover	Shorebird	Assess/Maintain			Y					
Y		American Woodcock	Shorebird	Increase 50%			Y					
	Y	Black-bellied Plover	Shorebird	Assess/Maintain			Y					
	Y	Dunlin	Shorebird	Assess/Maintain			Y					
	Y	Hudsonian Godwit	Shorebird	Assess/Maintain			Y					
Y		Killdeer	Shorebird	Assess/Maintain			Y					
	Y	Least Sandpiper	Shorebird	Assess/Maintain			Y					
Y	Y	Lesser Yellowlegs	Shorebird	Assess/Maintain			Y					
Y	Y	Piping Plover (melodus)	Shorebird	Recovery objective	EN	EN	Y					
	Y	Purple Sandpiper	Shorebird	Assess/Maintain			Y					
	Y	Red Knot (rufa)	Shorebird	Assess/Maintain†	EN	EN	Y					
	Y	Sanderling	Shorebird	Assess/Maintain			Y					
	Y	Semipalmated Sandpiper	Shorebird	Assess/Maintain			Y					
Y	Y	Solitary Sandpiper	Shorebird	Assess/Maintain			Y					
Y		Spotted Sandpiper	Shorebird	Assess/Maintain			Y					

Table 1 continued

BCR 14-PE	MBU 12-PE	Priority Species	Bird Group	Population Objective ¹	SARA ²	COSEWIC ³	National/Continental Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl ⁴	Expert Review ⁵
Y	Y	Whimbrel	Shorebird	Assess/Maintain			Y					
	Y	Willet	Shorebird	Assess/Maintain			Y					
Y		Wilson's Snipe	Shorebird	Assess/Maintain			Y					
Y		American Bittern	Waterbird	Assess/Maintain			Y		Y			
	Y	Bonaparte's Gull	Waterbird	Assess/Maintain			Y					
Y	Y	Common Loon	Waterbird	Assess/Maintain			Y		Y			
Y	Y	Common Tern	Waterbird	Assess/Maintain					Y			
	Y	Great Cormorant	Waterbird	Assess/Maintain			Y					
	Y	Horned Grebe	Waterbird	Assess/Maintain†	EN ⁶	EN ⁶ SC ⁷						
Y	Y	Pied-billed Grebe	Waterbird	Assess/Maintain			Y					
	Y	Red-throated Loon	Waterbird	Assess/Maintain			Y					
Y		Sora	Waterbird	Assess/Maintain			Y					
Y		Virginia Rail	Waterbird	Assess/Maintain			Y					
Y	Y	American Black Duck	Waterfowl	Increase 50% (BCR 14) Maintain current (MBU 12)							EHJV, NAWMP	
Y	Y	Barrow's Goldeneye (Eastern)	Waterfowl	Assess/Maintain	SC	SC						
	Y	Black Scoter	Waterfowl	Assess/Maintain								Added (on review)

⁶ Status applies to the Magdalen Islands population of Horned Grebe, which migrates and overwinters in this BCR.

⁷ Status applies to the Western population of Horned Grebe, which migrates and overwinters in this BCR.

Table 1 continued

BCR 14-PE	MBU 12-PE	Priority Species	Bird Group	Population Objective ¹	SARA ²	COSEWIC ³	National/Continental Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl ⁴	Expert Review ⁵
Y	Y	Canada Goose (North Atlantic)	Waterfowl	Maintain current							NAWMP	
	Y	Common Goldeneye	Waterfowl	Assess/Maintain							NAWMP ⁸	
Y	Y	Green-winged Teal	Waterfowl	Increase 50%							EHJV	
	Y	Long-tailed Duck	Waterfowl	Assess/Maintain							NAWMP	
Y	Y	Mallard	Waterfowl	Decrease (BCR 14) Maintain current (MBU 12)							EHJV	
Y		Ring-necked Duck	Waterfowl	Increase 50%							EHJV	
	Y	Surf Scoter	Waterfowl	Assess/Maintain			Y				NAWMP	
	Y	White-winged Scoter	Waterfowl	Assess/Maintain								Added (on review)

⁸ Common Goldeneye was selected as priority despite its rank of “Moderate High” in NAWMP, because of its priority status in other Maritimes MBUs.

Table 2. Summary of priority bird species, by bird group, in BCR 14 PEI and MBU 12 PEI.

Bird Group	Total Species	Total Priority Species	Percent Priority	Percent of Priority List
BCR 14 PEI				
Landbird	119	31	26%	60%
Shorebird	26	9	35%	17%
Waterbird	19	6	32%	11%
Waterfowl	23	6	26%	11%
Total	187	52		100%
MBU 12 PEI				
Landbird	4	0	0%	0%
Shorebird	26	13	50%	45%
Waterbird	40	7	18%	23%
Waterfowl	30	10	33%	33%
Total	100	30		100%

Table 3. Number of priority species in BCR 14 PEI and in MBU 12 PEI by reason for priority status.

Reason for Priority Listing ¹	Landbird	Shorebird	Waterbird	Waterfowl
BCR 14 PEI				
COSEWIC ²	7	1	0	1
Federal SARA listed ³	5	1	0	1
NAWMP ⁴	-	-	-	5
National/Continental Concern	5	14	5	-
National/Continental Stewardship	2	0	0	-
Regional/Subregional Concern	15	0	3	0
Regional/Subregional Stewardship	11	0	0	0
MBU 12 PEI				
COSEWIC ²		2	1	1
Federal SARA listed ³		2	1	1
NAWMP ⁴		-	-	7
National/Continental Concern		13	5	1
National/Continental Stewardship		0	0	-
Regional/Subregional Concern		4	2	2
Regional/Subregional Stewardship		0	0	0

¹ A single species can be on the priority list for more than one reason. Note that not all reasons for inclusion apply to every bird group (indicated by "-").

² COSEWIC indicates species assessed by the Committee on the Status of Endangered Wildlife in Canada as Endangered, Threatened, or Special Concern (COSEWIC 2012).

³ Species listed on Schedule 1 of the *Species at Risk Act* as Endangered; Threatened; or Special Concern (Species at Risk Public Registry 2012).

⁴ NAWMP indicates "key species" in the PEI EHJV 5-year Implementation Plan (2008), or ranked under NAWMP (NAWMP Plan Committee 2004) as having "High" or "Highest" breeding or non-breeding conservation/monitoring needs in the BCR.

Element 2: Habitats Important to Priority Species

Identifying the broad habitat requirements for each priority species within the BCR and the MBU allowed species to be grouped by shared habitat-based conservation issues and actions (see Appendix 2) for details on how species were assigned to standard habitat categories). If many priority species associated with the same habitat face similar conservation issues, then conservation action in that habitat may support populations of several priority species. BCR strategies use a modified version of the standard land cover classes developed by the United Nations (Food and Agriculture Organization 2000) to categorize habitats, and species were often assigned to more than one habitat class.

The assignment of habitat associations to priority bird species was primarily done through a literature review and expert consultations. For each priority species in BCR 14 PEI and MBU 12 PEI, all habitat associations were included in the database (Table A-2). Because of the variability and the availability of information related to species-habitat associations, quantifying relative importance (i.e., preference) of any given habitat was not possible. In this document, statements regarding the importance of habitat to priority bird species are related to the number of priority birds associated with that habitat and may not reflect that habitat's overall importance to all bird species in the planning unit. For more quantitative and qualitative field-based information on habitat associations of all breeding birds species in Prince Edward Island, please consult the Second Maritimes Breeding Bird Atlas (Stewart et al., in prep.).

Wetlands are used by the greatest number of priority bird species (24 species or 46%; Fig. 4). Of the 3 forest types, there are more priority bird species that use mixed wood forests (17 species or 33%) than either coniferous (14 species or 27%) or deciduous forests (9 species or 17%; Fig. 4). Seventeen (17) species use cultivated and managed areas (33%) and coastal (above high tide) habitat (33%). Urban habitat is used by only 4 species (8%; Fig. 4).

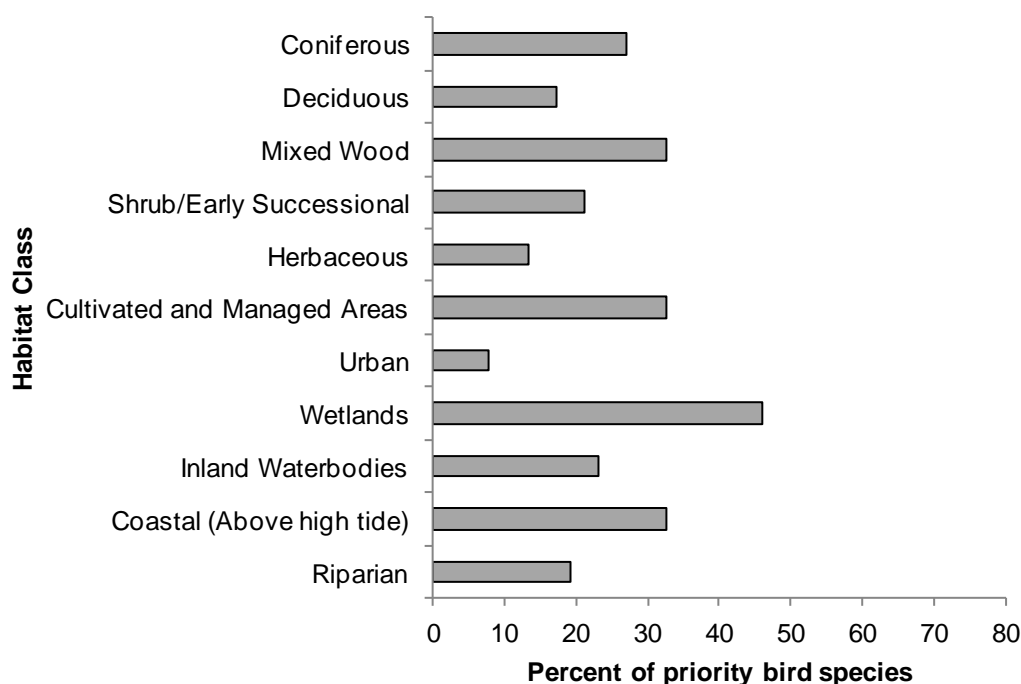


Figure 4. Percent of priority bird species that are associated with each habitat type in BCR14 PEI.

Note: The total exceeds 100% because each species may be assigned to more than one habitat.

For MBU 12 PEI, only 2 habitats were considered. Coastal habitats (intertidal) are used by 23 (77%) priority bird species and 16 (53%) priority bird species use marine waters (nearshore waters and continental shelf; Fig. 5).

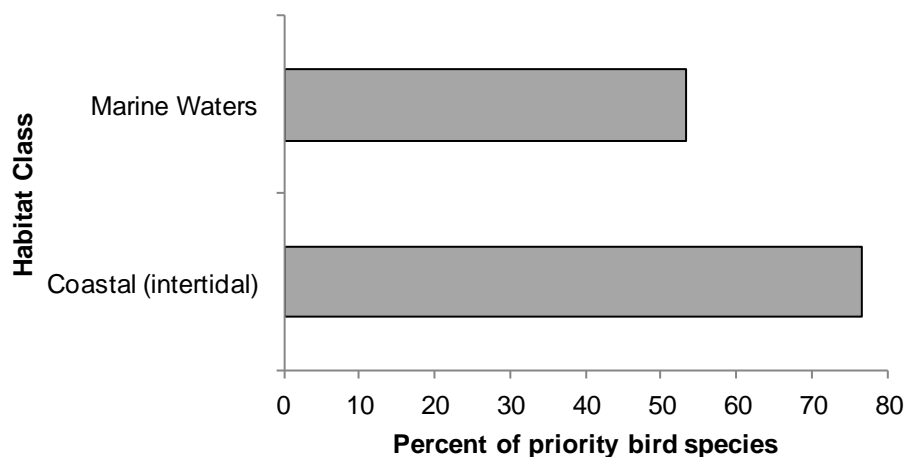


Figure 5. Percent of priority bird species that are associated with each habitat type in MBU 12 PEI.

Note: The total exceeds 100% because each species may be assigned to more than one habitat.

Element 3: Population Objectives

Population objectives allow us to measure and evaluate conservation success. The objectives in this strategy are assigned to categories and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain", and a monitoring objective is given (see Appendix 2). For any species listed under the *Species at Risk Act* (SARA) or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. The ultimate measure of conservation success will be the extent to which population objectives have been reached over the next 40 years. Population objectives do not currently factor in feasibility of achievement, but are held as a standard against which to measure progress.

In BCR 14 PEI, 20 priority bird species (38%) have a population objective of assess/maintain, which means there is not enough data to reliably assess a trend. However, for those species for which there is enough data to reliably assess a trend, 20 species have an objective of increase by 50% or 100% or are species at risk with a specific recovery objective (Fig. 6). The remaining 11 priority bird species (21%) have a population objective to maintain current levels, and the temperate breeding Canada Goose is the only priority species of management concern and should be decreased (Fig. 6). As a result, there are no threats, conservation objectives or actions listed for the North Atlantic population of Canada Goose.

There are 4 population objectives for priority bird species identified for MBU 12 PEI (Fig. 7). For the majority (25 species, 83%) we do not have enough data to reliably assess a trend and the population objective was set as assess/maintain (Fig. 7). While 3 species (10%) have a population objective of maintain current; 1 species (Piping plover) has a specific recovery objective in a recovery strategy (see Table 1) and for 1 species (Green-winged Teal, see Table 1), the objective is to increase by 50% (Fig. 7).

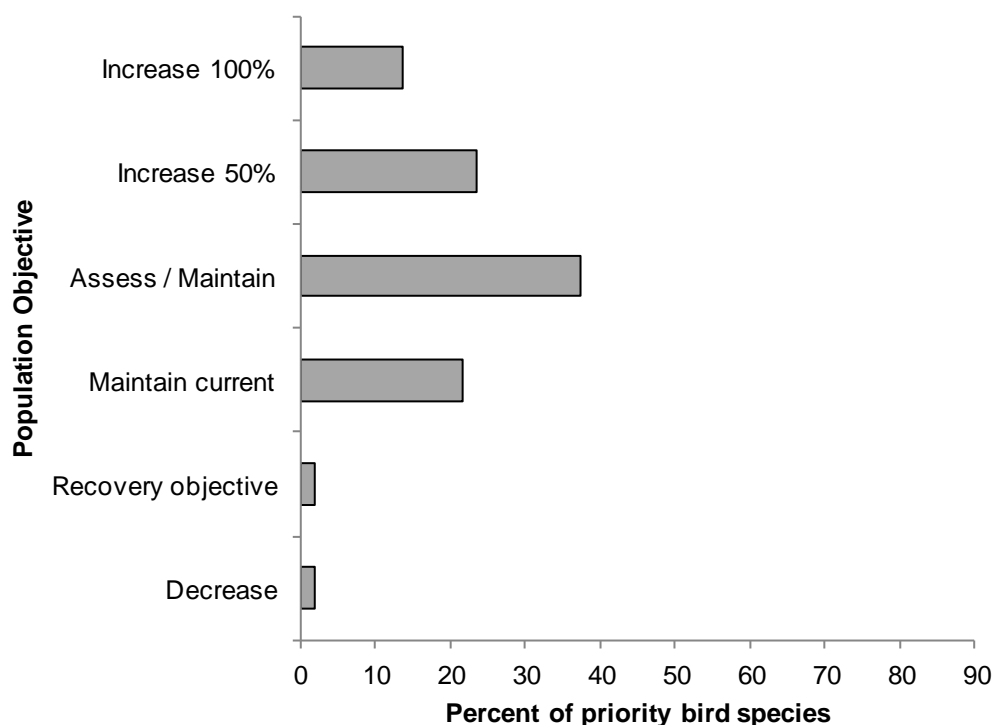


Figure 6. Percent of priority bird species that are associated with each population objective category in BCR 14 PEI.

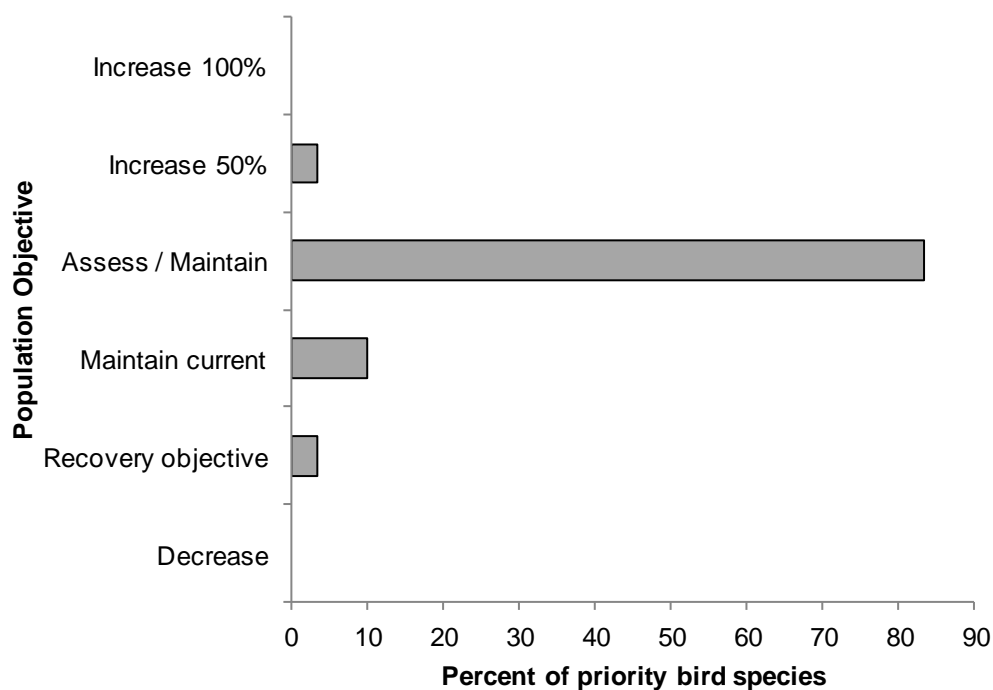


Figure 7. Percent of priority bird species that are associated with each population objective category in MBU 12 PEI.

Element 4: Threat Assessment for Priority Species

The threats assessment process (see Appendix 2) identifies threats believed to have a population-level effect on individual priority species. These threats are assigned a relative magnitude (Low, Medium, High, Very High), based on their scope (the proportion of the species' range within the subregion that is impacted) and severity (the relative impact on the priority species' population). This allows us to target conservation actions towards threats with the greatest effects on suites of species or in broad habitat classes. Some well-known conservation issues (such as predation by domestic cats or climate change) may not be identified in the literature as significant threats to populations of an individual priority species and therefore may not be captured in the threat assessment. However, they merit attention in conservation strategies because of the large numbers of individual birds affected in many regions of Canada. We have incorporated them in a separate section on Widespread Issues, but, unlike other threats, they are not ranked.

For both planning units of Prince Edward Island, there were no threats ranked as very high. The following discussion focuses mainly on the highest ranked threats and notes a few medium and low threats when appropriate. In BCR 14 PEI and MBU 12 PEI, a category was added to allow for the inclusion of inadequate monitoring or research information in the threats classification scheme (category 12 "other direct threats" and sub-category 12.1 "information lacking"). However, this threat category was not ranked due to its incompatibility with the threat assessment method.

The list of all threats for each planning unit is included in Appendix 1 (Table A3). Some of the threats identified are not unique to a particular planning unit or a type of habitat (for example, fragmentation or loss of a particular habitat to urban development), while others are unique to a particular habitat (for example, loss of rooftops for nesting is a specific threat in urban habitats). These threats are categorized as per Salafsky et al. (2008; see Table A-4 in Appendix 3 for a complete list of threat categories). When the ranked threats are rolled up for each habitat class (Table 4), there are only three threat categories ranked high in BCR 14 PEI (Fig. 8): 11.4 Storms and flooding (the threats include reductions in survival of adults or chicks, flooding of nests due to heavy rains, and habitat loss due to increased severity or frequency of storms leading to coastal erosion) and 2.0 Agriculture and aquaculture in Cultivated and managed areas (the threats include fragmentation or loss of habitat due to conversion to cropland and destruction of nests due to early haying); and for MBU 12 PEI (Fig. 9), 9.0 Pollution in Coastal (intertidal) habitats (the threats include the decrease in diet quality, prey availability and therefore the health of birds due to chemical or heavy metal contamination or to oil spills and discharges and hypothermia caused by oil on plumage).

In BCR 14 PEI, the most frequently identified threats were related to Agricultural and forestry effluents (sub-category 9.3), such as decreases in diet quality and health of birds due to the consumption of contaminated food or the decrease in prey availability due to chemical contamination from biocides (Fig. 8 and Table A-3).

Inadequate monitoring or research was the second most frequently identified threat for priority bird species in MBU 12 PEI (Fig. 9). The most frequent (and, as mentioned above, highest ranked threats) were contamination of prey or decreases in prey availability due to chemical contamination or hypothermia caused by oil on plumage due to oil spills and discharges in coastal (intertidal) habitats (Fig. 9 and Table 4).

Threats to priority species while they are outside Canada during the non-breeding season were also assessed and are presented in the section: Threats Outside Canada.

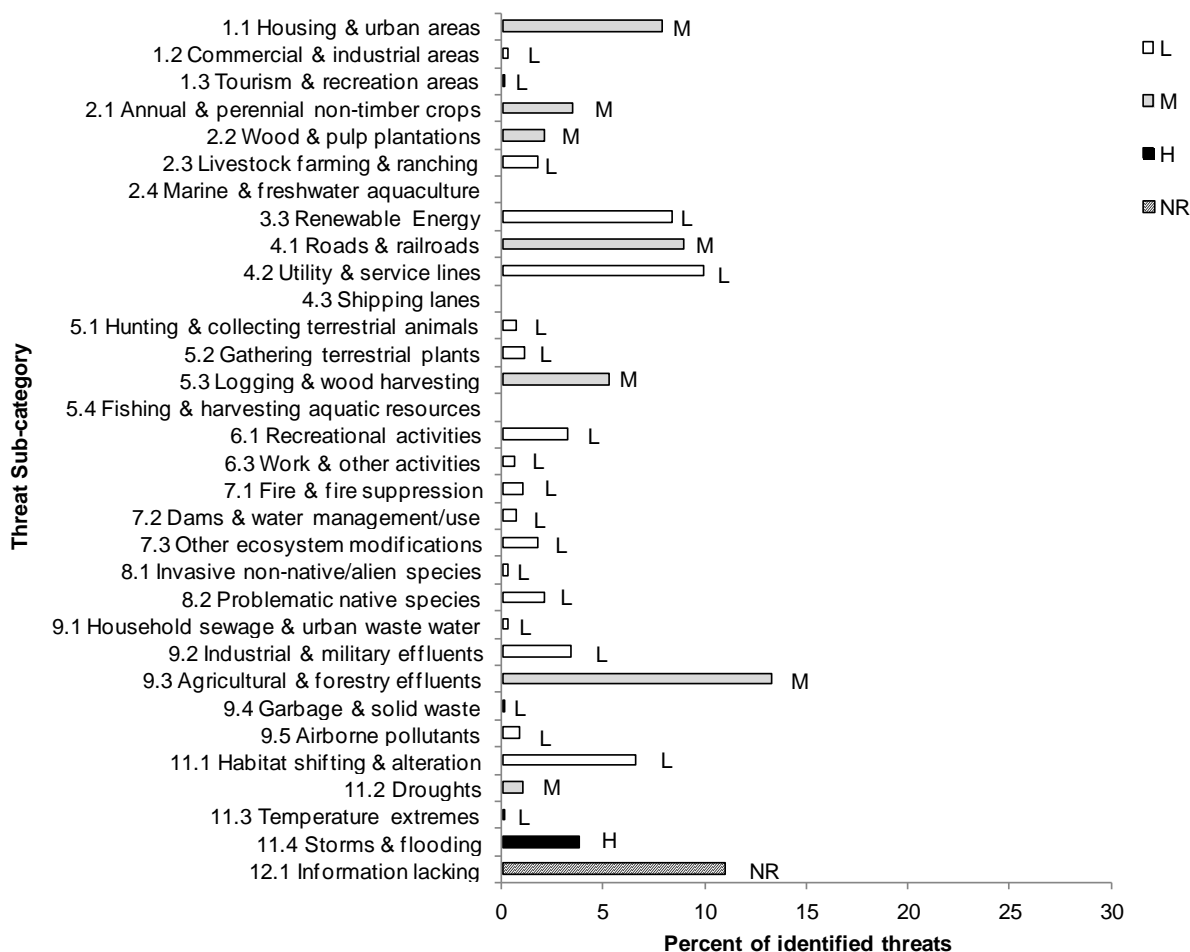


Figure 8. Percent of identified threats to priority bird species within BCR 14 PEI by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 14 PEI (for example, if 100 threats were identified in total for all priority species in BCR 14 PEI, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). Shading in the bars (H = high, M = medium, L = low and NR = not ranked) represents the rolled up magnitude of all threats in each threat sub-category in the BCR. (See Appendix 2 for details on how magnitude was assessed).

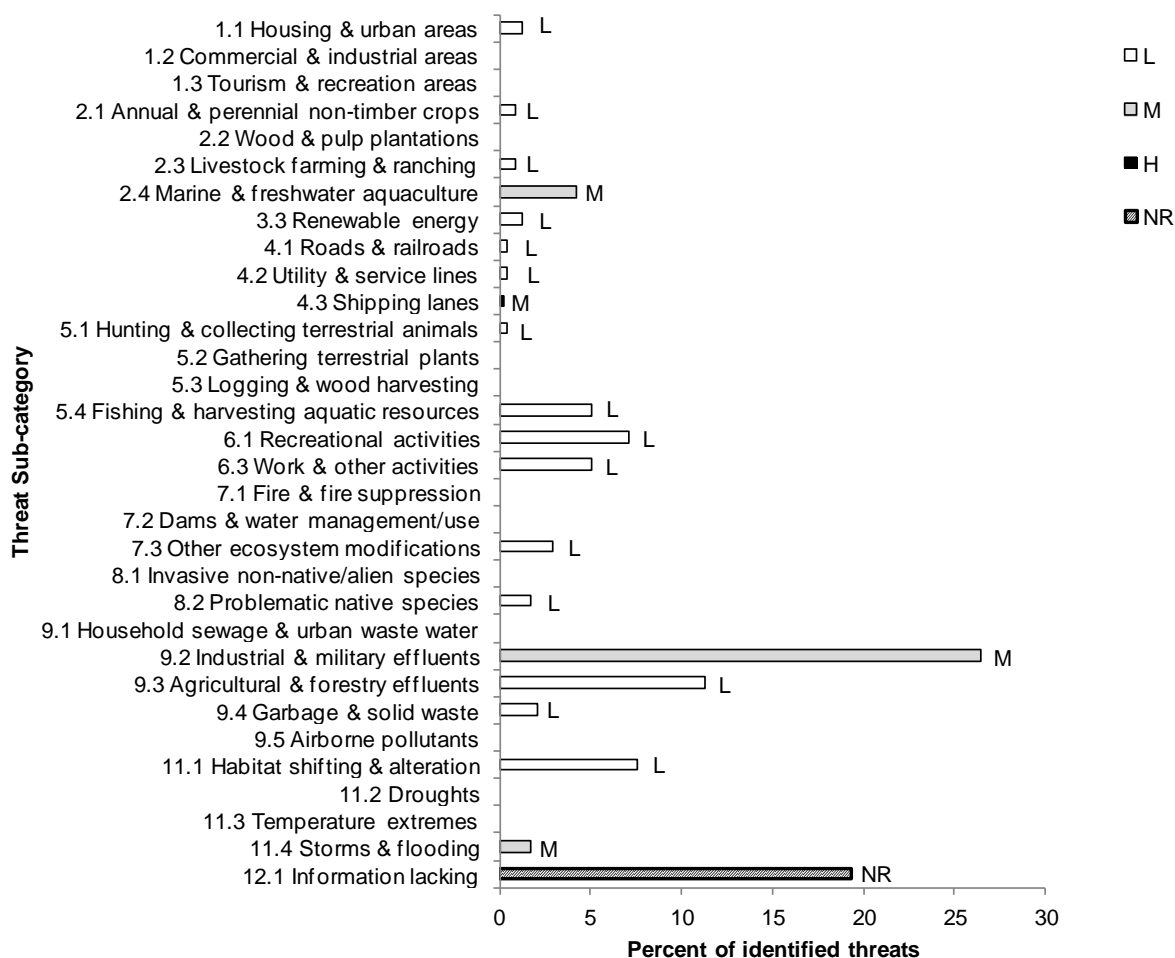


Figure 9. Percent of identified threats to priority bird species within MBU 12 PEI by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in MBU 12 PEI (for example, if 100 threats were identified in total for all priority species in MBU 12 PEI, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). Shading in the bars (H = high, M = medium, L = low and NR = not ranked) represents the rolled up magnitude of all threats in each threat sub-category in the BCR. (See Appendix 2 for details on how magnitude was assessed).

Table 4. Relative magnitude of identified threats to priority species within BCR 14 PEI by threat category and broad habitat class.

Overall ranks were generated through a roll-up procedure described in Kennedy et al. (2012). L represents Low Magnitude threats; M = Medium; H = High. Blank cells indicate that no priority species had threats identified in the threat category/habitat combination.

	BCR 14 PEI													MBU 12 PEI			
Threat category	Habitat class													Habitat class			
	Coniferous	Deciduous	Mixedwood	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Wetlands	Inland Waterbodies	Coastal (above high tide)	Riparian	Widespread	Overall	Marine Waters	Coastal (intertidal)	Widespread	Overall
Overall	M	M	M	L	L	M	L	M	L	M	M	M		M	M	L	
1. Residential & Commercial Development	L		L	L	L	L	M	M	L	M	M	L	M		L		L
2. Agriculture & aquaculture	M	M	M	L		H		M		L			M	M	L		L
3. Energy production & mining	L	L	L		L							L	L		L	L	L
4. Transportation & service corridors	M	L	M	L	L			L		L	L	L	M		L		L
5. Biological resource use	M	L	M		L			L	L	L	M		M	L	L		L
6. Human intrusions & disturbance					L		L	L	L	M	L		L	L	M		L
7. Natural system modifications	L	L	L	L		L		L		L	L		L		L		L
8. Invasive & other problematic species & genes		L	L	L		L	L	L	L	M	L		L	L	L		L
9. Pollution	M	M	M	L	L	M	L	M	M	M	M		M	M	H		M
11. Climate change & severe weather												H	M			M	L

Element 5: Conservation Objectives

Conservation objectives were designed to address threats and information gaps that were identified for priority species. They describe the environmental conditions and research and monitoring that are thought to be necessary for progress towards population objectives and to understand underlying conservation issues for priority bird species. As conservation objectives are reached, they will collectively contribute to achieving population objectives. Whenever possible, conservation objectives were developed to benefit multiple species, and/or respond to more than one threat (see Appendix 2).

In BCR 14 PEI, the majority of the conservation objectives fell into the category of ensuring adequate habitat is available for priority bird species (Fig. 10), while in MBU 12 PEI, the majority of conservation objectives fell in the category of reducing mortality of priority bird species (Fig. 11). While conservation objective category 2 includes objectives to both reduce mortality and increase productivity, most priority bird species in MBU 12 PEI do not breed within the MBU, and therefore most of the recommended objectives and actions address the reduction of mortality in MBU 12 PEI. However, in BCR 14 PEI, either reducing mortality or increasing productivity of priority birds was the second-most frequent conservation objective (Fig. 10). Improving our understanding of priority bird species in MBU 12 PEI is the second-most frequent conservation objective category (Fig. 11) and the third in BCR 14 PEI (Fig. 10); this is consistent with the fact that for the majority of priority bird species of MBU 12 PEI, we do not have enough information on population trends to set specific population objectives (Fig. 7), while for most priority birds in BCR 14 PEI, there is more information regarding population trends.

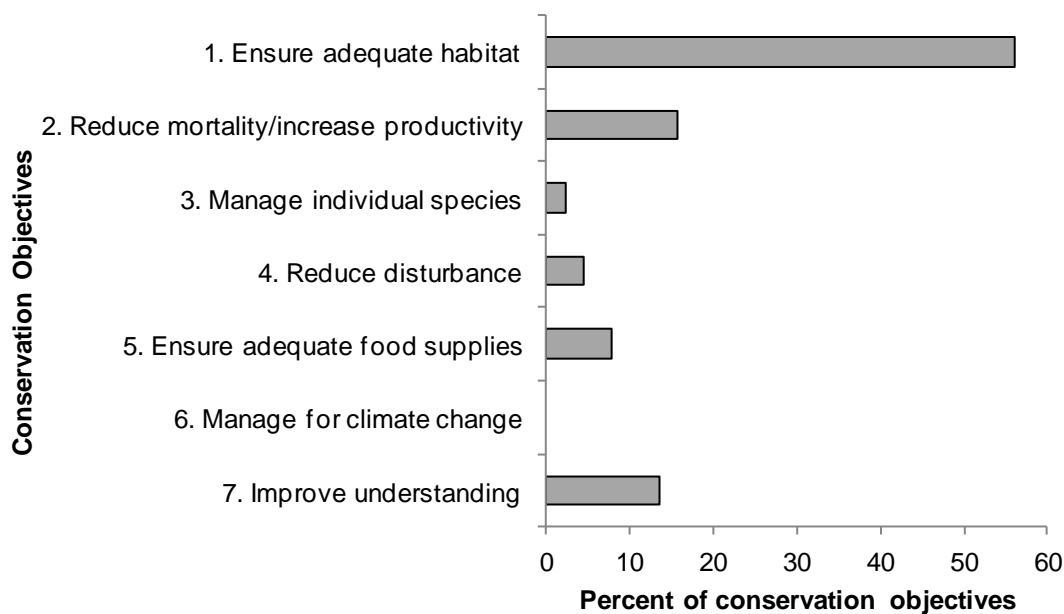


Figure 10. Percent of all conservation objectives assigned to each conservation objective category in BCR 14 PEI. Conservation objectives related to climate change are discussed in Section 3: Widespread Issues.

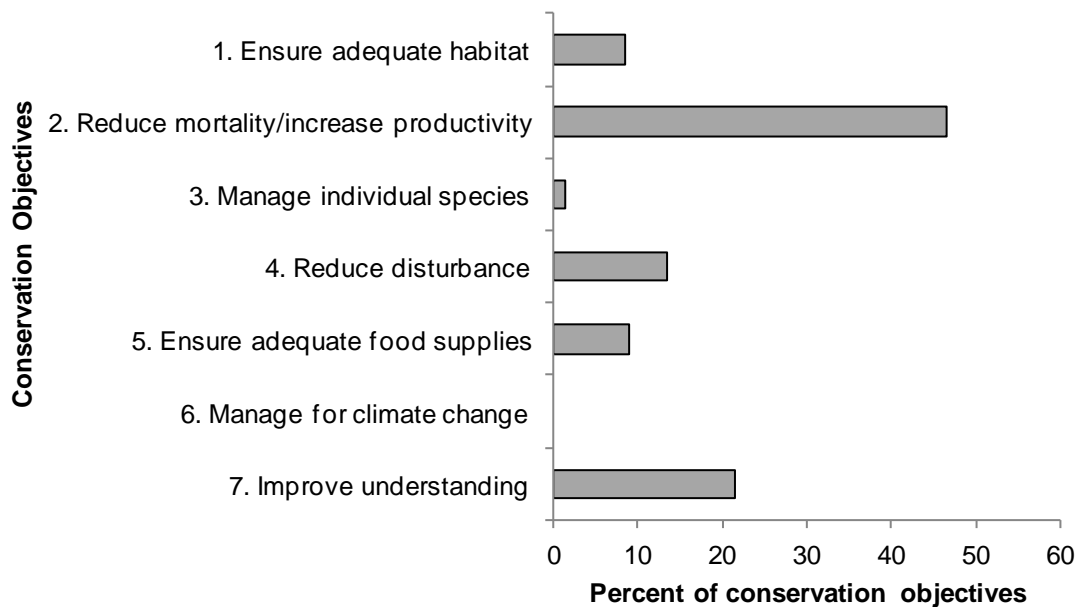


Figure 11. Percent of all conservation objectives assigned to each conservation objective category in MBU 12 PEI. Conservation objectives related to climate change are discussed in Section 3: Widespread Issues.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (Figs. 10 and 11). Actions are strategic rather than highly detailed and prescriptive (see Appendix 2). Whenever possible, recommended actions benefit multiple species, and/or respond to more than one threat. Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but will usually be more general than those developed for individual species.

The recommended conservation actions are categorized as per World Conservation Union-Conservation Measures Partnership (IUCN-CMP) with the addition of categories for research and monitoring (see Table A-5 in Appendix 3 for a complete list of conservation action categories). In BCR 14 PEI, the most frequently recommended conservation actions fall under the sub-categories of 2.1 Site/area management and 5.3 Private sector standards and codes (Fig. 12). Examples of recommended conservation actions under site or area management include specific recommendations to maintain patch sizes, configuration and connectivity of different types of forests; to reduce fragmentation of habitats within wetlands to reduce the extent of edges; to maintain large trees, to define and provide minimum number, size and condition of residual snags and living trees for priority bird species. Examples of recommended conservation actions under 5.3 Private sector standards and codes include the development and implementation of guidelines for the protection of priority bird species and development of beneficial management practices for peat harvesting, renewable energy development, forestry and agriculture (see Section 2: Conservation Needs by Habitat for more examples).

In MBU 12 PEI, the most frequently recommended conservation actions fall in the 5 Law and policy category as 5.3 Private sector standards and codes and 5.4 Compliance and enforcement (Fig. 13). Examples of recommended conservation actions under private sector standards and codes, specific to MBUs include the implementation of beneficial management practices for aquaculture, fisheries and other coastal resource harvesting industries; the development of beneficial management practices and avoidance guidelines to manage renewable energy developments and minimize habitat degradation. Examples of recommended conservation actions under compliance and enforcement include monitoring and enforcing compliance with laws, policies and regulations to minimize seabird bycatch and/or laws, policies and regulations related to the release of oil and other wastes into marine waters (see Section 2: Conservation Needs by Habitat for more examples).

In MBU 12 PEI, 4.3 Awareness and communications is another sub-category of frequently recommended conservation actions (Fig. 13). Examples of recommended conservation actions include raising public awareness of shorebirds and their habitat needs as well as the impacts of disturbance from recreational activities in coastal habitats; or raising public awareness of issues surrounding human disturbance at seabird colonies or in other nesting areas; or of the impacts on shorebirds and seabirds of installing riprap in coastal areas (see Section 2: Conservation Needs by Habitat for more examples).

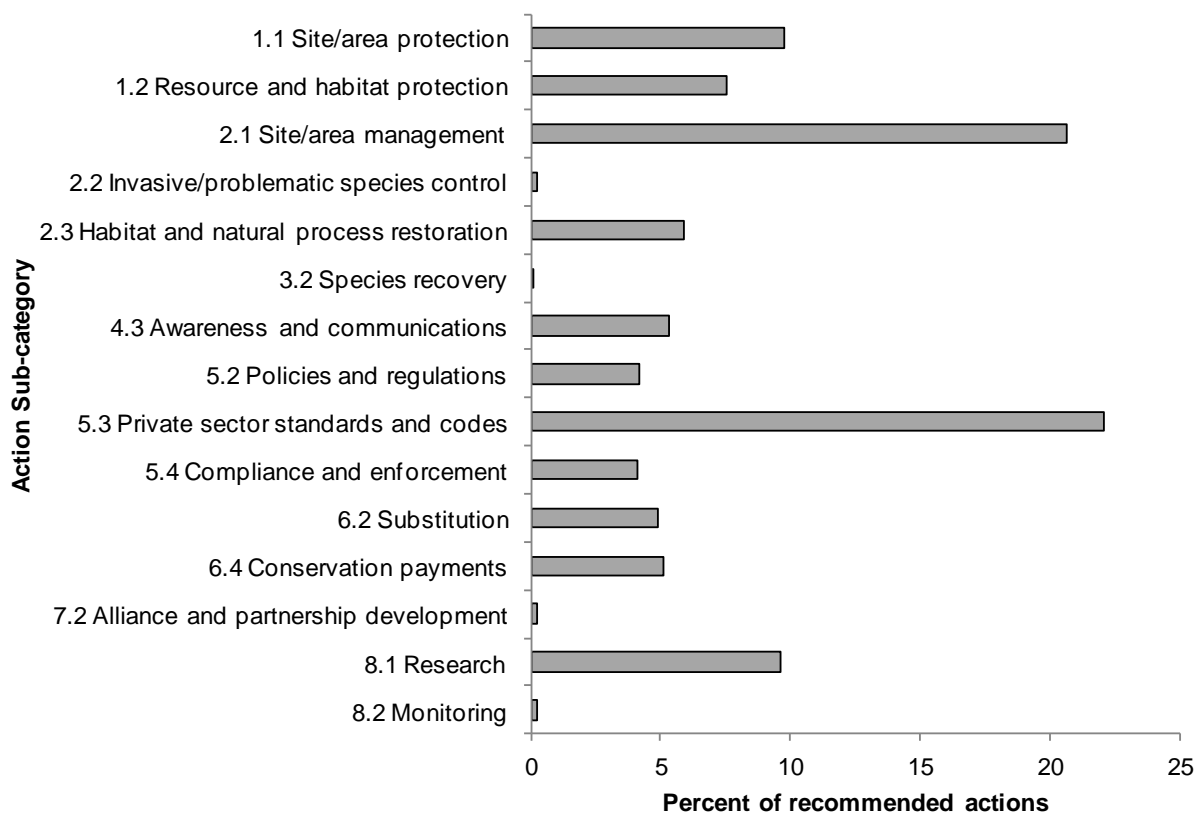


Figure 12. Percent of recommended actions assigned to each sub-category in BCR 14 PEI.

“8.2 Monitoring” refers to specific species where monitoring is required. “8.1 Research” refers to specific species where additional information is required. For more information, see Research and Population Monitoring Needs in Section 3.

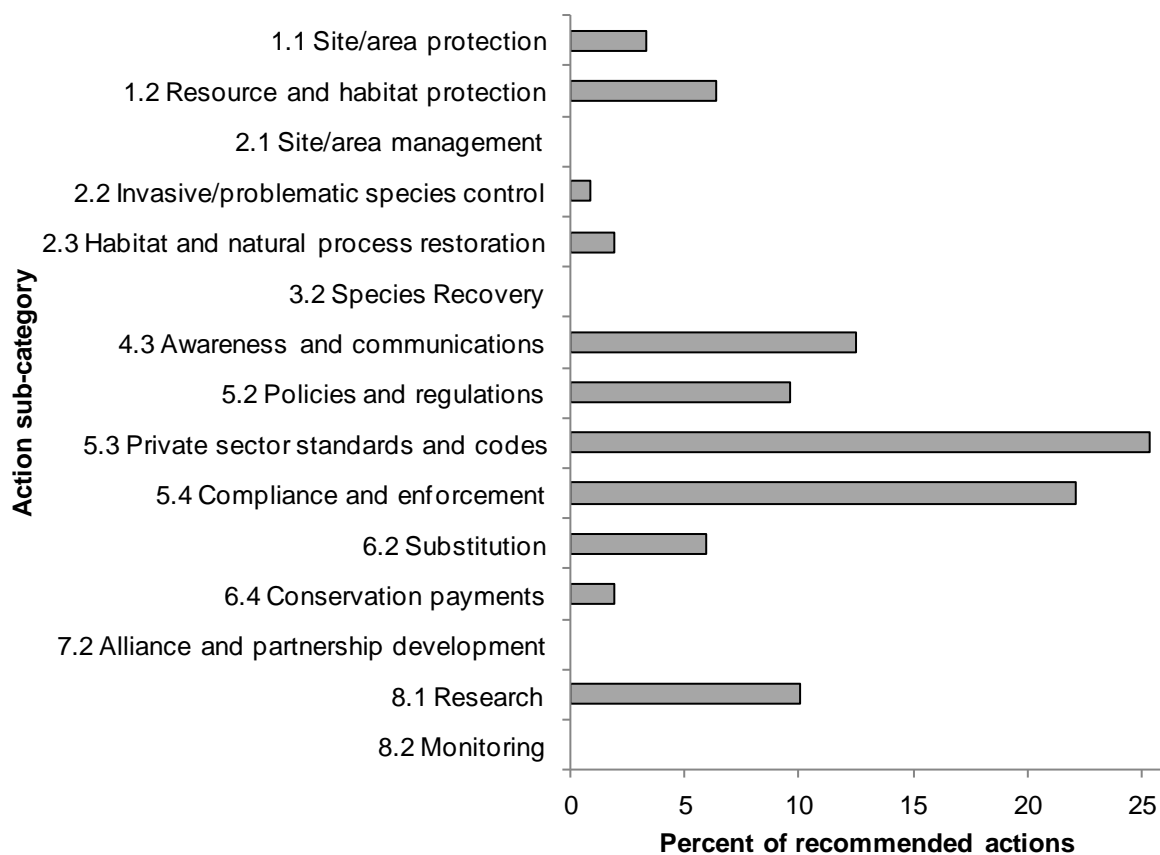


Figure 13. Percent of recommended actions assigned to each sub-category in MBU 12 PEI.

“8.2 Monitoring” refers to specific species where monitoring is required. “8.1 Research” refers to specific species where additional information is required. For more information, see Research and Population Monitoring Needs in Section 3.

Section 2: Conservation Needs by Habitat

The following sections provide more detailed information on priority species, their threats and objectives within each of the broad habitat classes that occur in BCR 14 PEI and in MBU 12 PEI. Where appropriate, habitat information is provided at a finer scale than the broad habitat categories in order to coincide with other land management exercises in the region. Some species do not appear in the threats table because threats that were ranked low have not been assigned objectives or actions and/or identified threats are addressed in the Widespread Issues section of the strategy.

Coniferous

Unlike the other two Maritime provinces (where over 75% of total tree basal area is coniferous trees), BCR 14 PEI is not dominated by coniferous forests, with only 455 km² of BCR 14 PEI covered by coniferous forest (8% as calculated by Dettmers (2006)). In fact, there are no large areas of coniferous forest and where there are smaller areas, they are typically along coastal or riparian areas (Fig. 14). The dominant canopy species of these areas include: red spruce (*Picea rubens*), balsam fir (*Abies balsamea*) and white spruce (*Picea glauca*). Black spruce (*Picea mariana*) is found in wet and nutrient poor areas, often with Tamarack (*Larix laricina*). Also present are red pine (*Pinus resinosa*) and white pine (*Pinus strobus*). Eastern hemlock (*Tsuga Canadensis*) is typical of cool moist slopes in old growth areas, and eastern white cedar (*Thuja occidentalis*) is found in moderate rich wet soils (Simpson 2008).

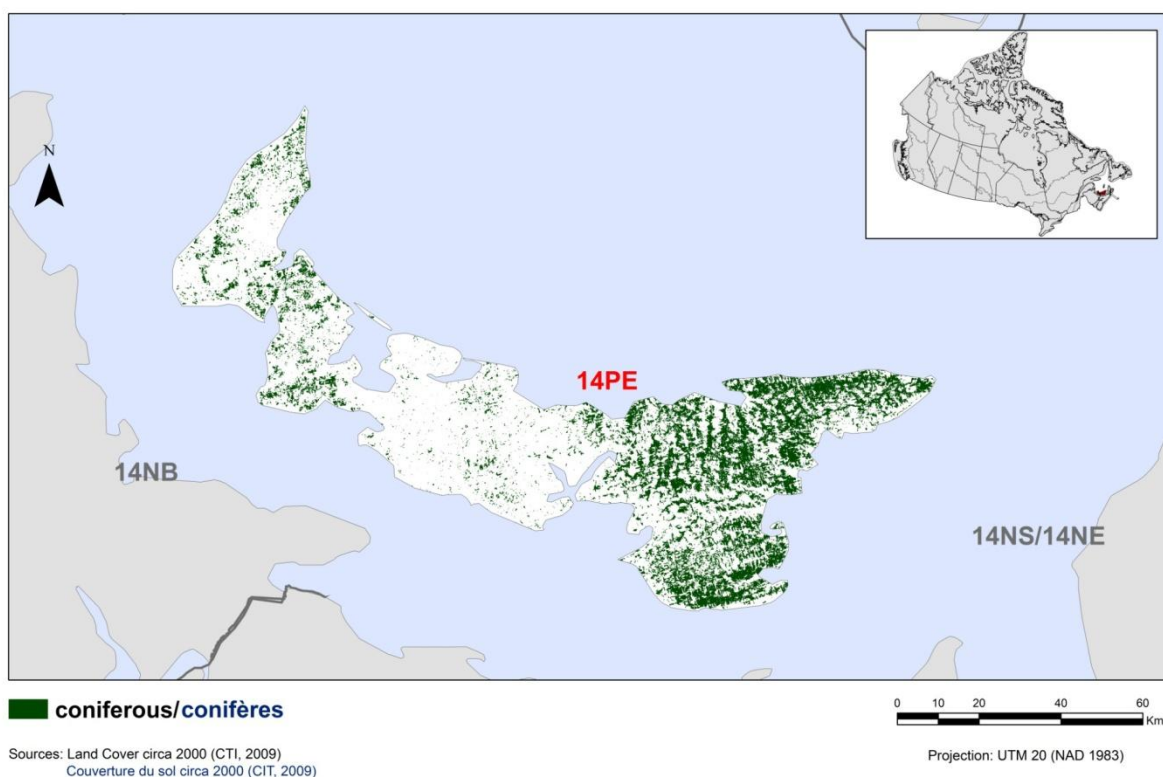


Figure 14. Map of coniferous habitat in PEI BCR14.

There are 14 priority bird species found in coniferous forest in BCR 14 PEI; all are landbirds and 4 of these are Species at Risk (Table 5). Within the broad coniferous habitat category, half of the priority bird species are found in mature or old growth forests. Priority species are also found in open forest, spruce-fir forest, dense forest, second-growth forest and moist forest.

The highest ranked threats identified were related to forestry activities such as habitat conversion to managed coniferous forest (2.2 Wood & pulp plantations); logging activities (5.3 Logging & wood harvesting); and chemical contamination of the birds' food sources by pesticides, fungicides and insecticides used by either the forestry industry or by drifting from nearby agriculture industry (9.3 Agricultural & forestry effluents) (Mineau 2003). All of these ranked medium. The three most frequently identified threats to priority birds in coniferous forests were: forest loss and fragmentation due to the construction and operation of wind farms (3.3 Renewable energy); construction and maintenance of roads (4.1 Roads & railroads); and construction and maintenance of right-of-ways to service lines (4.2 Utility & service lines) (Fig. 15). These threats were ranked low, except for the threats related to roads, which ranked medium.

Many more bird species will benefit from the recommended actions presented in Table 6. The recommended actions to address medium ranked threats relate primarily to forest management and promote the integration of bird conservation needs into forest management practices by protecting areas of existing old-growth and late-succession forest habitats, and developing beneficial management practices and guidelines to limit degradation of habitat features important to priority birds. The agriculture industry in Prince Edward Island is extensive, and chemical contamination of coniferous forest is likely affecting food sources for birds (for example, by reducing insect populations) and reproductive success of some priority bird species as a result of chemical drifting (e.g., Tennessee Warbler, Common Nighthawk; Mineau 2003). As such, pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 5. Priority species that use coniferous habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						Review
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	
American Redstart	Second-Growth Forest	abundant shrubs and saplings, near water and/or forest edge	Maintain current					Y		
Bay-breasted Warbler	Mature to Old Growth Forest	mature forest and older	Increase 100%				Y			
Black-throated Green Warbler	Middle-aged to Mature Forest	interior, middle/mature forest	Maintain current			Y		Y		
Boreal Chickadee	Spruce-Fir Forest	snags/cavities, coastal ridges	Assess/Maintain				Y			
Canada Warbler	Moist Forest	dense understory, shrub layer, ground moss, moist	Increase 50%	Y	Y		Y			
Cape May Warbler	Mature to Old Growth Forest	mature	Increase 50%				Y	Y		
Common Nighthawk	Open Forest	mature forest and older, bare areas within	Increase 100%	Y						
Evening Grosbeak	Second-Growth and Mature Forest	mid/mature open canopy, nesting in bigger trees	Increase 100%				Y			
Gray Jay	Mature Forest	mature forest	Assess/Maintain							Y
Northern Parula	Second-Growth and Mature Forest	<i>Usnea</i> and similar lichens	Maintain current					Y		
Olive-sided Flycatcher	Second-Growth and Mature Forest	edges, open areas with perches	Increase 50%	Y	Y		Y			
Rusty Blackbird	Moist Forest	bog edges or forested wetland, shrub layer, old beaver flowages	Increase 100%	Y			Y			
Sharp-shinned Hawk	Second-Growth Forest	mature, dense, well developed canopy	Maintain current					Y		
Tennessee Warbler	Second-Growth and Mature Forest	small deciduous trees and shrubs	Increase 100%							Y

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

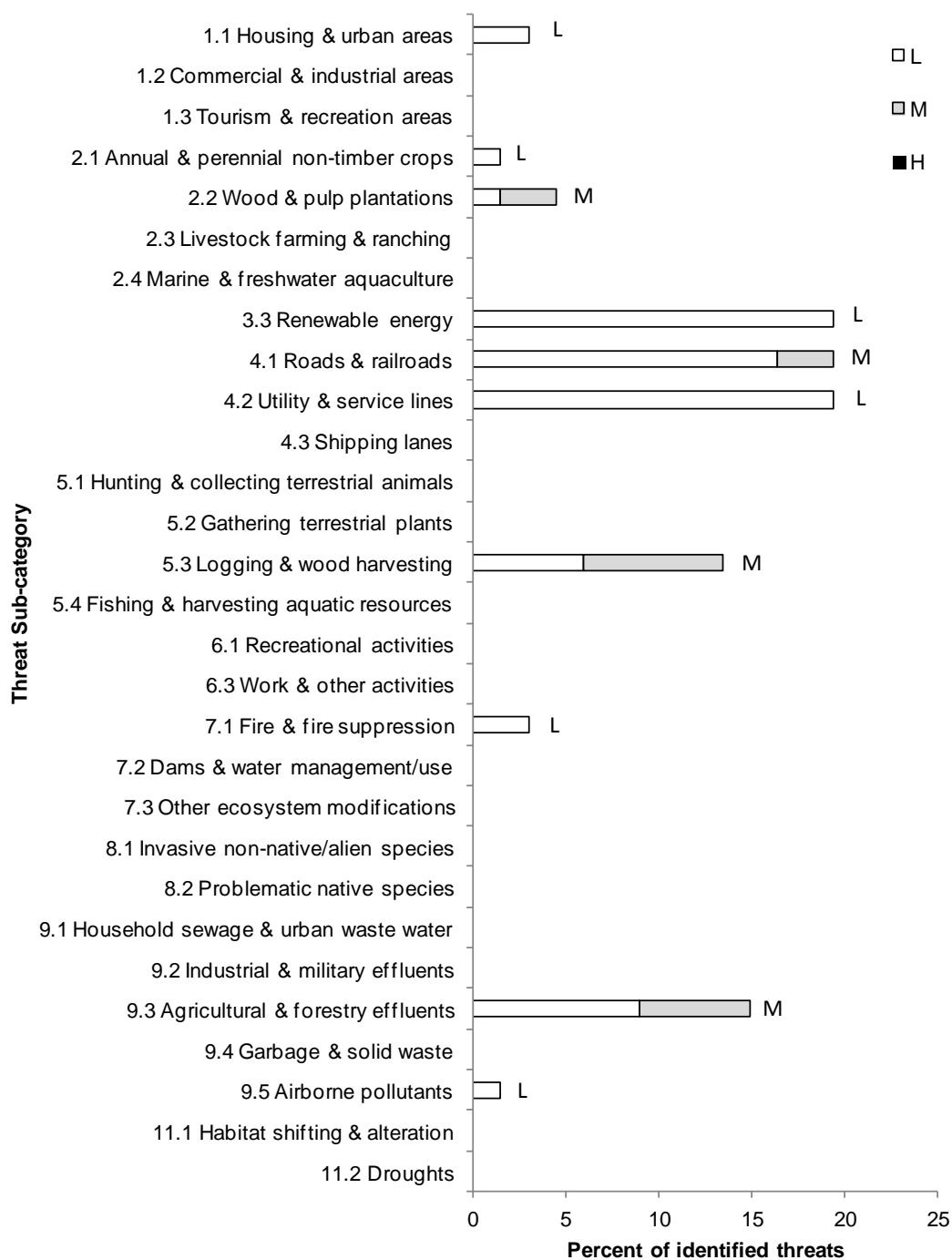


Figure 15. Percent of identified threats to priority bird species in coniferous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the coniferous habitat (for example, if 100 threats were identified in total for all priority bird species in coniferous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for

one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in coniferous habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 14 PEI by threat category and broad habitat class). **Note:** Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions.

Table 6. Threats addressed, conservation objectives, recommended actions, and priority species affected for coniferous habitat in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of coniferous forests due to its conversion to managed coniferous forest	2.2 Wood & pulp plantations	Maintain/restore coniferous forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Bay-breasted Warbler, Boreal Chickadee, Tennessee Warbler
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Fragmentation or loss of coniferous forests due to the construction and maintenance of roads	4.1 Roads & railroads	Reduce/eliminate habitat fragmentation from the construction of roads	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Black-throated Green Warbler, Boreal Chickadee
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees	2.1 Site/area management	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the **Error! Reference source not found.** section, 3) identified threats in this habitat are of low magnitude.

Table 6 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
				needed for priority species.		
				Develop and implement beneficial management practices to limit habitat fragmentation from development (e.g. power lines, road construction).	5.3 Private sector standards and codes	
				Undertake further analysis to achieve a more complete understanding of the impacts of fragmentation on species composition.	8.1 Research	
Fragmentation or loss of coniferous forests due to logging activities	5.3 Logging & wood harvesting	Maintain/restore coniferous forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Bay-breasted Warbler, Boreal Chickadee, Canada Warbler, Cape May Warbler, Evening Grosbeak
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Decrease of diet quality and of health of birds due to the	9.3 Agricultural & forestry effluents	Reduce mortality from exposure to pesticides and other biocides	2.1 Reduce mortality and/or sub-lethal effects from pesticide	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Tennessee Warbler

Table 6 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide		used by the agriculture industry	use	Promote pesticide free products.	6.2 Substitution	
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Cape May Warbler, Common Nighthawk, Olive-sided Flycatcher
				Promote pesticide free products.	6.2 Substitution	

Deciduous

Deciduous forest habitats (where over 75% of total tree basal area is deciduous trees) occur throughout BCR 14 PEI (Fig. 16). Covering 722 km², this habitat class accounts for nearly 13% of the planning unit (Dettmers 2006). Dominant canopy species include sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*) and red oak (*Quercus rubra*). Other common species include: white ash (*Fraxinus americana*), red maple (*Acer rubrum*) and striped maple (*Acer pensylvanicum*). White birch (*Betula papyrifera*), grey birch (*Betula populifolia*), trembling aspen (*Populus tremuloides*) and largetooth aspen (*P. grandidentata*) are commonly found pioneer species.

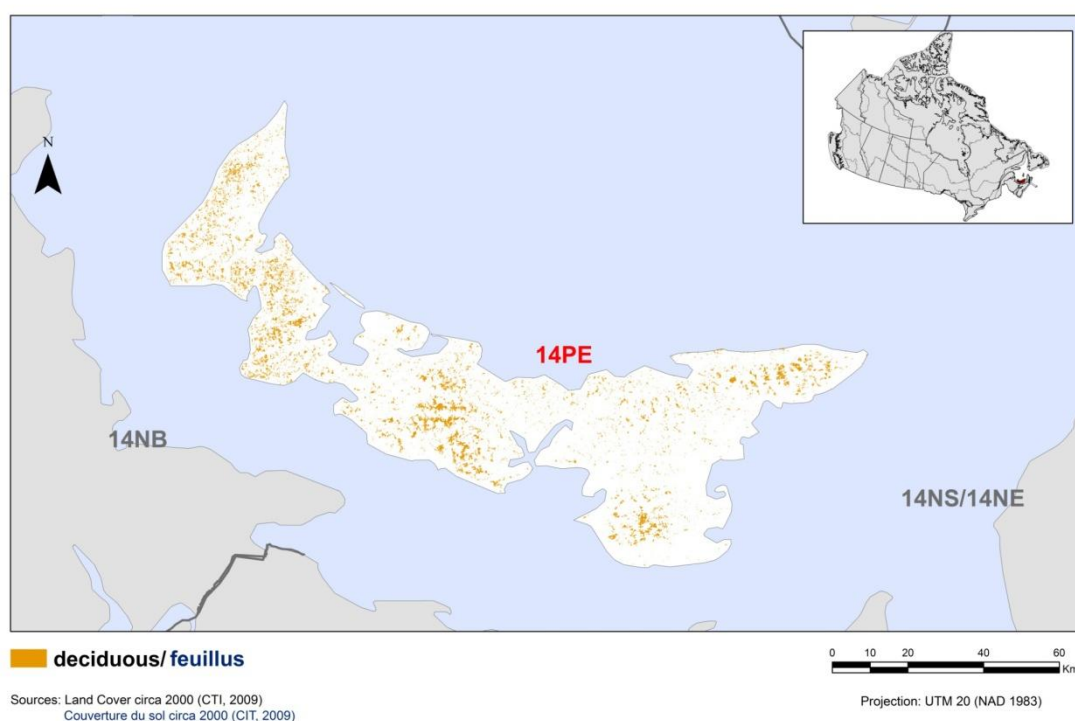


Figure 16. Map of deciduous habitat in PEI BCR14.

There are nine priority bird species in the deciduous forests of BCR 14 PEI; all are landbirds and only one of these is a Species at Risk (Table 7), though the Eastern Wood-Pewee is a candidate under review by COSEWIC as of 2012. Within this habitat, four of the priority bird species are found in mature or old-growth forest, though nearly all of them (7) are found in second-growth forests.

The highest ranked threats were related to forestry activities such as habitat conversion to managed coniferous forest (2.2 Wood & pulp plantations); logging activities (5.3 Logging & wood harvesting); and chemical contamination of the birds' food sources by

pesticides, fungicides and insecticides used by either the forestry industry or by drifting from nearby agriculture industry (9.3 Agricultural & forestry effluents) (Mineau 2003). Only the conversion to managed coniferous forest had an overall magnitude of medium. The three most frequently identified threats to the priority birds found in deciduous forests were: forest loss and fragmentation due to the construction and operation of wind farms (3.3 Renewable energy); construction and maintenance of roads (4.1 Roads & railroads); and construction and maintenance of right-of-ways to service lines (4.2 Utility & service lines) (Fig. 17). These threats, however, were all ranked low.

Many more bird species will benefit from the Recommended Actions presented in Table 8. The recommended actions to address medium ranked threats relate primarily to forest management and promote the integration of bird conservation needs into forest management practices by protecting areas of existing old-growth and late-succession forest habitats, and developing beneficial management practices and guidelines to limit degradation of habitat features important to priority birds. The agriculture industry in Prince Edward Island is extensive and chemical contamination of deciduous forest is likely affecting food sources for birds (for example, by reducing insect populations) and reproductive success of some priority bird species as a result of chemical drifting (e.g., Eastern Wood-Pewee; Mineau 2003). As such, pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 7. Priority species that use deciduous habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
American Redstart	Second-Growth Forest	abundant shrubs and saplings, near water and/or forest edge	Maintain current					Y		
Black-billed Cuckoo	Second-Growth Forest	shrubs	Assess/Maintain		Y		Y			
Canada Warbler	Moist Forest	dense understory, shrub layer, ground moss, moist	Increase 50%	Y	Y		Y			
Eastern Wood-Pewee	Middle-aged to Mature Forest	mature with open understory	Increase 50%				Y			
Mourning Warbler	Second-Growth Forest	young, clearcuts, pushups (where clearcut rubble is pushed in piles on edge of cut)	Maintain current					Y		
Northern Parula	Second-Growth and Mature Forest	Usnea and similar lichens	Maintain current					Y		
Rose-breasted Grosbeak	Second-Growth and Mature Forest	forest edge or dense saplings with open canopy	Maintain current					Y		
Ruffed Grouse	Second-Growth and Mature Forest	coarse woody debris, older forest for nesting, younger for brood cover	Increase 50%				Y			
Veery	Second-Growth Forest	dense understory, moist	Assess/Maintain				Y			

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

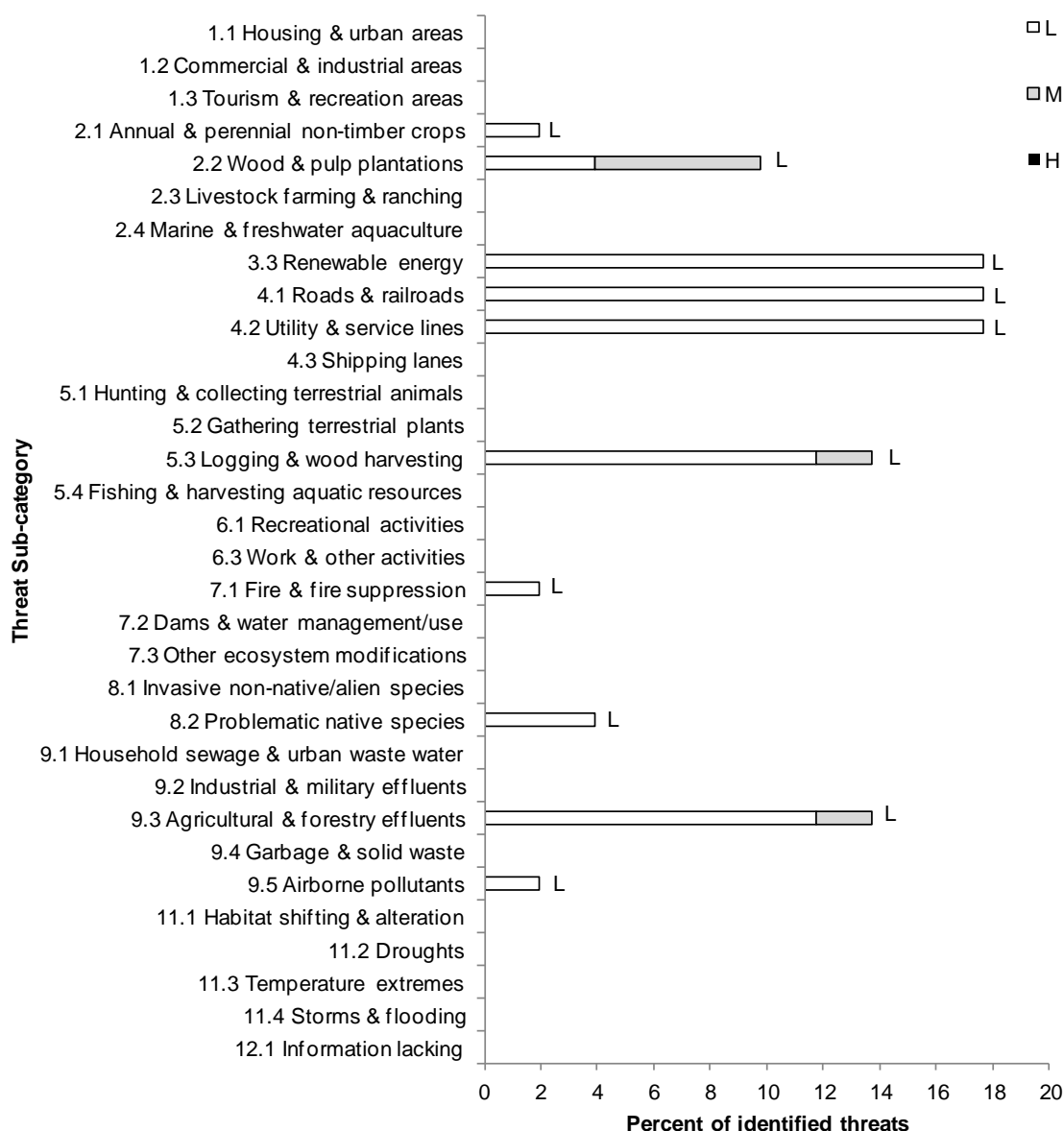


Figure 17. Percent of identified threats to priority bird species in deciduous forests in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the deciduous habitat (for example, if 100 threats were identified in total for all priority bird species in deciduous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in deciduous habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions

Table 8. Threats addressed, conservation objectives, recommended actions, and priority species affected for deciduous habitat in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of deciduous forest due to its conversion to managed coniferous forest	2.2 Wood & pulp plantations	Maintain/restore deciduous forest habitat	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Black-billed Cuckoo, Mourning Warbler, Ruffed Grouse
				Maintain sufficient patch sizes, configuration, and connectivity of deciduous forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Manage post-logging sites to also permit/encourage deciduous regeneration.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Fragmentation or loss of deciduous forests due to logging activities	5.3 Logging & wood harvesting	Maintain/restore deciduous forests	1.1 Ensure land and resource-use policies and practices	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Canada Warbler
				Maintain sufficient patch sizes, configuration, and connectivity of deciduous forest habitats to support and,	2.1 Site/area management	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the **Error! Reference source not found.** section, 3) identified threats in this habitat are of low magnitude.

Table 8 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
			maintain or improve bird habitat	where necessary, enhance populations of priority species.		
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Manage post-logging sites to also permit/encourage deciduous regeneration.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Eastern Wood-Pewee
				Promote pesticide free products.	6.2 Substitution	

Mixed Wood

Mixed wood forest habitat (where smaller proportion of deciduous or coniferous tree basal area is a minimum of 25%) is the dominant forest habitat type (the second most common habitat type overall following agriculture and cultivated lands; Fig. 18), with 1145 km² (20%) of BCR 14 PEI (Dettmers 2006). Dominant canopy species include red spruce (*Picea rubens*), sugar maple (*Acer saccharum*) and balsam fir (*Abies balsamea*), with other species such as American beech (*Fagus grandifolia*) and yellow birch (*Betula alleghaniensis*) in smaller numbers.

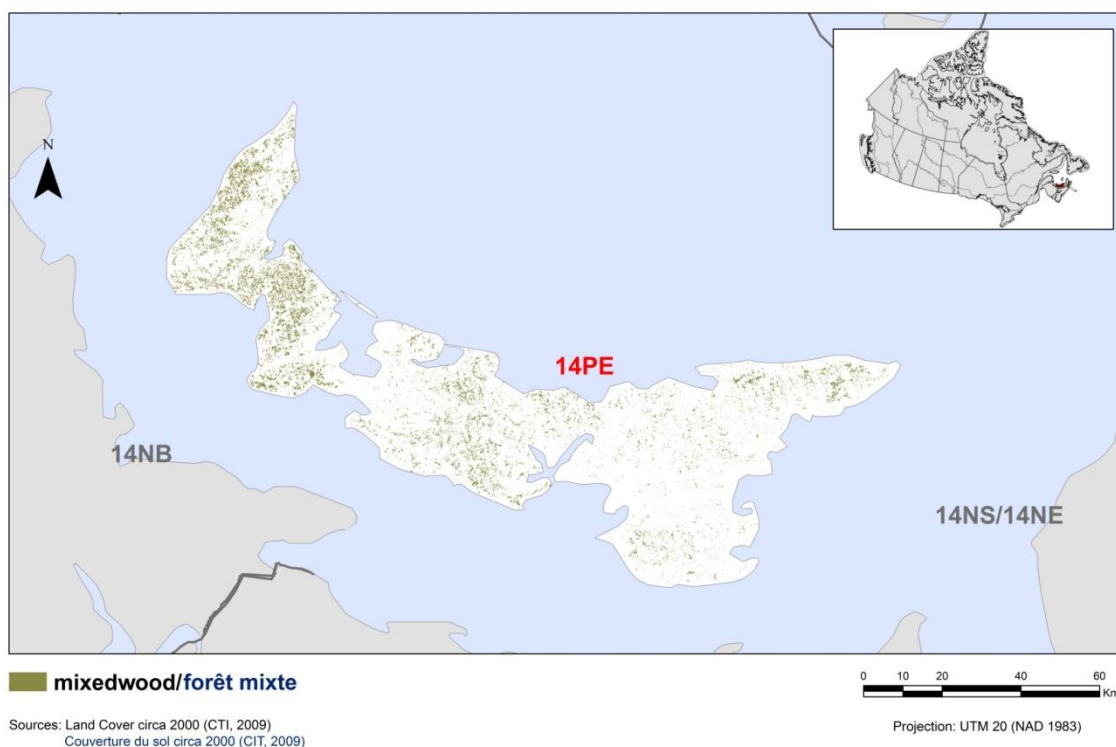


Figure 18. Map of mixed wood habitat in BCR 14 PEI.

There are 17 priority bird species found in mixed wood forests in BCR 14 PEI; all are landbirds and 4 of these are Species at Risk (Table 9). Within this habitat type, 8 of the priority bird species are found in mature or old-growth forests, though 11 of them are found in second-growth forest (Table 9).

The highest ranked threats identified in the mixed wood forests of BCR 14 PEI (Fig. 19 and Table 10) were related to forestry activities such as habitat conversion to managed coniferous forest (2.2 Wood & pulp plantations); logging activities (5.3 Logging & wood harvesting); and chemical contamination of the birds' food sources by pesticides, fungicides and insecticides used by either the forestry industry or by drifting from nearby agriculture industry (9.3 Agricultural & forestry effluents) (Mineau 2003). The three most frequently

identified threats to priority birds found in mixed wood forests were: forest loss and fragmentation due to the construction and operation of wind farms (3.3 Renewable energy); construction and maintenance of roads (4.1 Roads & railroads); and construction and maintenance of right-of-ways to service lines (4.2 Utility & service lines). These threats, however, were ranked low, with the exception of threats related to roads, which ranked medium.

Many more bird species will benefit from the Recommended Actions presented in Table 10. The recommended actions to address medium-ranked threats include promoting the integration of bird conservation needs into forest management practices by protecting areas of existing old-growth and late-succession forest habitats, and the development of beneficial management practices and guidelines to limit degradation of habitat features important to priority birds. In addition, pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 9. Priority species that use mixed wood habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
American Redstart	Second-Growth Forest	abundant shrubs and saplings, near water and/or forest edge	Maintain current					Y		
American Woodcock	Second-Growth Forest	young moist forest with openings	Increase 50%		Y					
Bay-breasted Warbler	Mature to Old-Growth Forest	mature forest and older	Increase 100%				Y			
Black-billed Cuckoo	Second-Growth Forest	shrubs	Assess/Maintain		Y		Y			
Black-throated Green Warbler	Middle-aged to Mature Forest	interior, middle/mature forest	Maintain current			Y		Y		
Canada Warbler	Moist Forest	dense understory, shrub layer, ground moss, moist	Increase 50%	Y	Y		Y			
Common Nighthawk	Open Forest	mature forest and older, bare areas within	Increase 100%	Y						
Eastern Wood-Pewee	Middle-aged to Mature Forest	mature with open understory	Increase 50%				Y			
Evening Grosbeak	Second-Growth and Mature Forest	mid/mature open canopy, nesting in bigger trees	Increase 100%				Y			
Mourning Warbler	Second-Growth Forest	young, clearcuts, pushups (where clearcut rubble is pushed in piles on edge of cut)	Maintain current					Y		
Northern Parula	Second-Growth and Mature Forest	Usnea and similar lichens	Maintain current					Y		
Olive-sided Flycatcher	Second-Growth and Mature Forest	edges, open areas with perches	Increase 50%	Y	Y		Y			
Rose-breasted Grosbeak	Second-Growth and Mature Forest	forest edge or dense saplings with open canopy	Maintain current					Y		
Ruffed Grouse	Second-Growth and Mature Forest	coarse woody debris, older forest for nesting, younger for brood cover	Increase 50%				Y			
Rusty Blackbird	Moist Forest	bog edges or forested wetland, shrub layer, old beaver flowages	Increase 100%	Y			Y			
Sharp-shinned Hawk	Second-Growth Forest	mature, dense, well developed	Maintain current					Y		

Table 9 continued

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
		canopy								
Veery	Second-Growth Forest	dense understory, moist	Assess/Maintain				Y			

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

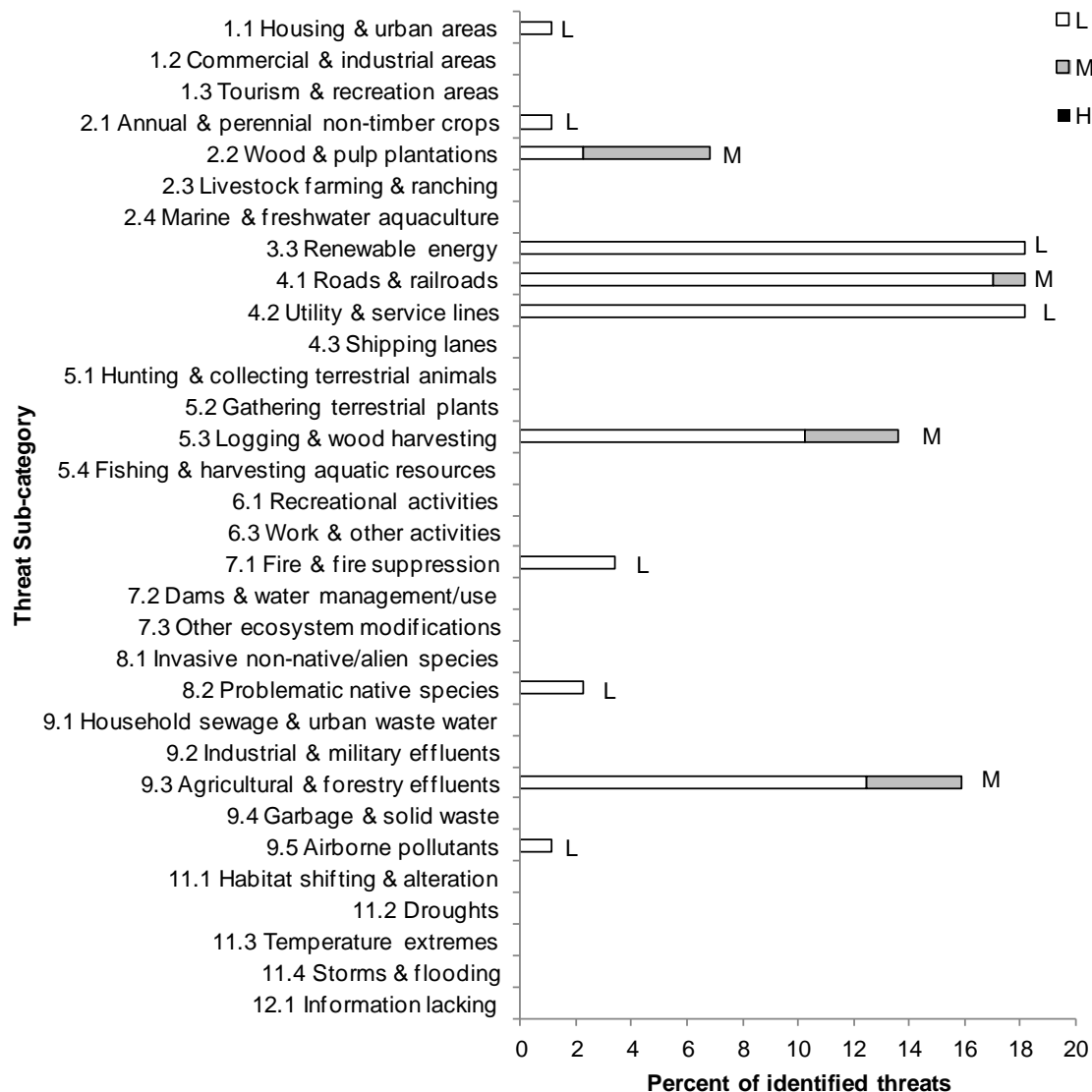


Figure 19. Percent of identified threats to priority bird species in mixed wood habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in mixed wood habitat (for example, if 100 threats were identified in total for all priority bird species in mixed wood habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in mixed wood habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 10. Threats addressed, conservation objectives, recommended actions, and priority species affected for mixed wood habitat in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of mixed wood forest due to its conversion to managed coniferous forest	2.2 Wood & pulp plantations	Maintain/restore mixed wood	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Bay-breasted Warbler, Black-billed Cuckoo, Mourning Warbler, Ruffed Grouse
				Maintain sufficient patch sizes, configuration, and connectivity of mixed wood habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Fragmentation or loss of mixed wood forest due to the construction and maintenance of	4.1 Roads & railroads	Reduce/eliminate habitat fragmentation from the construction of	1.1 Ensure land and resource-use policies and practices maintain or improve bird	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Black-throated Green Warbler
				Maintain sufficient patch sizes, configuration, and connectivity of mixed wood habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 10 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
roads		roads	habitat	Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement beneficial management practices to limit habitat fragmentation from development (e.g. power lines, road construction).	5.3 Private sector standards and codes	
				Undertake further analysis to achieve a more complete understanding of the impacts of fragmentation on species composition.	8.1 Research	
Fragmentation or loss of mixed wood forests due to logging activities	5.3 Logging & wood harvesting	Maintain/restore forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Bay-breasted Warbler, Canada Warbler, Evening Grosbeak
				Maintain sufficient patch sizes, configuration, and connectivity of mixed wood habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Decrease of prey availability to	9.3 Agricultural	Reduce the loss of prey/food	5.2 Manage decreases in	Use pesticides and other biocides only where necessary and only as part of an integrated pest	5.3 Private sector standards and codes	Medium: Common

Table 10 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	& forestry effluents	source from exposure to pesticides and other biocides used by the agriculture industry	prey due to contaminants	management system to minimize exposure of birds to potentially toxic chemicals.		Nighthawk, Eastern Wood-Pewee, Olive-sided Flycatcher
				Promote pesticide free products.	6.2 Substitution	

Shrub/Early Successional

Shrub/early successional habitats are generally transient, occurring where disturbance has removed the tree cover (Fig. 20) and are fairly common, covering 468 km² (or 8% of BCR 14 PEI; Dettmers 2006). These habitats are dominated by shrubs and a low density of pioneer tree species such as: pin cherry (*Prunus pensylvanica*), raspberry, white birch (*Betula papyrifera*) and grey birch (*Betula alleghaniensis*), poplar (*Populus*), white spruce (*Picea glauca*) and tamarack (*Larix laricina*).

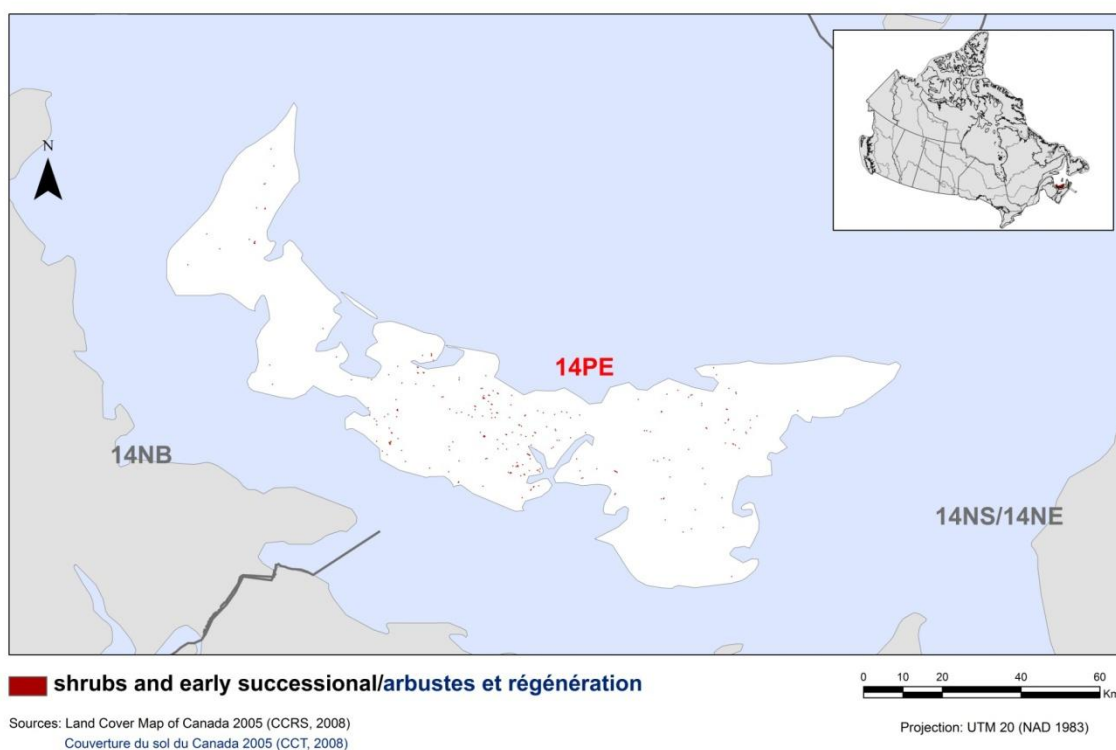


Figure 20. Map of shrub and early successional habitat in PEI BCR14.

Eleven priority bird species, 10 landbirds and 1 shorebird, were identified in shrub and early successional habitat. Of these, 2 are Species at Risk (Table 11). Within this habitat, 8 of the priority bird species are found in shrubs (either densely, scattered or non-specific) and 3 in non-specific early successional habitats.

The most frequently identified threats to priority birds using shrub and early successional habitats were the loss of old or abandoned fields returning to forest; the reforestation of agricultural land (7.3 Other ecosystem modifications); and the direct lethal and sub-lethal effects of chemical contamination on birds or their food from agricultural pesticides, fungicides, and other biocides (9.3 Agricultural & forestry effluents; Fig. 21). The threats were all ranked low overall; however, there were some priority species for which the

threats related to chemical contamination from agricultural effluents was ranked as medium (Table 12).

Decreased prey availability due to the use of pesticides, fungicides, insecticides, herbicides by the agriculture industry was the only medium-ranked threat in this habitat type and applies to Common Nighthawk. The recommended conservation actions are to use pesticides and other biocides only as part of an integrated pest management system to minimize exposure of birds (particularly Common Nighthawk) to potentially toxic chemicals. All other threats were ranked low for the priority bird species in this habitat (Fig. 21); there are conservation actions recommended for these threats in the database but they are not presented here.

Table 11. Priority species that use shrub and early successional habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Redstart	Dense Shrub	high shrubs, near water and/or forest edges	Maintain current					Y		
American Woodcock	Non-specific Early Successional	old fields, moist soil	Increase 50%		Y					
Black-billed Cuckoo	Non-specific Shrub	shrubs in old fields	Assess/Maintain		Y		Y			
Brown-headed Cowbird	Non-specific Shrub	medium shrubs	Increase 100%							Y
Common Nighthawk	Non-specific Early Successional	bare areas	Increase 100%	Y						
Eastern Kingbird	Scattered Shrub		Increase 100%				Y			
Mourning Warbler	Non-specific Early Successional	young, clearcuts, pushups (where clearcut rubble is pushed in piles on edge of cut)	Maintain current					Y		
Rose-breasted Grosbeak	Non-specific Shrub		Maintain current					Y		
Short-eared Owl	Scattered Shrub	abundant prey	Assess/Maintain	Y						
Veery	Dense Shrub	dense understory, moist	Assess/Maintain				Y			
White-throated Sparrow	Non-specific Shrub	any forest type with slash or shrubs	Maintain current			Y				

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

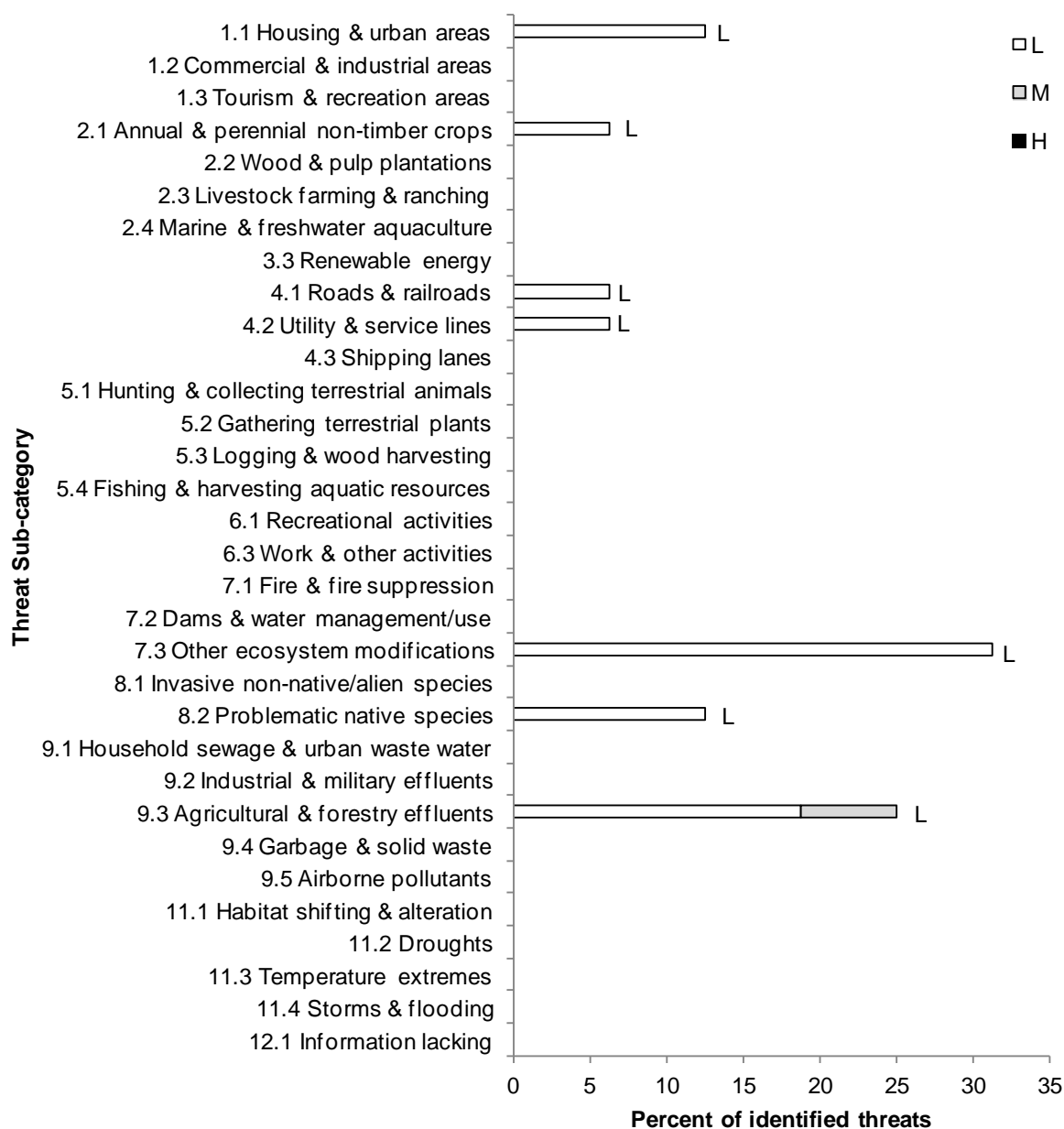


Figure 21. Percent of identified threats to priority bird species in shrub and early successional habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the shrub and early successional habitat (for example, if 100 threats were identified in total for all priority bird species in shrub and early successional habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in shrub

and early successional habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 12. Threat addressed, conservation objective, recommended actions, and priority species affected for shrub and/or early successional habitat in BCR 14 PEI.

Threats Addressed	Threat Category	Objectives	Objective Category	Recommended Actions	Action Category	Threat Rank and Priority Species Affected [†]
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals. Promote pesticide free products.	5.3 Private sector standards and codes 6.2 Substitution	Medium: Common Nighthawk

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude

Herbaceous

Herbaceous areas are natural assemblages of forbs and graminoids that are often associated with “open” areas. They include natural areas and pasturelands, but do not include cultivated and managed areas such as hayfields — these are discussed in the next section. On Prince Edward Island, herbaceous areas can be found near cliff edges and other exposed areas, along beaches and bog margins, in riverside seeps, river beaches, shoreline outcrops and tall meadows along river valleys (Fig. 22). Herbaceous plant communities can also be found in disturbed areas as early successional or pioneer species or in traditional pasturelands.

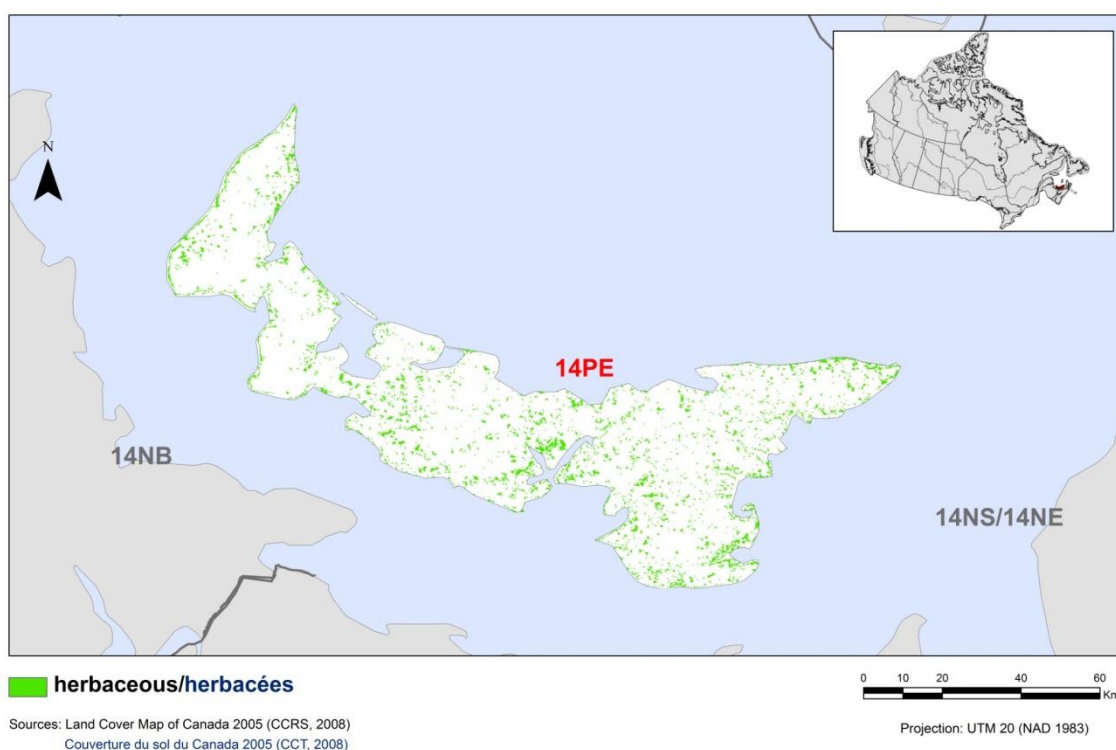


Figure 22. Map of herbaceous habitat in BCR 14 PEI.

Grassland associated birds are exhibiting continent-wide declines, and are one of the most rapidly declining bird groups (North American Bird Conservation Initiative Canada 2012; North American Bird Conservation Initiative 2009). Of the seven priority bird species that have been identified as using herbaceous habitats in BCR 14 PEI, three (all landbirds) are Species at Risk (Table 13), and they all use natural herbaceous habitats.

All threats identified in herbaceous habitats were ranked low (Fig. 23). The most frequently identified threats were the fragmentation or loss of herbaceous habitats as a result of construction and maintenance of wind farms (3.3 Renewable energy) and the fragmentation or loss of herbaceous habitat due to their conversion to urban development

(1.1 Housing & urban areas); construction and maintenance of roads (4.1 Roads & railroads) and right of ways for power, utility and service lines (4.2 Utility & service lines).

Given that there are no threats ranked greater than low, specific recommended actions that will benefit more than a single priority species can be found in the database but are not presented in this document.

Table 13. Priority species that use herbaceous habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Bittern	Natural Herbaceous		Assess/Maintain		Y		Y			
American Golden-Plover	Natural Herbaceous		Assess/Maintain		Y					
Bobolink	Natural Herbaceous	large fields, high grasses	Increase 50%	Y	Y		Y	Y		
Brown-headed Cowbird	Natural Herbaceous	large fields, high grasses	Increase 100%							Y
Common Nighthawk	Natural Herbaceous	bare areas	Increase 100%	Y						
Eastern Kingbird	Natural Herbaceous		Increase 100%				Y			
Short-eared Owl	Natural Herbaceous	sand dunes, abundant prey	Assess/Maintain	Y						

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

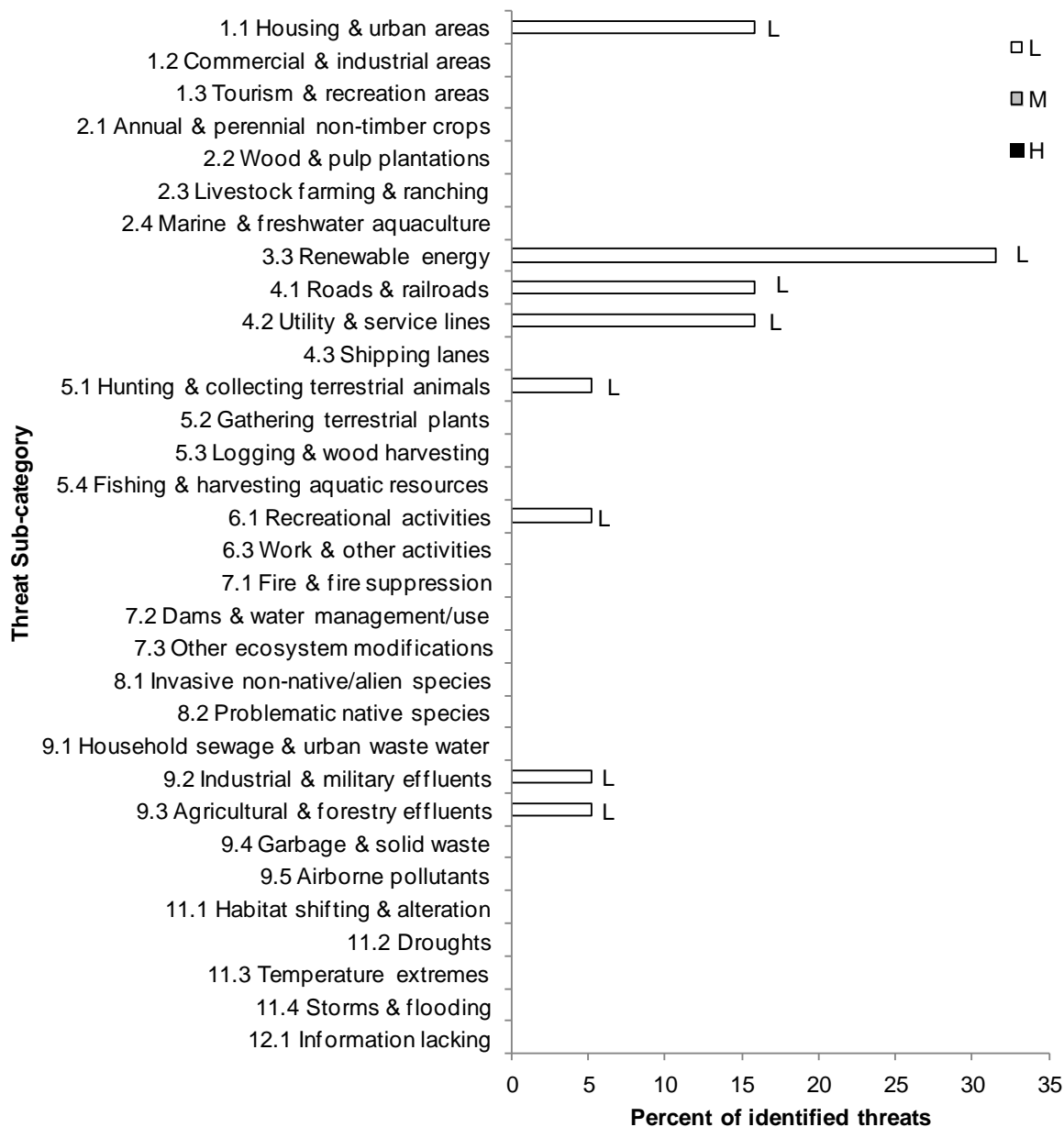


Figure 23. Percent of identified threats to priority bird species in herbaceous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the herbaceous habitat (for example, if 100 threats were identified in total for all priority bird species in herbaceous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in herbaceous habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Cultivated and Managed Areas

Cultivated and managed areas include agricultural areas and urban vegetation (or parklands); they are found throughout Prince Edward Island and are the dominant habitat types in the province. Cultivated and managed areas cover 40% of the province (2263 km²; Fig. 24; Dettmers 2006).

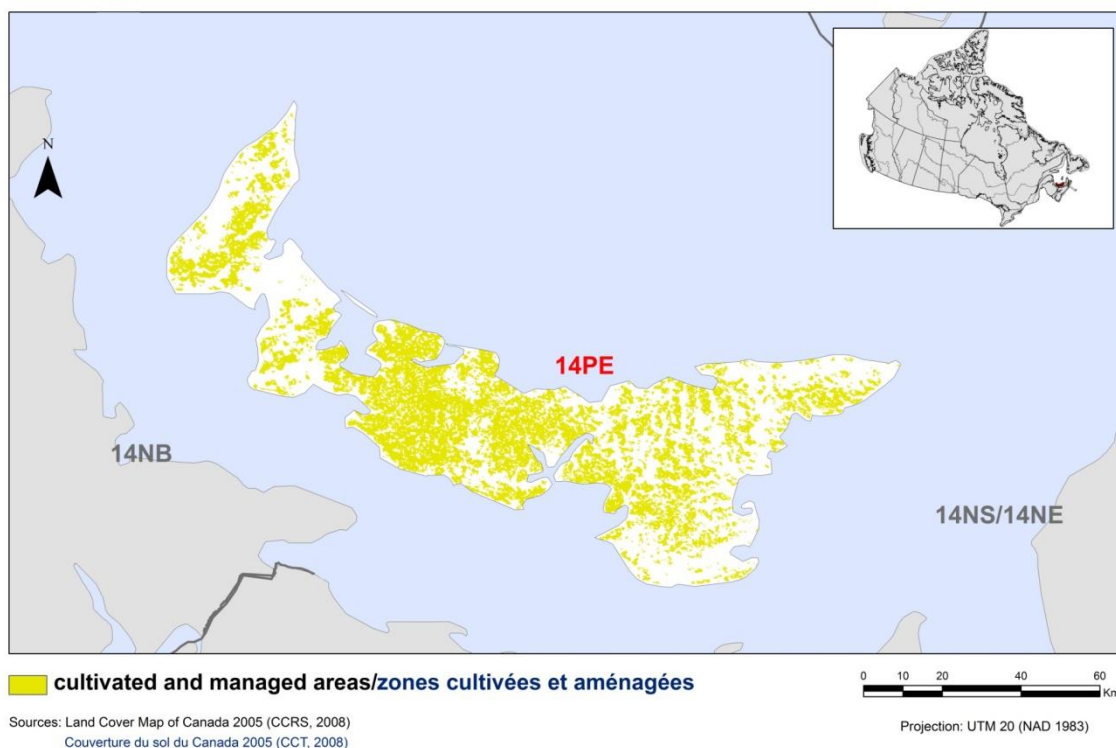


Figure 24. Map of cultivated and managed areas in BCR 14 PEI.

Of the 17 priority bird species that use cultivated and managed areas in BCR 14 PEI, 4 are waterfowl, 1 is a waterbird, five are shorebirds and the remaining 7 are landbirds. Of these, 3 are Species at Risk (Table 14). All but 1 (White-throated Sparrow) use cultivated lands and 3 (including the White-throated Sparrow) use parklands (Table 14).

The highest ranked threat to priority bird species in cultivated and managed areas is agricultural practices that result in 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; Table 15). The most frequently identified threat (which was ranked medium overall) is contamination from pesticide spraying (9.3 Agricultural & forestry effluents; Fig. 25), which can either directly affect bird survival or that of their food source. Evidence of drift of widely used fungicides and pesticides in the cultivation of

potatoes has been observed and identified as being of high concern for potential wildlife exposure (White et al. 2006).

Given the importance of the agricultural industry and its extent on Prince Edward Island, all recommended conservation actions to address high or medium ranked threats in this habitat are related to agricultural practices. Recommended actions include increasing the awareness of farmers about the impacts of agricultural practices on priority bird species; developing beneficial management practices and encouraging bird-friendly practices through economic and other incentives (Table 15). By-products or effluents of agricultural practices may also threaten either the survival of priority bird species (e.g., Short-eared Owl and Sharp-shinned Hawk) or their food sources (e.g., Barn Swallow and Eastern Kingbird). As such, pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals. Many more bird species will benefit from the Recommended Actions presented in Table 15.

Table 14. Priority species that use cultivated and managed habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Black Duck	Agriculture	proximity to water	Increase 50%						Y	
American Golden-Plover	Agriculture; Urban Vegetation	open areas such as golf courses, airports	Assess/Maintain		Y					
Barn Swallow	Agriculture; Urban Vegetation	structure with horizontal surface and shelter for nesting, nearby source of mud for nest construction	Increase 50%	Y						Y
Bobolink	Agriculture	large fields, high grasses	Increase 50%	Y	Y		Y	Y		
Brown-headed Cowbird	Agriculture	large fields, high grasses	Increase 100%							Y
Canada Goose (North Atlantic)	Agriculture	agricultural lands, potato fields	Maintain current						Y	
Eastern Kingbird	Agriculture		Increase 100%				Y			
Killdeer	Agriculture		Assess/Maintain		Y					
Mallard	Agriculture	proximity to water	Decrease						Y	
Nelson's Sparrow	Agriculture		Maintain current		Y		Y	Y		
Sharp-shinned Hawk	Agriculture	near forest	Maintain current					Y		
Short-eared Owl	Agriculture	abundant prey	Assess/Maintain	Y						
Sora	Agriculture	uplands near marshes, pastures	Assess/Maintain		Y					
Spotted Sandpiper	Agriculture	grassy areas near water	Assess/Maintain		Y					
Whimbrel	Agriculture	blueberry fields	Assess/Maintain		Y					
White-throated Sparrow	Urban Vegetation		Maintain current			Y				
Wilson's Snipe	Agriculture	open fields, proximity to water	Assess/Maintain		Y					

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004);

Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

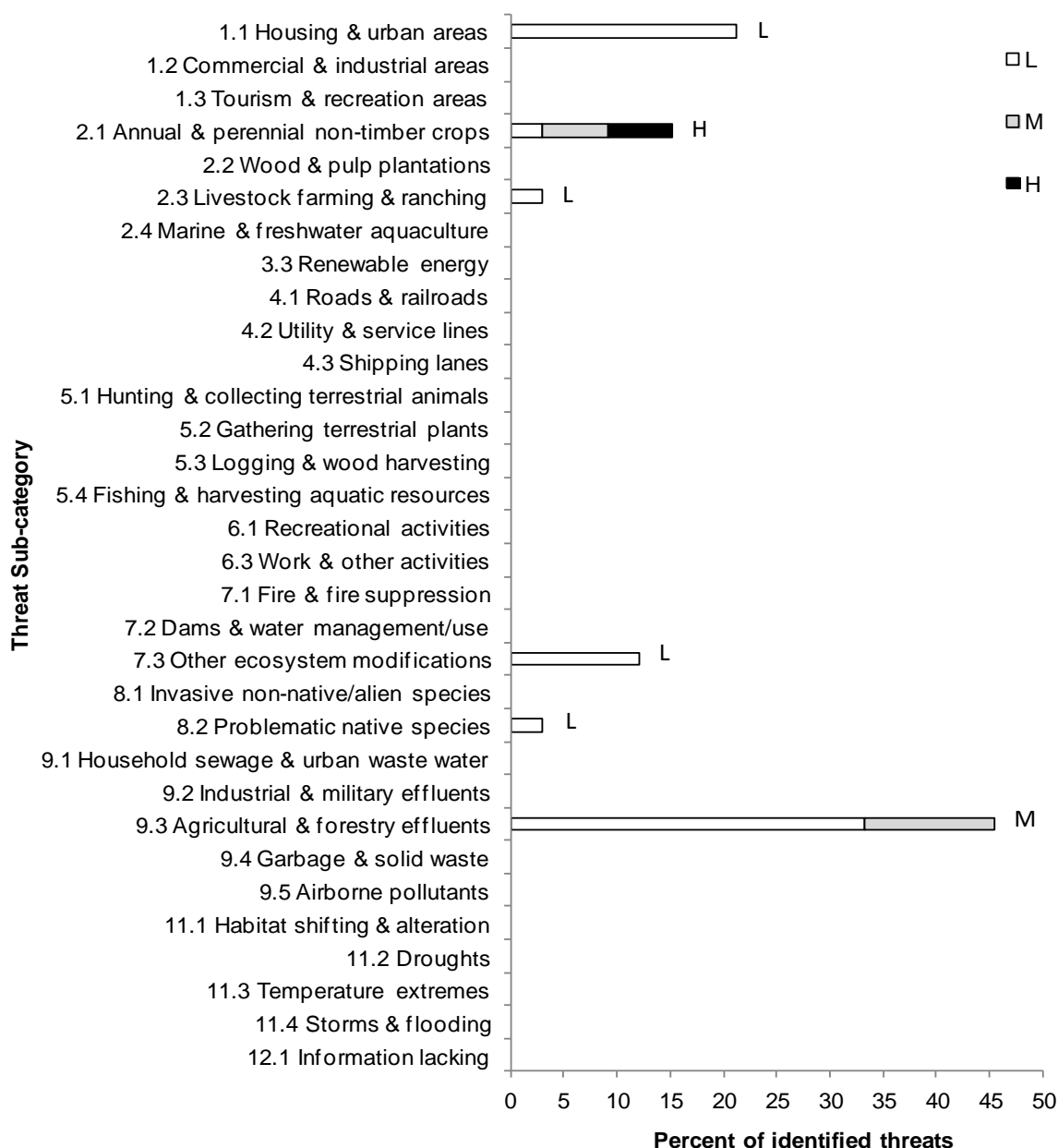


Figure 25. Percent of identified threats to priority bird species in cultivated and managed habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the cultivated and managed habitats (for example, if 100 threats were identified in total for all priority bird species in cultivated and managed habitats, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in cultivated and managed habitats is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 15. Threats addressed, conservation objectives, recommended actions, and priority species affected for cultivated and managed habitats in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Destruction of nests due to a choice of agricultural practices for early haying	2.1 Annual & perennial non-timber crops	Reduce/eliminate adult and nestling mortality as a result of early haying	2.4 Reduce incidental mortality	Increase awareness of and provide information to farmers on how to mitigate effects of their practices on grassland birds.	4.3 Awareness and communications	High: Bobolink, Nelson's Sparrow Medium: Short-eared Owl
				Encourage bird-friendly agricultural practices through economic and other incentives.	6.4 Conservation payments	
				Wherever possible, avoid activity in fields supporting grassland species during the breeding season.	5.3 Private sector standards and codes	
Fragmentation or loss of managed grasslands due to its conversion to cropland	2.1 Annual & perennial non-timber crops	Maintain/restore managed grassland habitat	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Encourage bird-friendly agricultural practices through economic and other incentives.	6.4 Conservation payments	Medium: Short-eared Owl
				Increase awareness of and provide information to farmers on how to mitigate effects of their practices on grassland birds.	4.3 Awareness and communications	
				Provide incentives for landowners to protect grassland habitat.	6.4 Conservation payments	
Decrease of diet quality and of health of birds due to the consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce mortality from exposure to pesticides and other biocides used by the agriculture industry	2.1 Reduce mortality and/or sub-lethal effects from pesticide use	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Sharp-shinned Hawk, Short-eared Owl
				Promote pesticide free products.	6.2 Substitution	
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 15 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Barn Swallow, Eastern Kingbird
				Promote pesticide free products.	6.2 Substitution	

Urban (artificial surfaces and bare areas)

The urban habitat class consists of areas where developments such as buildings, roads, parking lots and other impervious surfaces dominate. In BCR 14 PEI, there is approximately 225 km² of urban habitat, which accounts for 6% of the planning unit (Dettmers 2006; Fig. 26).

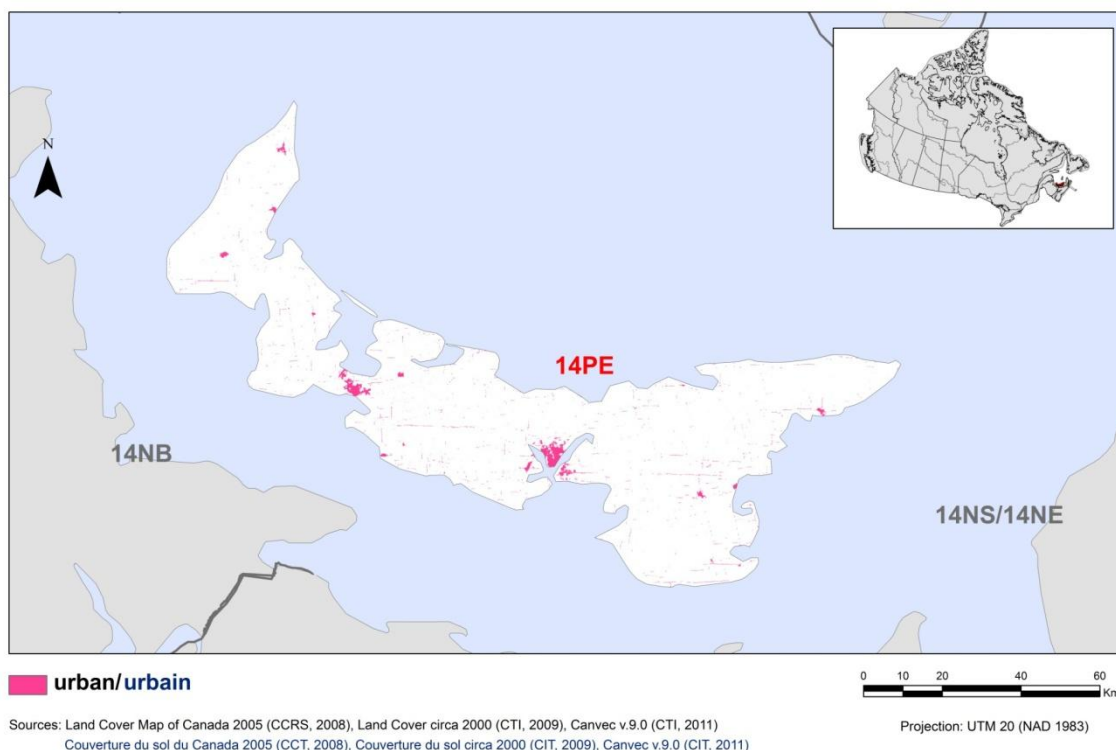


Figure 26. Map of urban areas in BCR 14 PEI.

Four priority bird species use urban habitats in BCR 14 PEI (Table 16). Of these, three are landbirds and one is a shorebird; two are Species at Risk. Two species use gravel areas, one uses mines and quarries and one uses buildings and bridges.

The highest ranked and most frequently identified threats are the loss of nesting habitat due to removal of or renovations to buildings and bridges (e.g., removal of gravel roof tops used by Common Nighthawk and barns used by Barn Swallows), and disturbance at nest sites from maintenance activities on buildings and bridges (1.2 Commercial & industrial areas; Fig. 27).

Many more bird species will benefit from the Recommended Actions presented in Table 17. Recommended conservation actions to address high and medium ranked threats are to raise awareness of the bird species' needs in urban habitats; to encourage urban planners

to consider changes in roof construction which will benefit Common Nighthawk; and to develop beneficial management practices and guidelines for urban land and infrastructure management that benefit birds.

Table 16. Priority species that use urban habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
Bank Swallow	Mines and Quarries	cut banks/cliffs with soft sandy soil	Increase 50%							Y
Barn Swallow	Buildings and Bridges	open habitats for foraging, nearby source of mud for nest construction	Increase 50%	Y						Y
Common Nighthawk	Gravel	gravel rooftops or other urban parklands, low artificial light	Increase 100%	Y						
Killdeer	Gravel	flat gravel rooftops, gravel pits, quarries	Assess/Maintain		Y					

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

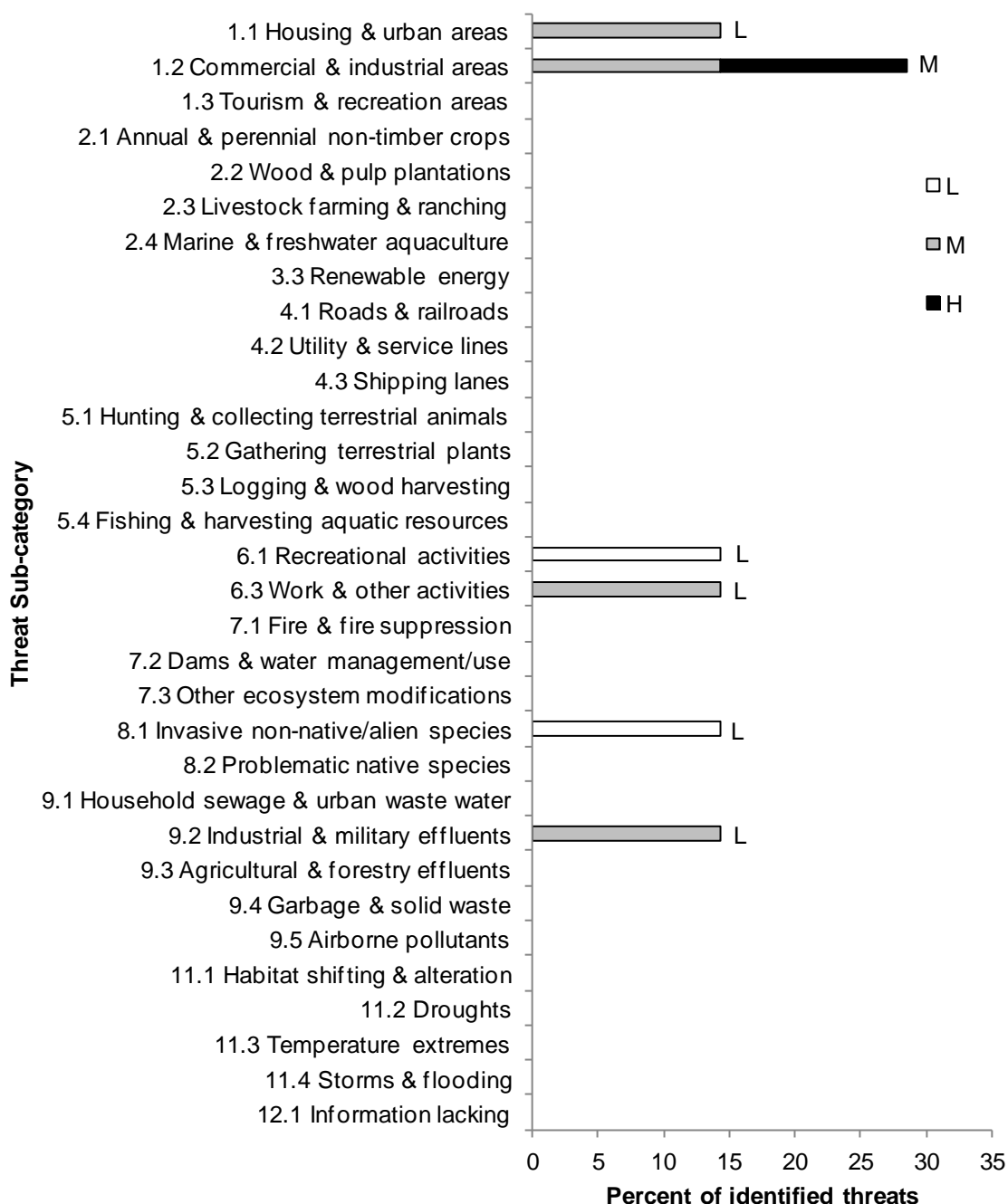


Figure 27. Percent of identified threats to priority bird species in urban habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the urban habitats (for example, if 100 threats were identified in total for all priority bird species in urban habitats, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-

category). The overall magnitude of the sub-threat in urban habitats is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 17. Threats addressed, conservation objectives, recommended actions, and priority species affected for urban habitats in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Loss of nesting habitat on private housing structures (gravel roofs) And Loss of nesting habitat on commercial or industrial structures (gravel roofs)	1.1 Housing & urban areas 1.2 Commercial & industrial areas	Maintain/restore availability of gravel rooftops	1.4 Maintain important habitat features on the landscape	Develop beneficial management practices and avoidance guidelines to manage building renovation and maintenance activities and maintain/restore gravel rooftops. Educate groups working on urban revitalization and urban wildlife about the issue of the nighthawk decline, and encourage changes in roof construction where feasible.	5.3 Private sector standards and codes 4.3 Awareness and communications	Medium: Common Nighthawk
Loss of nesting habitat on old wooden barns and covered bridges	1.2 Commercial & industrial areas	Maintain/restore old buildings	1.4 Maintain important habitat features on the landscape	Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation. Develop and implement mitigation measures (such as enhancements to new or existing buildings, or creation of alternative nesting structures) when loss of nesting structures cannot be avoided. Raise awareness of the importance of old buildings to Barn Swallows and the value of Barn Swallows in the ecosystem.	5.3 Private sector standards and codes 3.2 Species recovery 4.3 Awareness and communications	High: Barn Swallow
Disturbance at nest sites due to building and bridge maintenance activities	6.3 Work & other activities	Reduce/eliminate disturbance by building and bridge maintenance activities	4.2 Reduce disturbance from industrial or work activity	Develop and implement beneficial management practices for bridge maintenance crews, to benefit priority species.	5.3 Private sector standards and codes	Medium: Barn Swallow

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 17 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Decrease of prey availability to birds due to the chemical or heavy metal contamination from mines and quarries	9.2 Industrial & military effluents	Reduce the loss of prey/food source from exposure to chemical/heavy metal contaminants	5.2 Manage decreases in prey due to contaminants	Develop beneficial management practices to manage the discharge of chemical/heavy metal contaminants into the environment.	5.3 Private sector standards and codes	Medium: Bank Swallow
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	

Wetlands

Wetland habitats include bogs, swamps, marshes (fresh and saltwater), fens and shallow open water (largely unvegetated surfaces, <2m deep; Fig. 28). Over 5% (301 km²) of Prince Edward Island's land base is classified as wetlands (Dettmers 2006). Of these, 21% are salt marshes and 79% are freshwater wetlands. Of the freshwater wetlands, 35% are bogs (Prince Edward Island 2005).

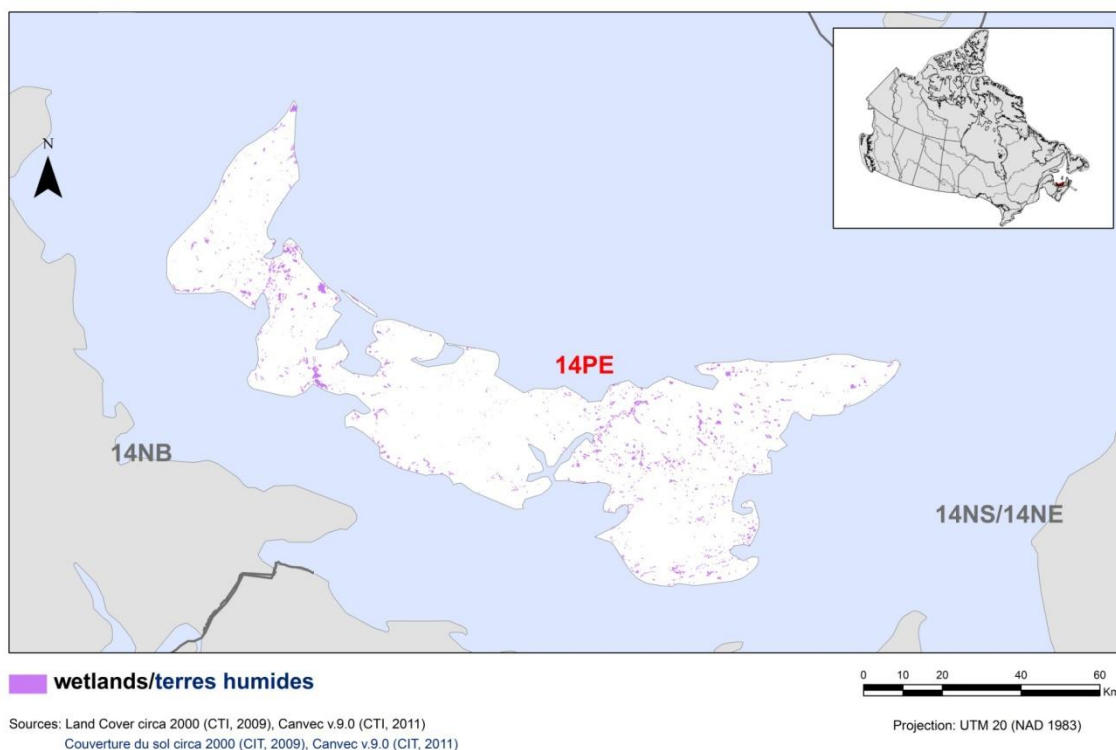


Figure 28. Map of wetlands in BCR 14 PEI.

Of the 51 priority species identified in BCR 14 PEI, 24 use wetland habitats (Table 18). Of these species, 5 are waterfowl, 4 are waterbirds, 5 are shorebirds and the remaining 10 are landbirds. Six are Species at Risk. Five species use non-specific freshwater wetlands while the others use bogs (6 species), swamps (5 species), or marshes (11 species), though many not exclusively (Table 18).

Species found in wetland habitats face a wide variety of threats (Fig. 29). Many of Prince Edward Island's salt marshes and coastal wetlands have been lost through drainage, flooding and infilling for urban (1.1 Housing & urban areas) or agricultural (2.1 Annual & perennial non-timber crops) purposes, and salt marshes continue to be threatened by coastal developments, particularly cottage subdivisions and municipal development projects. Three of the Island's largest bogs at Black Banks, Bideford and Miscouche are mined commercially for peat moss (2.1 Annual & perennial non-timber crops). A more

recent threat to priority bird species is the development of bogs for cranberry (*Vaccinium (Oxycoccus)*) production (Prince Edward Island 2003; 5.2 Gathering terrestrial plants). In addition to habitat loss from conversion to agriculture or commercial and residential developments, priority bird species relying on wetlands are also threatened by decreased water quality as a result of agricultural pesticides and other biocides (9.2 Agricultural & forestry effluents) and industrial-based chemical or heavy metal contamination (9.3 Industrial & military effluents), disturbance from recreational uses in wetlands such as ATV traffic (6.1 recreational activities), and degraded wetland hydrology from water diversion for irrigation and flood control (7.2 Dams & water management/use).

Many more bird species will benefit from the Recommended Actions presented in Table 19. The recommended conservation actions to address medium ranked threats include the securement and management of wetlands and marshes through various methods; encouragement of bird friendly agricultural and/or forest management practices through the development of beneficial management practices; and the recommendation to use pesticides and other biocides only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 18. Priority species that use wetlands in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
American Bittern	Non-specific Freshwater Wetlands	peat bogs, shrub swamps, marsh and fens with tall emergent vegetation	Assess/Maintain		Y		Y			
American Black Duck	Non-specific Freshwater Wetlands	freshwater wetlands with a mix of emergent and submergent vegetation	Increase 50%						Y	
Barn Swallow	Non-specific Freshwater Wetlands	structure with horizontal surface and shelter for nesting, nearby source of mud for nest construction	Increase 50%	Y						Y
Canada Goose (North Atlantic)	Marsh	adjacent, accessible upland areas with grasses and forbes	Maintain current						Y	
Canada Warbler	Swamp	dense understory, shrub layer, ground moss, moist	Increase 50%	Y	Y		Y			
Common Nighthawk	Bog; Marsh	bare areas, peat bogs	Increase 100%	Y						
Eastern Kingbird	Swamp	ponds with dead woody vegetation	Increase 100%				Y			
Gray Jay	Bog	black spruce	Assess/Maintain							Y
Green-winged Teal	Marsh	freshwater wetlands with a mix of emergent and submergent vegetation	Increase 50%						Y	
Killdeer	Marsh		Assess/Maintain		Y					
Lesser Yellowlegs	Bog; Marsh	shallow water (0-10 cm)	Assess/Maintain		Y					
Mallard	Non-specific Freshwater Wetlands	freshwater wetlands with a mix of emergent and submergent vegetation	Decrease						Y	
Nelson's Sparrow	Marsh		Maintain current		Y		Y	Y		
Northern Parula	Swamp	Usnea and similar lichens	Maintain current					Y		
Olive-sided Flycatcher	Bog	open areas with perches	Increase 50%	Y	Y		Y			
Pied-billed Grebe	Marsh	dense emergent vegetation with open water	Assess/Maintain		Y					
Ring-necked Duck	Marsh	open water (1.5 m depth) with abundant emergent and submergent vegetation	Increase 50%						Y	

Table 18 continued

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						Review
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	
Rusty Blackbird	Bog; Swamp	bog edges or forested wetland, shrub layer, standing deadwood, old beaver flowages	Increase 100%	Y			Y			
Short-eared Owl	Bog; Marsh	abundant prey	Assess/Maintain	Y						
Solitary Sandpiper	Swamp	wooded wetlands, shallow water (0-10 cm)	Assess/Maintain		Y					
Sora	Marsh	shallow water (0-15 cm) dominated by emergent vegetation	Assess/Maintain		Y					
Virginia Rail	Marsh	shallow water (0-15 cm), emergent cover and substrate	Assess/Maintain		Y					
Whimbrel	Bog	berries	Assess/Maintain		Y					
Wilson's Snipe	Non-specific Freshwater Wetlands	meadows, shallow water	Assess/Maintain		Y					

¹Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

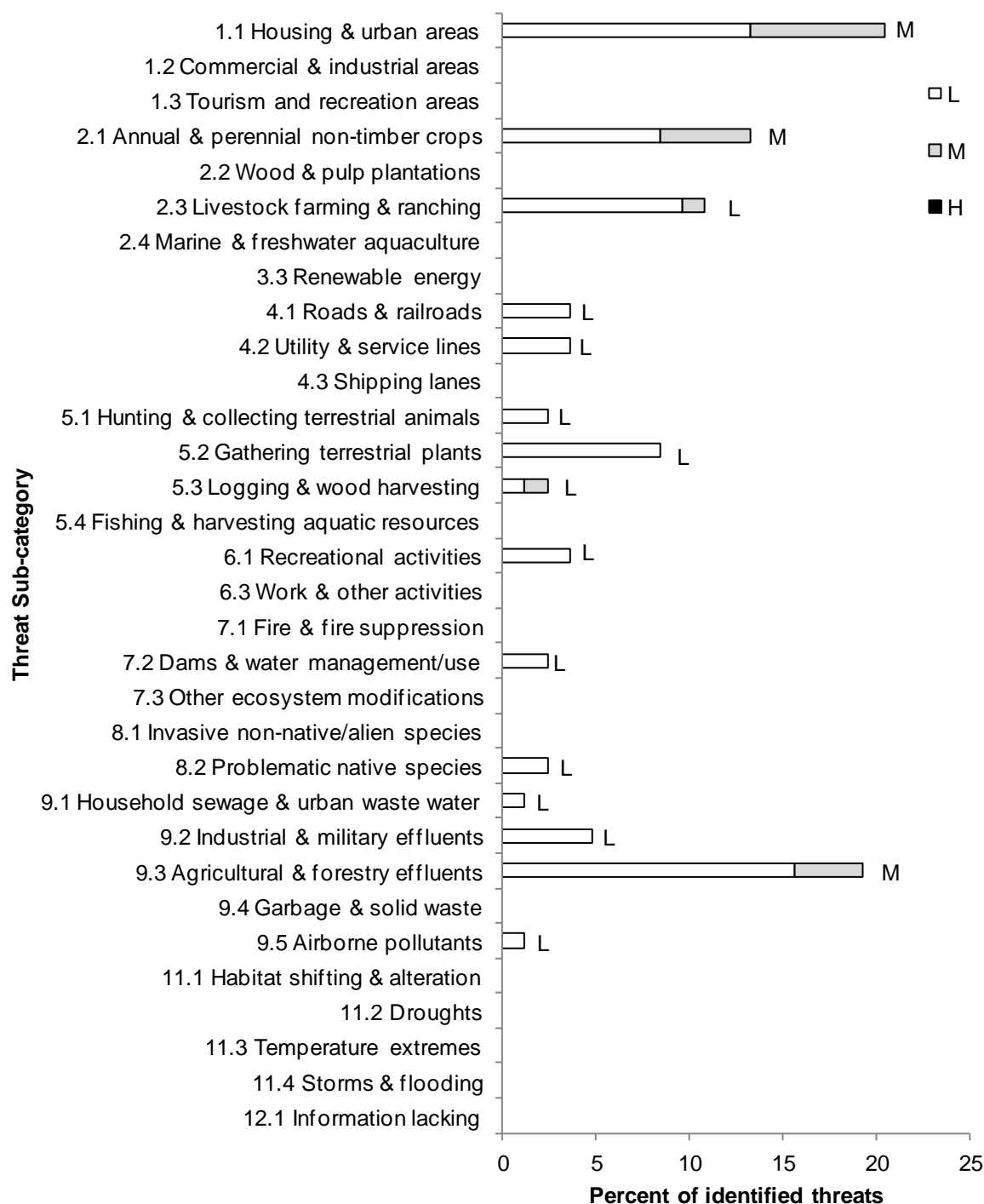


Figure 29. Percent of identified threats to priority bird species in wetlands in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the wetlands (for example, if 100 threats were identified in total for all priority bird species in wetlands, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual

threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in wetlands is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 19. Threats addressed, conservation objectives, recommended actions, and priority bird species affected for wetland habitats in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of freshwater wetlands to urban development	1.1 Housing & urban areas	Maintain/restore freshwater wetlands	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage freshwater wetlands for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: American Bittern, American Black Duck, Green-winged Teal, Nelson's Sparrow, Pied-billed Grebe, Ring-necked Duck
				Include guidelines for the protection of priority species in beneficial management practices for municipalities and industry.	5.3 Private sector standards and codes	
				Provide incentives for landowners to protect freshwater wetlands.	6.4 Conservation payments	
Fragmentation or loss of freshwater wetlands due to a conversion of that habitat to cropland	2.1 Annual & perennial non-timber crops	Maintain/restore freshwater wetlands	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage freshwater wetlands for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: American Black Duck, Green-winged Teal, Pied-billed Grebe, Ring-necked Duck
				Develop beneficial management practices that encourage bird-friendly agricultural practices.	5.3 Private sector standards and codes	
				Increase awareness of and provide information to farmers on how to mitigate effects of their practices on priority birds.	4.3 Awareness and communications	
				Provide incentives for landowners to protect freshwater wetlands.	6.4 Conservation payments	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 19 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of swamps due to logging activities	5.3 Logging & wood harvesting	Maintain/restore swamps	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage swamps for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: Canada Warbler
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Decrease of diet quality and of health of birds due to the consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce mortality from exposure to pesticides and other biocides used by the agriculture industry	2.1 Reduce mortality and/or sub-lethal effects from pesticide use	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Short-eared Owl
				Promote pesticide free products.	6.2 Substitution	
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Barn Swallow, Common Nighthawk
				Promote pesticide free products.	6.2 Substitution	

Riparian

Riparian areas occur adjacent to standing or flowing water (such as wetlands, lakes, and rivers) where the vegetation is influenced by the presence of water and is distinct from adjacent uplands. Riparian areas are the transition zone where land meets water along rivers, streams, lakes, ponds and estuaries and they may be treed, shrubby, or herbaceous, depending on site conditions. In BCR 14 PEI, natural riparian areas are usually forested. There are more than 4000 km of freshwater streams across Prince Edward Island (Prince Edward Island 2012b; Fig. 30). These freshwater streams are small and shallow (width from 5 cm to 10 m and depth from 5 cm to 2 m) and become estuaries for a good part of their length. Most streams in Prince Edward Island are quite short, less than 16 km in length, and are meandering and low gradient (Prince Edward Island 2012b).

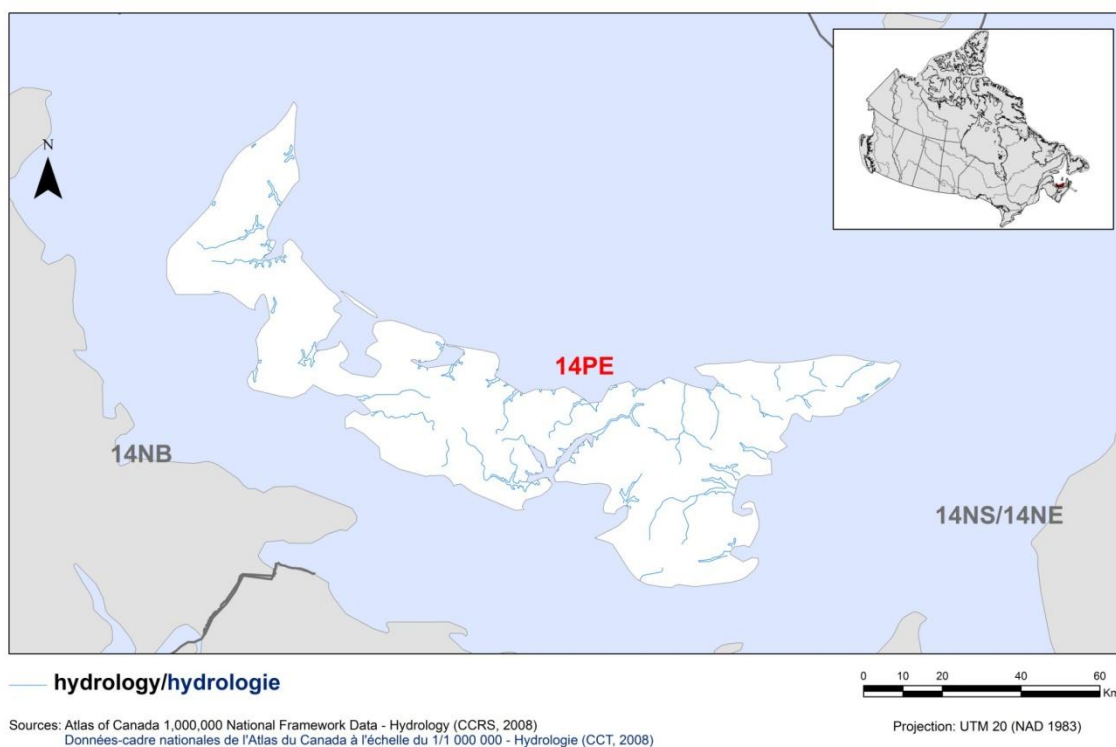


Figure 30. Map of riparian habitats in BCR 14 PEI.

Ten priority bird species have been identified as using riparian habitats in BCR 14 PEI (Table 20). Two are Species at Risk. Eight priority birds use forested riparian areas while the Bank Swallow uses banks and bluffs and the Belted Kingfisher uses bare areas (Table 20).

Riparian areas, and consequently the birds that use them, face a wide variety of threats (Fig. 31). Because of their proximity to water, riparian areas are threatened by urban development (1.1 Housing & urban development) and forestry activities (5.3 Logging &

wood harvesting), which in turn make them vulnerable to contamination from pesticides and other biocides used in agriculture and forestry (9.3 Agricultural & forestry effluents). Priority bird species using riparian areas are also threatened by disturbance caused by recreational activities such as boat traffic and fishing at foraging and nesting sites (6.1 Recreational activities).

Many more bird species will benefit from the Recommended Actions presented in Table 21. Recommended actions to address medium-ranked threats to priority species using riparian habitat focus on securing, managing and protecting riparian habitats; developing conservation strategies for the protection and management of habitat by industry, municipalities and forestry; assessing the impact of recreational activities, raising public awareness about the impacts of recreational activities and managing recreational activities to minimize disturbance to priority bird species. Bank Swallows, Bay-breasted Warblers, and Olive-sided Flycatchers that use riparian habitats are also threatened by chemical contamination of their food sources by pesticides (or other biocides). Therefore, pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 20. Priority species that use riparian habitat in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
Bald Eagle	Mature Forest	relatively unpopulated, deciduous or coniferous forest near water with large nest/perching trees	Maintain current							Y
Bank Swallow	Banks and Bluffs	cut banks/cliffs with soft sandy soil	Increase 50%							Y
Bay-breasted Warbler	Mature Forest	mature forest and older	Increase 100%				Y			
Belted Kingfisher	Bare Areas	vertical earth exposure for nest burrow	Assess/Maintain				Y	Y		
Eastern Kingbird	Non-specific Forest		Increase 100%				Y			
Mallard	Non-specific Forest		Decrease						Y	
Northern Parula	Coniferous Forest; Deciduous Forest; Mixedwood	forest edges where Usnea and similar lichens are found	Maintain current					Y		
Olive-sided Flycatcher	Coniferous Forest; Deciduous Forest; Mixedwood	open areas with perches	Increase 50%	Y	Y		Y			
Rusty Blackbird	Coniferous Forest		Increase 100%	Y			Y			
Spotted Sandpiper	Non-specific Forest	near open shoreline for foraging, displaying, etc, semi-open habitat for nesting	Assess/Maintain		Y					

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004; Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

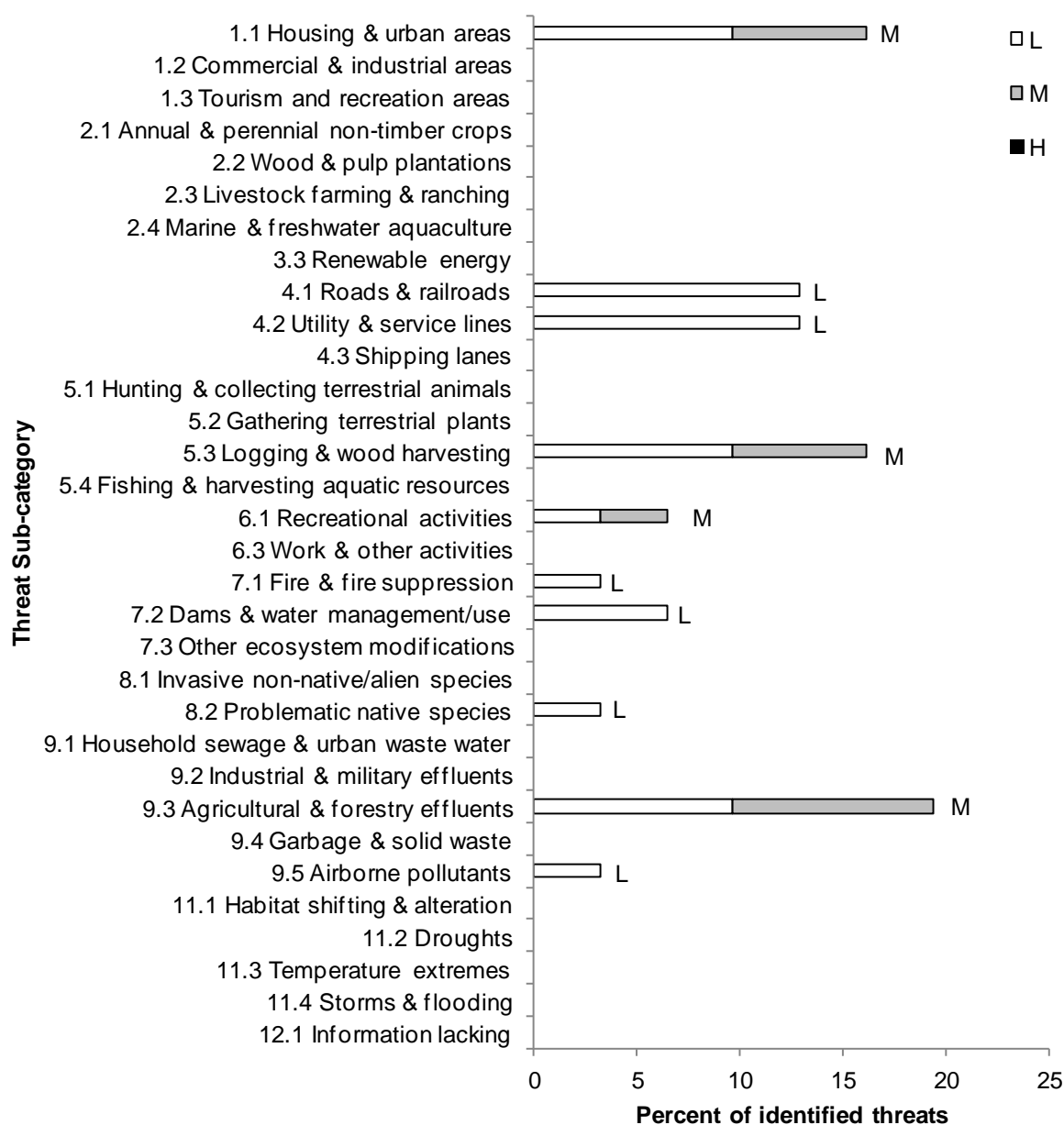


Figure 31. Percent of identified threats to priority bird species in riparian habitats in each threat sub-category in BCR 14 PEI.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the riparian habitats (for example, if 100 threats were identified in total for all priority bird species in riparian habitats, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in riparian habitats is shown at the end of each bar

(also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 21. Threats addressed, conservation objectives, recommended actions, and priority species affected for riparian habitat in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of riparian forests to urban development	1.1 Housing & urban areas	Maintain/restore riparian forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage riparian forest habitat for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: Bald Eagle, Bay-breasted Warbler
				Maintain/restore riparian buffers of suitable width depending on riparian sub-habitat type and species.	2.3 Habitat and natural process restoration	
				Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation.	5.3 Private sector standards and codes	
				Provide incentives for landowners to protect riparian forest habitat.	6.4 Conservation payments	
Fragmentation or loss of riparian forest due to logging activities	5.3 Logging & wood harvesting	Maintain/restore riparian forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	Medium: Bay-breasted Warbler, Bald Eagle
				Maintain/restore riparian buffers of suitable width depending on riparian sub-habitat type and species.	2.3 Habitat and natural process restoration	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 21 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
				Develop and implement reforestation beneficial management practices for retaining the natural range of forest composition.	5.3 Private sector standards and codes	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Disturbance at roosting sites by recreational activities in waterways	6.1 Recreational activities	Reduce/eliminate disturbance from recreational activities in riparian habitats	4.1 Reduce disturbance from human recreation	Secure and manage key riparian habitat for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: Bald Eagle
				Raise public awareness of priority species and their habitat needs, and the impacts of disturbance from recreational activities.	4.3 Awareness and communications	
				Manage recreational activities in waterbodies and waterways to minimize disturbance to priority species.	5.2 Policies and regulations	
				Assess the impacts of recreational activities in waterbodies and waterways on priority species.	8.1 Research	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Bay-breasted Warbler, Bank Swallow, Olive-sided Flycatcher
				Promote pesticide free products.	6.2 Substitution	

Inland Waterbodies

The waterbodies, snow and ice habitat class includes standing and flowing water such as oceans, reservoirs, lakes, ponds, rivers and streams (Food and Agriculture Organization 2000). There are no areas within BCR 14 PEI where snow and/or ice covers the ground for the majority of the year, and because the BCR 14 PEI does not extend into marine waters (see MBU 12 PEI for coverage of marine waters), the following discussion focuses on lakes, ponds, streams and rivers. Inland waterbodies cover 52 km² (less than 1%) of BCR 14 PEI (Dettmers 2006), making them a fairly scarce habitat in this planning unit (Fig. 32).

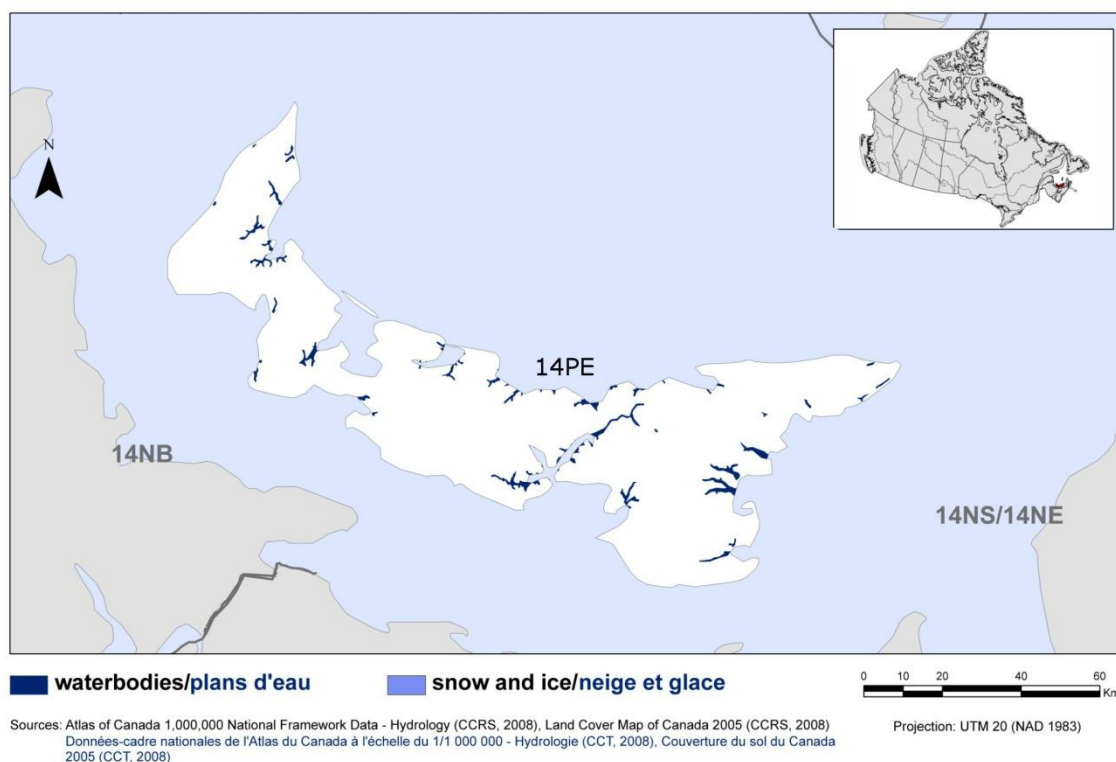


Figure 32. Map of inland waterbodies in BCR 14 PEI; there is no area covered by snow or ice for the majority of the year.

There are more than 4,000 km of freshwater streams across Prince Edward Island (Prince Edward Island 2012b). These freshwater streams are small and shallow (width from 5 cm to 10 m and depth from 5 cm to 2 m) and become estuaries for a good part of their length. Most streams in Prince Edward Island are quite short, less than 16 km in length, and are meandering and low gradient (Prince Edward Island 2012b). While there are over 600 human-made ponds on Prince Edward Island, with the exception of beaver ponds and barrier beach ponds, there are few truly natural ponds (Prince Edward Island 2012b).

Of the 12 priority bird species that use inland waterbodies, 6 are waterfowl, 3 are waterbirds, 1 is a shorebird and 2 are landbirds. Only 1 is a Species at Risk (Table 22). All priority species in this habitat type use lakes and ponds, except for Barrow's Goldeneye, which use rivers and streams.

Among the highest ranked and most frequently identified threats (ranked medium) are decreases in diet quality and health of birds due to the consumption of food that has contaminated biocides, decreases in prey availability due to chemical contamination from biocides and the loss of food sources due to eutrophication caused by fertilizers (9.3 Agricultural & forestry effluents; Fig. 33 and Table A-3). The only high-ranked threat in this habitat type was the reduction in survival of Common Loons due to heavy metal contamination of their food sources in lakes, ponds, rivers and streams (9.2 Industrial & military effluents). Priority bird species using inland waterbodies are also threatened by disturbance caused by recreational activities such as boat traffic and fishing at foraging and nesting sites (6.1 Recreational activities).

Many more bird species will benefit from the Recommended Actions presented in Table 23. Recommended actions to address the medium or high ranked threats discussed above focus on protecting riparian or lake and pond habitats using a suite of mechanisms which include: developing beneficial management practices for urban development along freshwater bodies; raising awareness of recreational boaters about the impacts of disturbance on Common Loons and other birds; promoting an integrated pest management system to minimize exposure of birds to potentially toxic chemicals. In addition, Common Terns are threatened by increased competition from and displacement by gulls. Discouraging gulls at managed tern colonies and on islands selected for restoration and monitoring gull populations and distributions will help address this threat.

Table 22. Priority species that use inland waterbodies in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Black Duck	Lakes/Ponds; Rivers/Streams	lake and pond margins, slow moving rivers and streams, wooded ponds, riparian areas, beaver ponds	Increase 50%						Y	
Barrow's Goldeneye (Eastern)	Rivers/Streams	flow constrictions that provide open water areas during winter	Assess/Maintain	Y						
Belted Kingfisher	Lakes/Ponds; Rivers/Streams	clear water with aquatic animals, near nest burrow, overhanging perches beneficial	Assess/Maintain				Y	Y		
Canada Goose (North Atlantic)	Lakes/Ponds	lake and pond margins, slow moving rivers and streams	Maintain current						Y	
Common Loon	Lakes/Ponds; Rivers/Streams	small island and sheltered coves	Assess/Maintain		Y		Y			
Common Tern	Lakes/Ponds	shallow areas, clear water for foraging, rocky islands	Assess/Maintain				Y			
Green-winged Teal	Lakes/Ponds	wooded ponds, riparian areas, beaver ponds	Increase 50%						Y	
Mallard	Lakes/Ponds; Rivers/Streams	lake and pond margins, slow moving rivers and streams, wooded ponds, riparian areas, beaver ponds	Decrease						Y	
Osprey	Lakes/Ponds; Rivers/Streams	snags or outstanding structures (e.g. clearcut with residual trees) for nesting/perching near clear water (0.5-2 m deep) with abundant fish	Maintain current					Y		
Pied-billed Grebe	Lakes/Ponds	dense emergent vegetation on the edges, warm water	Assess/Maintain		Y					
Ring-necked Duck	Lakes/Ponds	open water (1.5 m depth) with abundant emergent and submergent vegetation	Increase 50%						Y	
Solitary Sandpiper	Lakes/Ponds; Rivers/Streams	lake and stream margins, shallow water (0-10 cm)	Assess/Maintain		Y					

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan

Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

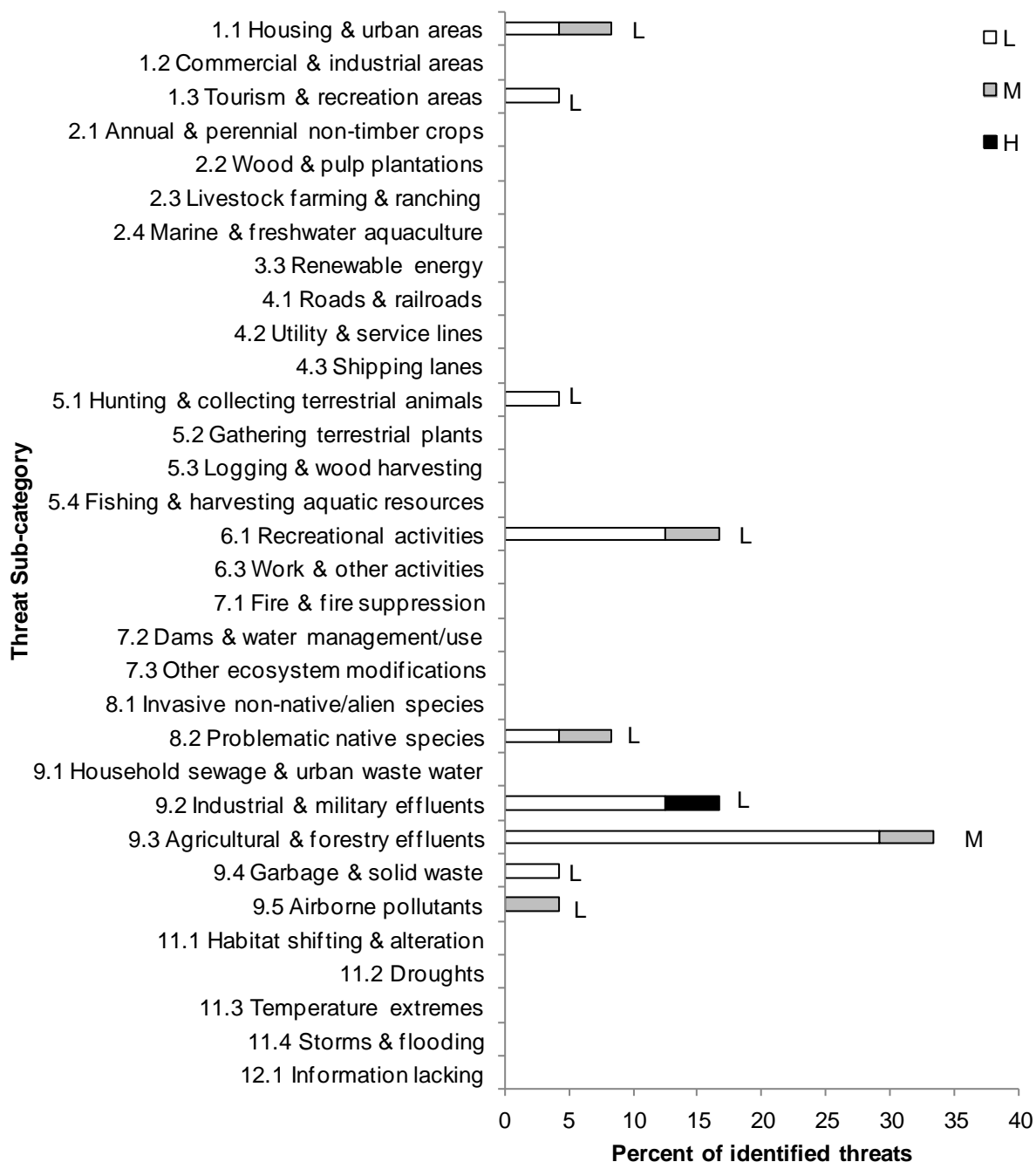


Figure 33. Percent of identified threats to priority bird species in inland waterbodies in each threat sub-category in BCR 14 PEI.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the inland waterbodies (for example, if 100 threats were identified in total for all priority bird species in inland waterbodies, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings

in the sub-category). The overall magnitude of the sub-threat in inland waterbodies is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 23. Threats addressed, conservation objectives, recommended actions, and priority species affected for inland waterbodies in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of riparian habitat to urban development	1.1 Housing & urban areas	Maintain/ restore waterbodies and waterways	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage riparian habitat for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	Medium: Osprey
				Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation.	5.3 Private sector standards and codes	
				Encourage stewardship organizations to promote the use of appropriate habitat management guidelines by private landowners and developers.	7.2 Alliance and partnership development	
				Provide incentives for landowners to protect riparian habitat.	6.4 Conservation payments	
Disturbance at nest sites by recreational activities in waterbodies and waterways	6.1 Recreational activities	Reduce/ eliminate disturbance from recreational activities in lakes and ponds	4.1 Reduce disturbance from human recreation	Establish/maintain protected areas to restrict access/activity at breeding sites.	1.1 Site/area protection	Medium: Common Loon
				Manage recreational activities to minimise disturbance during the breeding season.	5.2 Policies and regulations	
				Raise public awareness of waterbirds and their habitat needs, and the impacts of disturbance from recreational activities in lakes and ponds.	4.3 Awareness and communications	
				Assess the impacts of recreational activities in waterbodies and waterways on priority species.	8.1 Research	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 23 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Displacement by gulls	8.2 Problematic native species	Reduce/eliminate displacement by gulls	3.2 Reduce competition with problematic native species	Discourage gulls at managed colonies and at islands selected for restoration	2.2 Invasive/problematic species control	Medium: Common Tern
				Decrease gull populations near tern colonies by encouraging: closure of landfills, control of refuse at fish plants and on fishing boats and discouraging people from feeding gulls.	2.2 Invasive/problematic species control	
				Monitor gull population and distribution.	2.2 Invasive/problematic species control	
Decrease of diet quality and of health of birds due to the chemical or heavy metal contamination of food source	9.2 Industrial & military effluents	Reduce mortality from exposure to chemical/heavy metal contaminants from industry	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants	Develop beneficial management practices to manage the discharge of chemical/heavy metal contaminants into the environment.	5.3 Private sector standards and codes	High: Common Loon
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize destruction of non-target invertebrate species.	5.3 Private sector standards and codes	Medium: Osprey
				Promote pesticide free products.	6.2 Substitution	

Marine Waters – Gulf of St. Lawrence

The habitat class for waterbodies, snow and ice includes standing and flowing water such as oceans, reservoirs, lakes, ponds, rivers and streams (Food and Agriculture Organization 2000). There are no areas within MBU 12 PEI where snow and/or ice cover the sea for the majority of the year, and because the MBU 12 PEI does not extend onto land (see BCR 14 PEI for coverage of inland waters), the following discussion focuses on nearshore waters (Fig. 34).

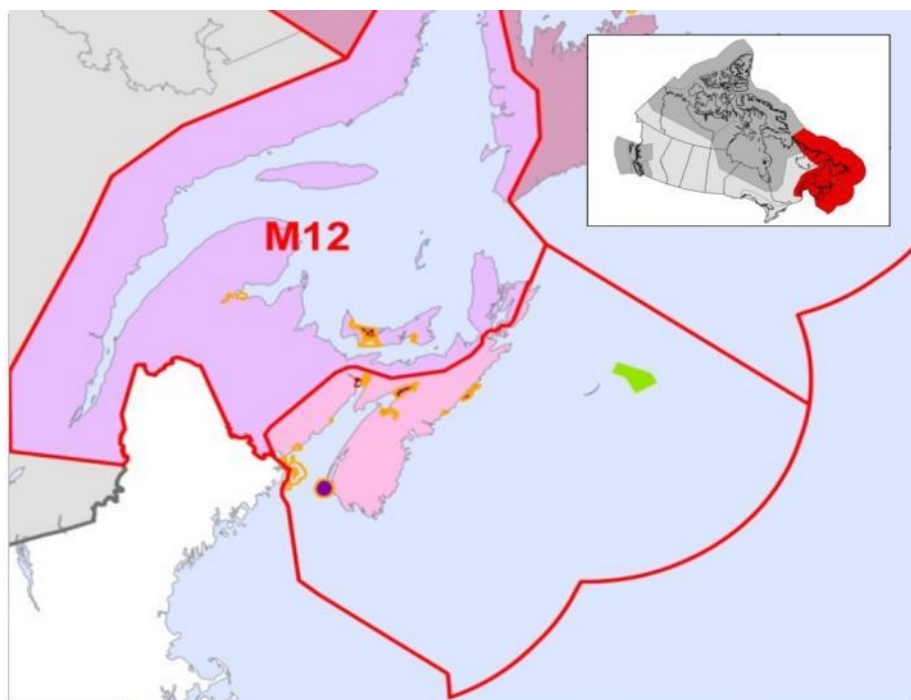


Figure 34. Map of the marine waters habitat in MBU 12 PEI.

The Prince Edward Island portion of MBU 12 (Gulf of St. Lawrence Marine Biogeographic Unit) encompasses an area approximately 21 400 km² (Fig. 34). The Gulf of St. Lawrence surrounding Prince Edward Island is significantly warmer and shallower than the rest of the Gulf of St. Lawrence, although in winter this portion of the Gulf is predominantly ice-covered.

Of the 16 priority bird species that use marine waters, 9 are waterfowl and 7 are waterbirds; 2 are Species at Risk (Table 24). All priority bird species in MBU 12 PEI use nearshore waters and two also use continental shelf.

The highest ranked and most frequently identified threats to priority bird species in nearshore waters are mortality of birds due to oil spills and discharges from shipping activities; decreases in prey availability due to oil spills and discharges and other heavy metal contaminants and decreases in diet quality and the health of priority birds due to heavy metal contamination of food sources (9.2 Industrial & military effluents; Fig. 35). Priority birds using marine waters around Prince Edward Island also compete for foraging areas with aquaculture operations (2.4 Marine & freshwater aquaculture).

Many more bird species will benefit from the Recommended Actions presented in Table 25. Recommended actions to address medium and high ranked threats focus on managing aquaculture to minimize the degradation and loss of habitat of priority waterfowl species; monitoring and enforcing compliance with laws, policies and regulations regarding the release of oil, oily waste, and garbage into the ocean; and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize the occurrence and potential impacts of accidental oil discharges on priority birds.

Table 24. Priority species that use marine waters in MBU 12 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Black Duck	Nearshore Waters	shallow sheltered areas	Maintain current						Y	
Barrow's Goldeneye (Eastern)	Nearshore Waters	open water, rocky coasts with dense growth of rockweed	Assess/Maintain	Y						
Black Scoter	Nearshore Waters	sandy, cobble or rocky substrate (<10 m depth)	Assess/Maintain							Y
Bonaparte's Gull	Nearshore Waters		Assess/Maintain		Y					
Common Goldeneye	Nearshore Waters	sandy, cobble, rocky, or boulder substrate with abundant prey	Assess/Maintain						Y ²	
Common Loon	Nearshore Waters	bays and nearshore coastal areas	Assess/Maintain		Y		Y			
Common Tern	Nearshore Waters	shallow areas, clear water for foraging	Assess/Maintain				Y			
Great Cormorant	Nearshore Waters	nearby perching sites	Assess/Maintain		Y					
Green-winged Teal	Nearshore Waters	sheltered bays	Increase 50%						Y	
Horned Grebe	Nearshore Waters	sheltered areas between islands far from land (10-20 m depth)	Assess/Maintain	Y						
Long-tailed Duck	Continental Shelf; Nearshore Waters	protected bays with steep slopes and shorelines with gradual shelves	Assess/Maintain						Y	
Mallard	Nearshore Waters	shallow sheltered areas	Maintain current						Y	
Pied-billed Grebe	Nearshore Waters	bays and coastal marshes	Assess/Maintain		Y					
Red-throated Loon	Continental Shelf; Nearshore Waters	sheltered, shallow, sandy substrate	Assess/Maintain		Y					
Surf Scoter	Nearshore Waters	sandy, cobble or rocky substrate (<10 m depth)	Assess/Maintain		Y				Y	
White-winged Scoter	Nearshore Waters	sandy, cobble or rocky substrate (<10 m depth)	Assess/Maintain							Y

¹ Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

² Common Goldeneye was selected as priority despite its rank of Moderate High in the North American Waterfowl Management Plan because of its priority status in other Maritime MBUs.

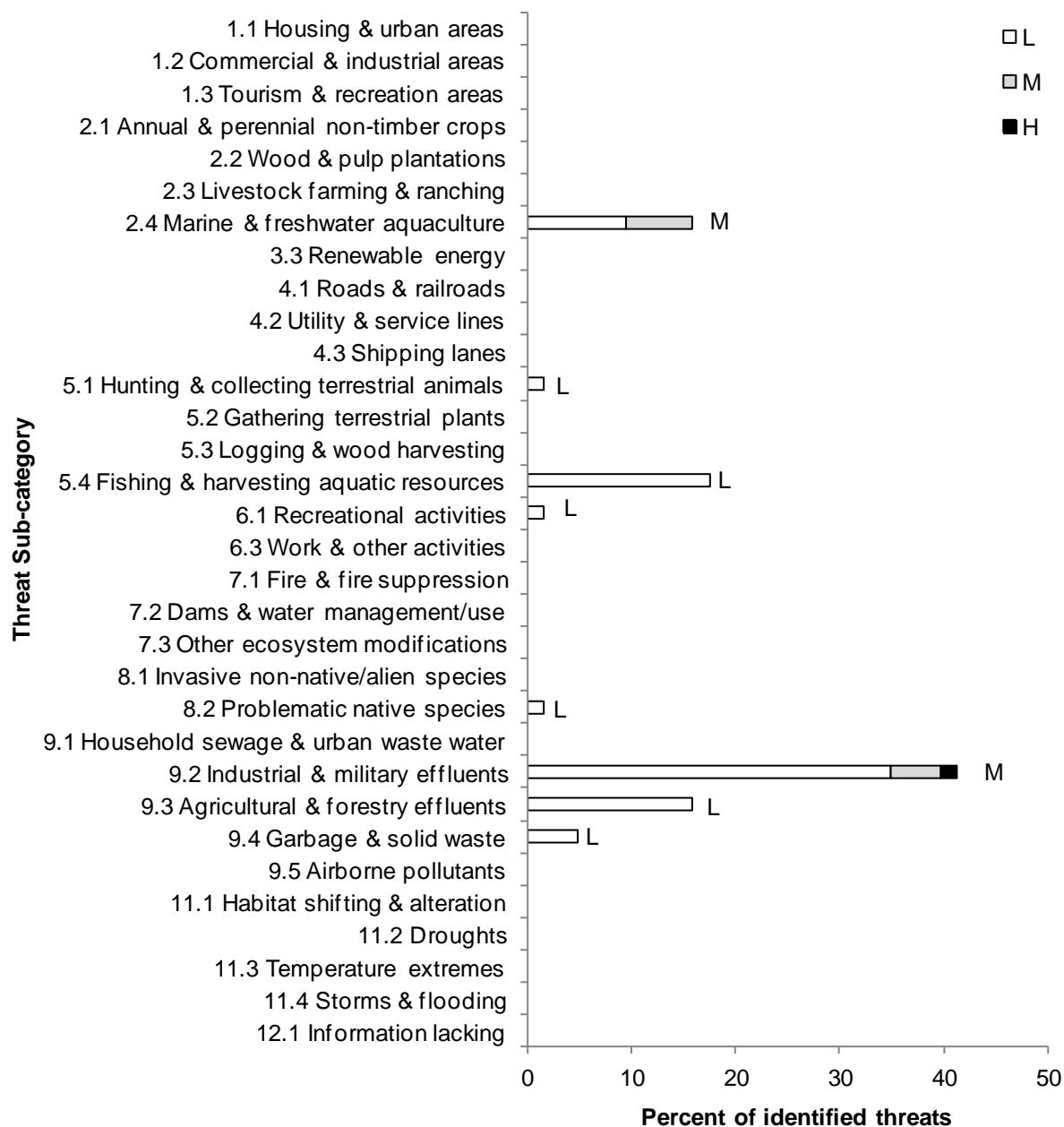


Figure 35. Percent of identified threats to priority bird species in the marine waters in each threat sub-category in MBU 12 PEI.

Each bar represents the percent of the total number of threats identified in each threat sub-category in marine waters (for example, if 100 threats were identified in total for all priority species in the marine waters, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in the marine waters is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within MBU 12 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions.

Table 25. Threats addressed, conservation objectives, recommended actions and priority bird species affected for marine waters in PEI MBU12.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Competition for foraging areas with aquaculture farms	2.4 Marine & freshwater aquaculture	Reduce/eliminate competition for foraging areas with the aquaculture industry	5.3 Reduce human competition for food sources or foraging sites	Manage the aquaculture industry to minimize competition with priority species.	5.3 Private sector standards and codes	Medium: Barrow's Goldeneye (Eastern), Black Scoter, Surf Scoter, White-winged Scoter
				Raise awareness in the industry on the impacts of activities on waterbirds and waterfowl.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Hypothermia caused by oil on plumage from oil spills and oil discharges	9.2 Industrial & military effluents	Reduce mortality from oiling	2.3 Reduce mortality and/or sub-lethal effects from oil pollution	Develop beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.	5.3 Private sector standards and codes	High: Great Cormorant Medium: Barrow's Goldeneye (Eastern), Common Loon, Horned Grebe
				Continue to monitor and enforce compliance with laws, policies and regulations regarding the release of oil and oily waste into marine waters.	5.4 Compliance and enforcement	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Coastal – Above High Tide

Coastal habitats include all habitat types above the tide line along ocean shorelines including: estuaries, mudflats, sand flats, barrier islands, beaches, rocky shorelines, eelgrass, saltmarshes, heath lands, coastal forest edges, and banks and bluffs.

BCR 14 PEI has 1100 km of coastline deeply indented by marine estuaries, along the Gulf of St. Lawrence and the Northumberland Strait (Fig. 36). The north shore of the Island, facing the Gulf of St. Lawrence, features extensive sand-dune formations. The shoreline of Prince Edward Island generally alternates between headlands of steep sandstone bluffs and extensive sandy beaches. Many of the Island's harbours have been created by dredging tidal runs, but there are also a few natural harbours, such as those of Summerside, Charlottetown, Georgetown and Souris.

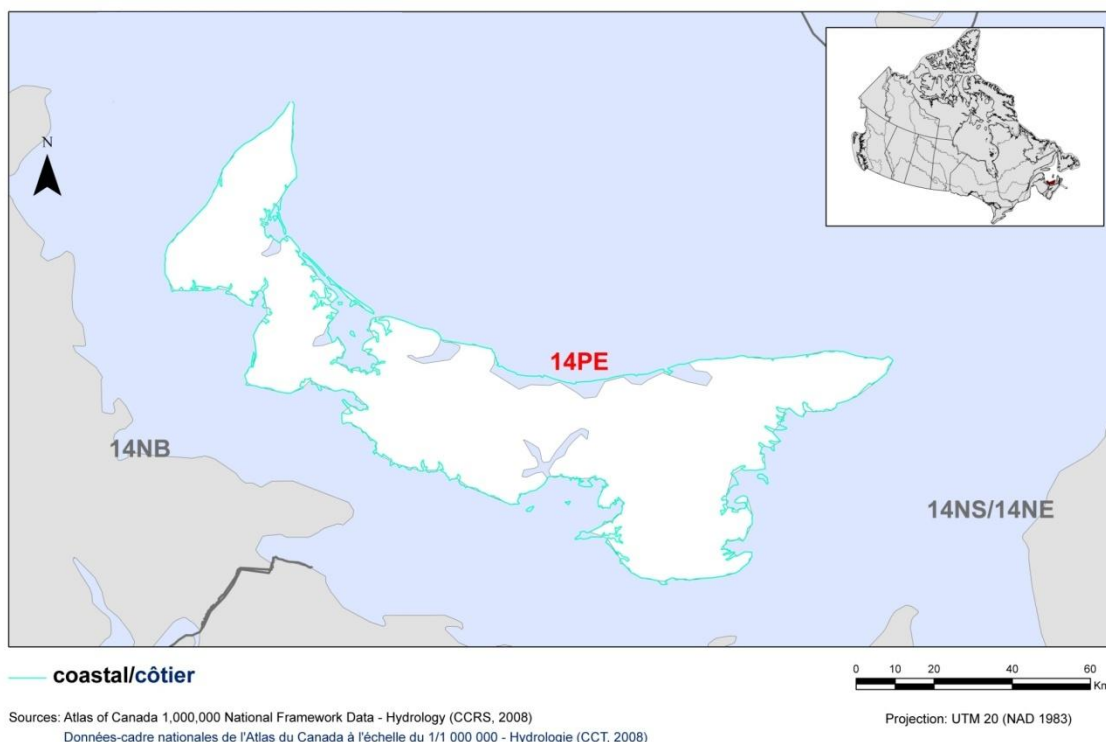


Figure 36. Map of coastal habitat (above high tide) in BCR 14 PEI.

Of the 17 priority bird species that use coastal habitat above high tide, 4 are waterbirds, 5 are shorebirds, 7 are landbirds, and 1 is a waterfowl; 3 are Species at Risk (Table 26). Beaches and saltmarshes are the most commonly used coastal habitat types by the priority bird species.

Aside from sea level rise due to climate change (discussed in the Climate Change section), the highest ranked and most frequently identified threats to priority bird species in coastal habitats include: direct mortality and decreases in prey availability due to oil spills and discharges; decreases in diet quality due to chemical and heavy metal contamination of food sources (9.2 Industrial & military effluents); chemical contamination of food sources or decreases in prey availability due to agricultural runoffs (9.3 Agricultural & forestry effluents); disturbances at foraging, nesting or roosting sites due to recreational use of beaches (6.1 Recreational activities); and habitat loss from beach front cottages (1.1 Housing & urban areas; Fig. 37). Recreational activity on beaches is the greatest during July and August. This period overlaps with the incubation and chick rearing periods for a number of priority bird species (e.g., Piping Plover (*melodus*) and Common Tern). Other development-related threats include artificially high populations of predators (foxes, raccoons and domestic cats) due to the easily available and accessible household wastes.

Many more bird species will benefit from the Recommended Actions presented in Table 27. Recommended actions to address medium or high ranked threats include securing, managing, and protecting remaining coastal habitats, raising public awareness of the impacts of coastal development on coastal habitats and priority bird species; and in some cases, assessing the impacts of urban development on coastal habitats. Pesticides and other biocides should be used only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.

Table 26. Priority species that use coastal habitats (above high tide) in BCR 14 PEI, regional habitat sub-class, important habitat features, population objectives and the reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/ EHJV	Review
American Bittern	Saltmarsh	tall emergent vegetation with aquatic bed vegetation	Assess/Maintain		Y		Y			
American Golden-Plover	Beaches	beaches and barrier beaches	Assess/Maintain		Y					
Bald Eagle	Beaches; Estuaries; Saltmarsh; Mature Forest	shoreline, relatively unpopulated, deciduous or coniferous forest near water with large nest/perching trees	Maintain current							Y
Bank Swallow	Banks and Bluffs	cut banks/cliffs with soft sandy soil	Increase 50%							Y
Belted Kingfisher	Estuaries	clear water with aquatic animals, near nest burrow, overhanging perches beneficial	Assess/Maintain				Y	Y		
Canada Goose (North Atlantic)	Estuaries, Saltmarsh (provisional)	eelgrass beds and adjacent upland areas	Maintain current						Y	
Common Nighthawk	Beaches	bare areas	Increase 100%	Y						
Common Tern	Beaches	sand and gravel, scattered vegetation (cover for chicks)	Assess/Maintain				Y			
Killdeer	Barachois; Beaches	barachois ponds	Assess/Maintain		Y					
Nelson's Sparrow	Saltmarsh		Maintain current		Y		Y	Y		
Osprey	Barachois; Estuaries; Saltmarsh	barachois ponds	Maintain current					Y		
Piping Plover (melodus)	Beaches	sparse vegetation and wrack, sand or medium cobble beach but not rocky	Recovery objective	Y	Y					
Short-eared Owl	Saltmarsh	sand dunes, abundant prey	Assess/Maintain	Y						
Sora	Saltmarsh		Assess/Maintain		Y					
Spotted Sandpiper	Barachois; Beaches	beaches and barrier beaches, barachois ponds	Assess/Maintain		Y					
Virginia Rail	Barachois	barachois ponds	Assess/Maintain		Y					
Whimbrel	Heathlands	coastal heathlands	Assess/Maintain		Y					

¹Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

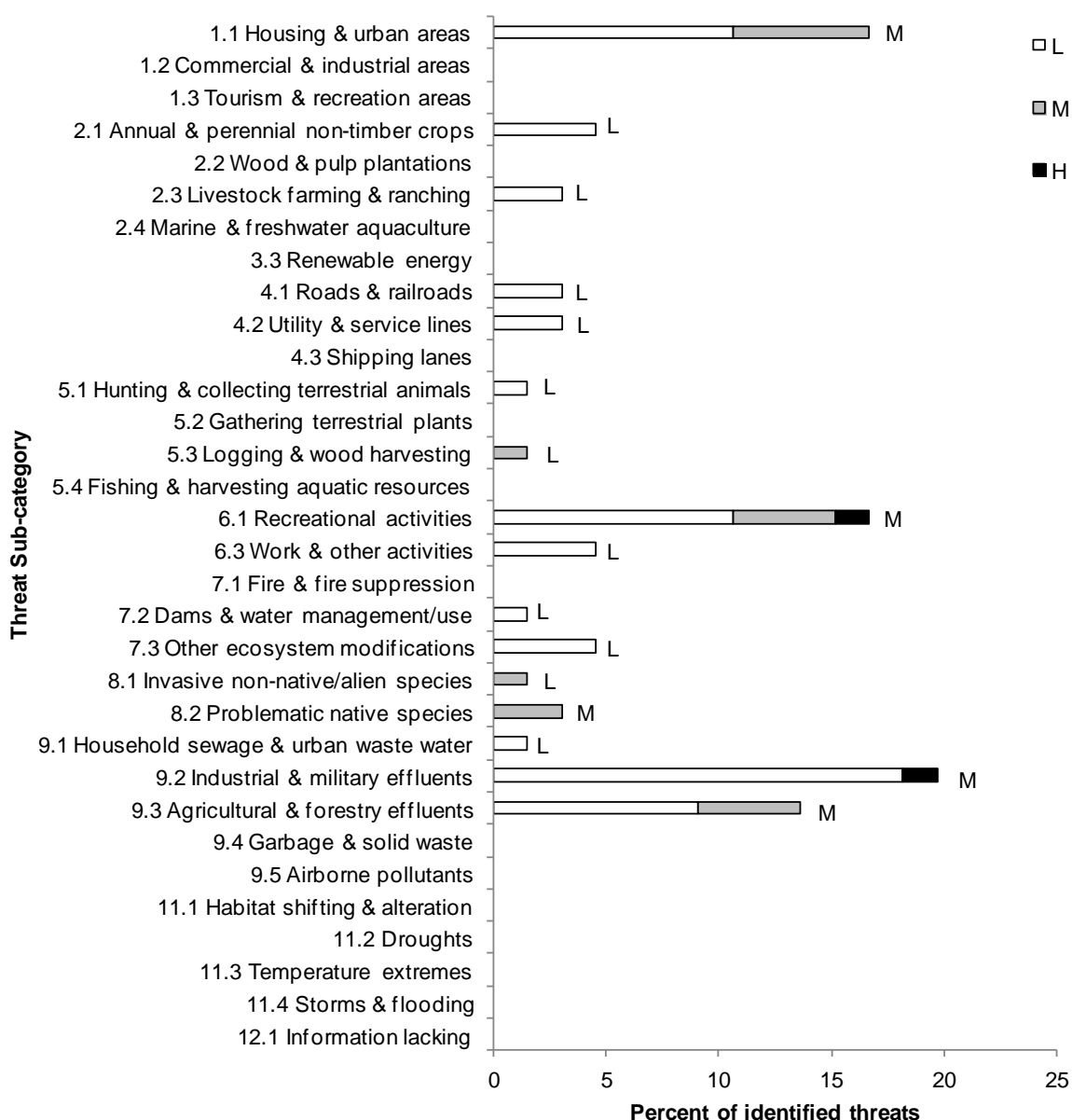


Figure 37. Percent of identified threats to priority bird species in coastal habitats (above high tide) in each threat sub-category in BCR 14 PEI.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal habitats (above high tide; for example, if 100 threats were identified in total for all priority bird species in coastal habitats (above high tide), and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in coastal habitats (above high tide) is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority bird species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended action.

Table 27: Threats addressed, conservation objectives, recommended actions, and priority species affected in coastal habitats (above high tide) in BCR 14 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of saltmarshes and barachois due to urban development	1.1 Housing & urban areas	Maintain/restore saltmarshes	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage saltmarsh habitat for priority species through various methods such as provincial Integrated Coastal Zone Management plans, creation of protected areas, private land acquisitions, conservation easements, or community conservation plans.	1.2 Resource and habitat protection	Medium: American Bittern, Canada Goose (North Atlantic), Osprey
				Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation.	5.3 Private sector standards and codes	
				Raise public awareness of the importance of saltmarsh habitat to priority species.	4.3 Awareness and communications	
				Provide incentives for landowners to protect saltmarsh habitat.	6.4 Conservation payments	
				Assess the impacts of coastal development on saltmarshes and priority species.	8.1 Research	
Fragmentation or loss of mature coastal forest due to urban development	1.1 Housing & urban areas	Maintain/restore mature and old growth coastal forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional coastal forest habitats.	1.1 Site/area protection	Medium: Bald Eagle
				Maintain sufficient patch sizes, configuration, and connectivity of coastal mature forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the Widespread Issues section, 3) identified threats in this habitat are of low magnitude.

Table 27 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
				Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation.	5.3 Private sector standards and codes	
Loss of nesting or perching trees in mature coastal forest due to logging activities	5.3 Logging & wood harvesting	Maintain /restore mature and old growth coastal forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional coastal forest habitats.	1.1 Site/area protection	Medium: Bald Eagle
				Maintain sufficient patch sizes, configuration, and connectivity of coastal mature forest habitats to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species.	2.1 Site/area management	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Disturbance at foraging sites by recreational activities in coastal areas	6.1 Recreational activities	Reduce /eliminate disturbance from recreational activities in coastal areas	4.1 Reduce disturbance from human recreation	Secure and manage key coastal habitat for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements.	1.2 Resource and habitat protection	High: Piping Plover (<i>melodus</i>) Medium: American Golden-Plover, Canada Goose (North Atlantic)
				Raise public awareness of shorebirds and waterfowl and their habitat needs, and the impacts of disturbance from recreational activities in coastal areas.	4.3 Awareness and communications	
				Manage coastal recreational activities to minimize disturbance to priority species.	5.2 Policies and regulations	
				Assess the impacts of recreational activities in coastal areas on priority species.	8.1 Research	
Disturbance at roost sites by recreational activities in	6.1 Recreational activities	Reduce/ eliminate disturbance from	4.1 Reduce disturbance from human recreation	Establish/maintain protected areas to restrict access/activity at roost sites.	1.1 Site/area protection	Medium: Bald Eagle
				Raise environmental awareness of issues surrounding human disturbance in coastal habitat.	4.3 Awareness and	

Table 27 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
coastal areas		recreational activities in mature coastal forest			communications	
				Manage recreational activities to minimize disturbance during key periods for priority species.	5.2 Policies and regulations	
Competition from and displacement by gulls	8.2 Problematic native species	Reduce/eliminate displacement by gulls	3.2 Reduce competition with problematic native species	Discourage gulls at managed colonies and at islands selected for restoration	2.2 Invasive/problematic species control	Medium: Common Tern
				Decrease gull populations near tern colonies by encouraging: closure of landfills, control of refuse at fish plants and on fishing boats and discouraging people from feeding gulls.	2.2 Invasive/problematic species control	
				Monitor gull population and distribution.	2.2 Invasive/problematic species control	
Increased predation - increasing populations of foxes and racoons as a results of land use practices	8.2 Problematic native species	Reduce predation by foxes and racoons	2.5 Reduce parasitism /predation	Improve waste management (household and industrial waste, landfills and waste processing facilities) to minimize availability of food to scavengers and reduce artificially sustained predator populations (e.g. racoons, foxes, gulls).	2.2 Invasive/problematic species control	Medium: Piping Plover (<i>melodus</i>)
Hypothermia caused by oil on plumage from oil spills and oil discharges	9.2 Industrial & military effluents	Reduce mortality from oiling	2.3 Reduce mortality and/or sub-lethal effects from oil pollution	Develop beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.	5.3 Private sector standards and codes	High: Piping Plover (<i>melodus</i>)
				Continue to monitor and enforce compliance with laws, policies and regulations regarding the release of oil and oily waste into waterbodies.	5.4 Compliance and enforcement	

Table 27 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Decrease of diet quality and of health of birds due to the consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce mortality from exposure to pesticides and other biocides used by the agriculture industry	2.1 Reduce mortality and/or sub-lethal effects from pesticide use	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Short-eared Owl
				Promote pesticide free products.	6.2 Substitution	
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	9.3 Agricultural & forestry effluents	Reduce the loss of prey/food source from exposure to pesticides and other biocides used by the agriculture industry	5.2 Manage decreases in prey due to contaminants	Use pesticides and other biocides only where necessary and only as part of an integrated pest management system to minimize exposure of birds to potentially toxic chemicals.	5.3 Private sector standards and codes	Medium: Bank Swallow, Osprey
				Promote pesticide free products.	6.2 Substitution	

Coastal – Intertidal – Gulf of St. Lawrence

The coastal (intertidal) habitats of MBU 12 PEI include all marine habitats along ocean shorelines, but do not include terrestrial shoreline habitat (Fig. 36). Priority bird species using primarily coastal (above high tide) habitats in Prince Edward Island are included in the previous section: Coastal – Above High Tide. Habitats in the coastal (intertidal) areas include estuaries, mudflats, sand flats, rocky shorelines, eelgrass and saltmarshes. Islands are also included in this habitat class for MBU 12 PEI (Fig. 38).

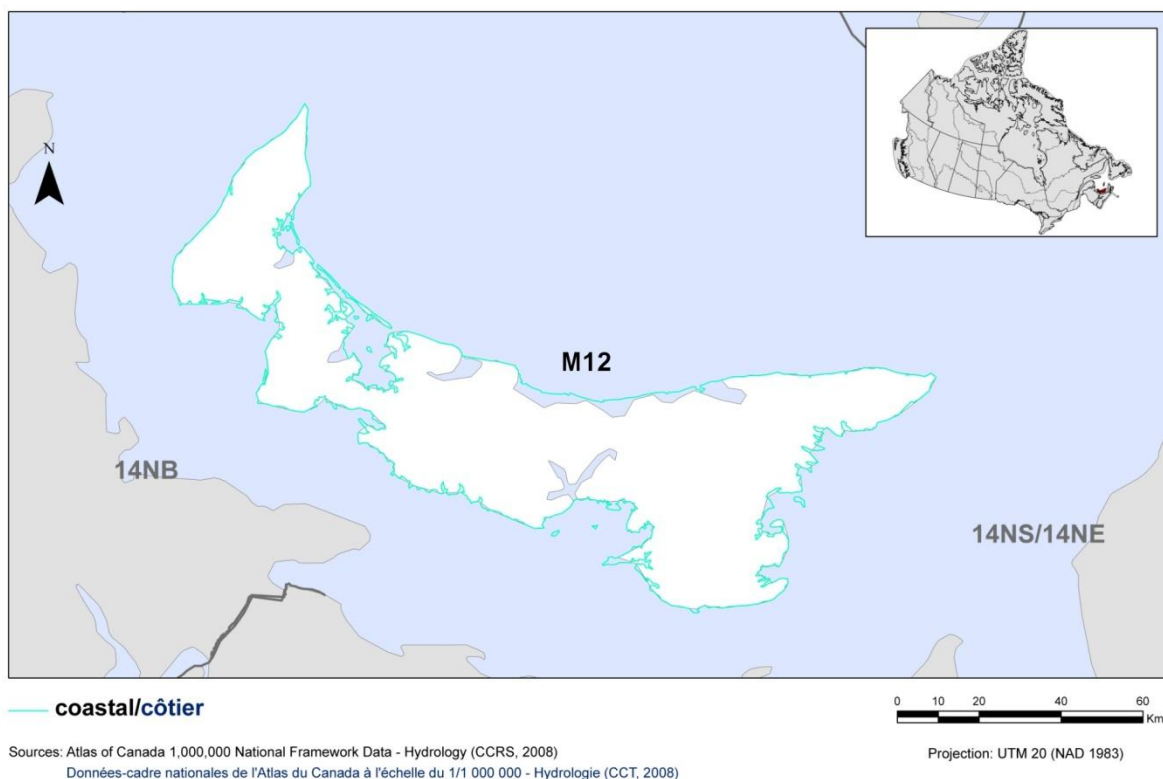


Figure 38. Map of coastal habitat (intertidal) in MBU 12 PEI.

Of the 23 priority species that use this habitat, 6 are waterfowl, 4 are waterbirds and 13 are shorebirds; 3 are Species at Risk (Table 28). A review of regional habitat use shows that 14 priority species use saltmarshes, 8 use mudflats, 2 use islands and 17 use estuaries, making estuaries the most widely used habitat in coastal MBU 12 PEI.

The highest ranked and most frequently identified threats include direct and indirect mortality from oil spills and discharges (9.2 Industrial & military effluents) and human disturbance to roost and nest sites (6.1 Recreational activities; Fig. 39). Decreases in diet quality and the health of birds due to the consumption of food contaminated by biocides such as pesticides, herbicides or fungicides (9.3 Agricultural & forestry effluents) is also a frequently identified threat, though it was ranked low (Fig. 39) for priority bird species using the coastal (intertidal) habitats of MBU 12 PEI.

Many more bird species will benefit from the Recommended Actions presented in Table 29. Recommended actions to address medium or high ranked threats focus on managing coastal recreational and commercial activities to minimize disturbance to priority bird species and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize the occurrence and potential impacts of accidental oil discharges on priority birds. Pesticides and other biocides should be used only as part of an integrated pest management system to minimise exposure of birds to potentially toxic chemicals.

Table 28. Priority bird species that use coastal (intertidal) habitats in MBU 12 PEI, regional habitat class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
American Black Duck	Estuaries; Saltmarsh		Maintain current						Y	
Barrow's Goldeneye (Eastern)	Estuaries		Assess/Maintain	Y						
Black-bellied Plover	Estuaries; mudflats; Saltmarsh; Sandflats		Assess/Maintain		Y					
Bonaparte's Gull	Estuaries		Assess/Maintain		Y					
Canada Goose (North Atlantic)	Estuaries; Mudflats; Saltmarsh; Sandflats	eelgrass beds	Maintain current						Y	
Common Goldeneye	Estuaries	adequate prey	Assess/Maintain						Y ²	
Common Loon	Estuaries		Assess/Maintain		Y		Y			
Common Tern	Estuaries; Saltmarsh; Islands	sand and gravel, scattered vegetation (cover for for chicks)	Assess/Maintain				Y			
Dunlin	Estuaries; Mudflats; Sandflats		Assess/Maintain		Y					
Great Cormorant	Islands	cliffs or rocky islands free from predators	Assess/Maintain		Y					
Green-winged Teal	Saltmarsh	coastal marshes with heavy vegetation and muddy bottoms	Increase 50%						Y	
Hudsonian Godwit	Estuaries; Mudflats; Saltmarsh; Sandflats		Assess/Maintain		Y					
Least Sandpiper	Barachois; Estuaries; Mudflats; Saltmarsh		Assess/Maintain		Y					
Lesser Yellowlegs	Barachois; Estuaries; Mudflats; Saltmarsh		Assess/Maintain		Y					
Mallard	Estuaries; Saltmarsh		Maintain current						Y	
Piping Plover (melodus)	Sandflats		Recovery objective	Y	Y					
Purple Sandpiper	Rocky Shoreline	rocky shoreline exposed to wave action	Assess/Maintain		Y					
Red Knot (rufa)	Mudflats; Saltmarsh;		Assess/Maintain	Y	Y					

Table 28 continued

Priority Bird Species	Regional Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status ¹						
				SAR	N/CC	N/CS	R/SC	R/SS	NAWMP/EHJV	Review
	Sandflats									
Sanderling	Estuaries; Sandflats		Assess/Maintain		Y					
Semipalmated Sandpiper	Beaches; Estuaries; Mudflats; Sandflats	sand or gravel beaches with sparse vegetation and wrack	Assess/Maintain		Y					
Solitary Sandpiper	Estuaries		Assess/Maintain		Y					
Whimbrel	Estuaries; Saltmarsh; Sandflats		Assess/Maintain		Y					
Willet	Beaches; Estuaries; Saltmarsh		Assess/Maintain		Y					

¹Reasons for priority status are as follows: SAR, species listed under SARA (Species at Risk Public Registry 2012) or assessed by COSEWIC (2012) as Endangered, Threatened, or Special Concern; N/CC, National/Continental Concern; N/CS, National/Continental Stewardship; R/SC, Regional/Sub-regional Concern; R/SS, Regional/Sub-regional Stewardship; NAWMP/EHJV, waterfowl that are priority species under the PEI EHJV implementation plan (PEI EHJV 2008) or ranked as having High or Highest conservation/monitoring needs in WCR 14 in the North American Waterfowl Management Plan (NAWMP Plan Committee 2004); Review, species added by the Regional Working Group or upon expert review. For further details on reasons for priority status and the species prioritization process, see Appendices 1 and 2.

²Common Goldeneye was selected as priority despite its rank of Moderate High in the North American Waterfowl Management Plan because of its priority status in other Maritime MBUs.

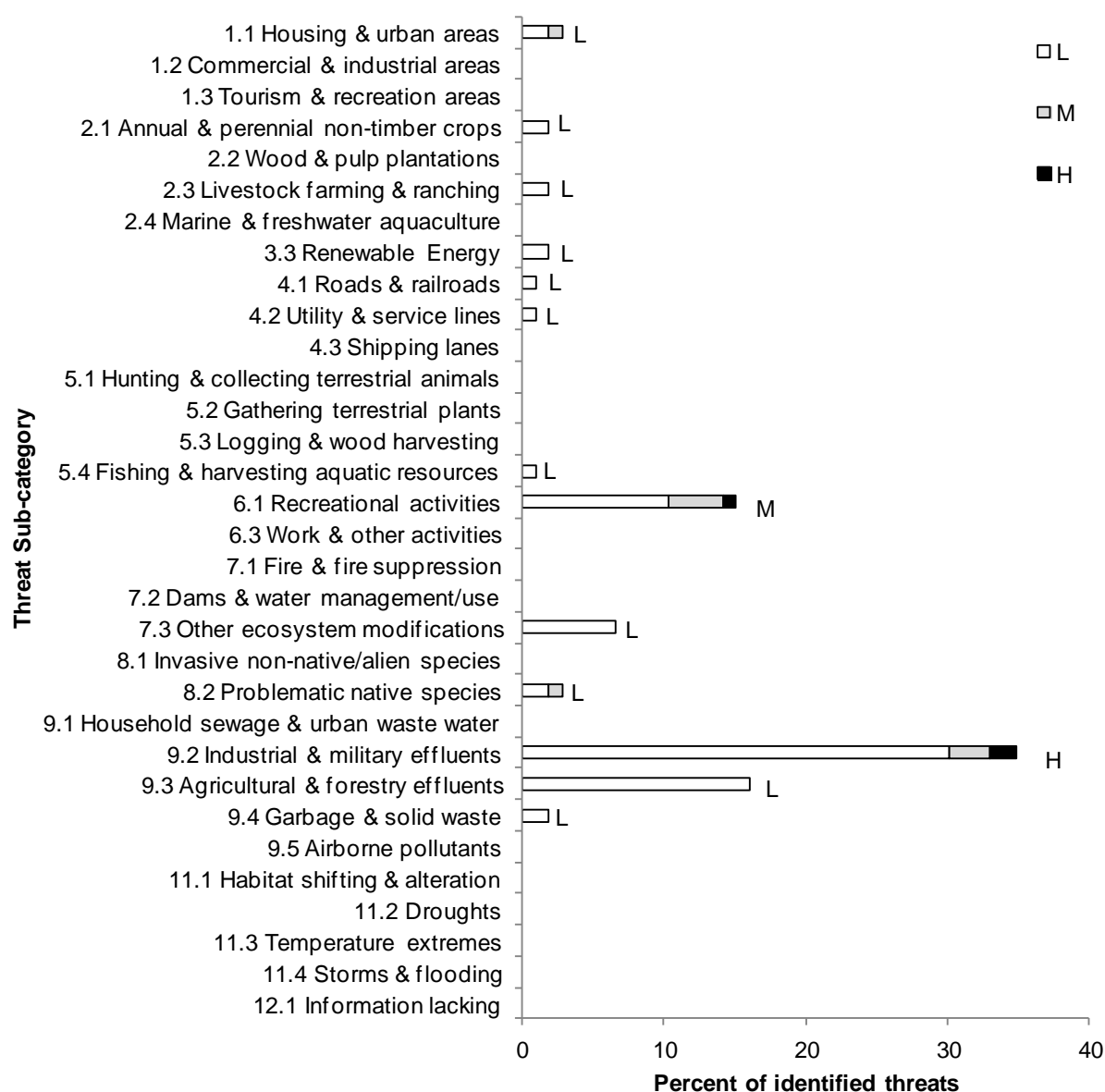


Figure 39. Percent of identified threats to priority bird species in coastal (intertidal) habitat in each threat sub-category in MBU 12.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal habitat (intertidal; for example, if 100 threats were identified in total for all priority species in coastal habitat (intertidal), and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, and H rankings in the sub-category). The overall magnitude of the sub-threat in coastal habitat (intertidal) is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 14 PEI by threat category and broad habitat class).

Note: Threats of all magnitudes are included, although low ranked threats affecting only a single species were not assigned conservation objectives or recommended actions.

Table 29. Threats addressed, conservation objectives, recommended actions and priority bird species affected in coastal habitat (intertidal) in MBU 12 PEI.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Fragmentation or loss of saltmarshes due to urban development	1.1 Housing & urban areas	Maintain/restore saltmarshes	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage saltmarsh habitat for priority species through various methods such as provincial Integrated Coastal Zone Management plans, creation of protected areas, private land acquisitions, conservation easements, and community conservation plans.	1.2 Resource and habitat protection	Medium: Canada Goose (North Atlantic)
				Raise public awareness of the importance of saltmarsh habitat to priority species.	4.3 Awareness and communications	
				Provide incentives for landowners to protect saltmarsh habitat.	6.4 Conservation payments	
				Assess the impacts of coastal development on saltmarshes and priority species.	8.1 Research	
Disturbance at foraging sites from recreational activities in coastal areas	6.1 Recreational activities	Reduce/eliminate disturbance from recreational activities in coastal areas	4.1 Reduce disturbance from human recreation	Secure and manage key coastal habitat (beaches, intertidal mudflats, saltmarshes, etc.) for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, and community conservation plans.	1.2 Resource and habitat protection	High: Piping Plover (<i>melodus</i>) Medium: Black-bellied Plover, Canada Goose (North Atlantic), Red Knot (<i>rufa</i>), Sanderling
				Raise public awareness of shorebirds and waterfowl and their habitat needs, and the impacts of disturbance from recreational activities in coastal areas.	4.3 Awareness and communications	
				Manage coastal recreational activities to minimize disturbance to priority species.	5.2 Policies and regulations	
				Assess the impacts of recreational activities in coastal areas on priority species.	8.1 Research	

[†] Priority species not mentioned in this table are absent for one of the following reasons: 1) no identified threats in this habitat, 2) identified threats are discussed in the **Error! Reference source not found.** section, 3) identified threats in this habitat are of low magnitude.

Table 29 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Recommended Action	Action Category	Threat Rank and Priority Species Affected [†]
Competition from and displacement by gulls	8.2 Problematic native species	Reduce/eliminate displacement by gulls	3.2 Reduce competition with problematic native species	Discourage gulls at managed colonies and at islands selected for restoration	2.2 Invasive/problematic species control	Medium: Common Tern
				Decrease gull populations near tern colonies by encouraging: closure of landfills, control of refuse at fish plants and on fishing boats and discouraging people from feeding gulls.	2.2 Invasive/problematic species control	
				Monitor gull population and distribution.	2.2 Invasive/problematic species control	
Hypothermia caused by oil on plumage from oil spills and oil discharges	9.2 Industrial & military effluents	Reduce mortality from oiling	2.3 Reduce mortality and/or sub-lethal effects from oil pollution	Develop beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.	5.3 Private sector standards and codes	High: Piping Plover (<i>melodus</i>), Red Knot (<i>rufa</i>) Medium: Barrow's Goldeneye (Eastern), Common Loon, Willet
				Continue to monitor and enforce compliance with laws, policies and regulations regarding the release of oil and oily waste into marine waters.	5.4 Compliance and enforcement	

Section 3: Additional Issues

Widespread Issues

Some well-known conservation issues may not be identified in the literature as significant threats to populations of an individual priority species and therefore may not be captured in the threat assessment. However, these issues, while they may or may not be limiting factors for any individual species or population, contribute to avian mortality or decreases in fecundity across many species and thus warrant conservation attention. Usually these issues transcend habitat types and are considered “widespread”. Examples of these issues include:

- Collisions with human-made structures (buildings, cars, utility/telecommunications towers and lines, etc.)
- Predation by domestic cats
- Pollution/pesticides/oil spills
- Climate change

Because the widespread issues do not fit into the standard presentation format used in the BCR strategies, they are presented separately here. The mortality estimates included here are largely based on draft reports that were available within Environment Canada when this strategy was produced; the numbers may change as the final scientific papers are peer-reviewed and published. Human-related avian mortality across all sectors was standardized and compared in Calvert et al. 2013.

These widespread issues are not presented in any particular order as the relative importance of these issues in Prince Edward Island is not known.

Collisions

Buildings

Collisions with glass windows or reflective panels on buildings, is believed to be a significant source of bird mortality in Canada. Estimates of mortality from collisions with houses in Canada (including birds using feeders) range from approximately 15.8–30.5 million birds per year (Machtans et al. 2013). Mortality from collisions with buildings of fewer than 12 storeys is estimated at approximately 0.3–11.4 million birds/year, and for all cities in Canada with tall buildings in an urban core the estimate is 13 000 – 256 000 birds/year (Machtans et al. 2013). The total estimate of mortality from collisions with buildings in Canada is therefore between 16.1–42.2 million birds/year (Machtans et al. 2013).

Data from Canada and the northeastern United States reveal that 163 species of birds of 32 families are known to have been killed by buildings. Some families and species of birds are disproportionately affected by collisions with buildings. *Parulidae* (warblers), *Fringillidae*

(sparrows and allies), and *Regulidae* (kinglets) account for 70% of all bird deaths; the species most frequently killed are White-throated Sparrows (a priority bird species in BCR 14 PEI; 13.5% of all reported deaths), Golden-crowned Kinglets (10.2%), Dark-eyed Juncos (6.1%), Ovenbirds (5.3%) and Ruby-crowned Kinglets (5.3%). The population-level effects of bird mortality from building strikes are unknown. See Table 30 for conservation objectives and actions.

Wind Turbines

The 2955 wind turbines in Canada in 2011 have drawn considerable attention for their potential to cause mortality to birds and other species (notably bats). Two sources of mortality are typically associated with wind turbines: collisions with the turbines themselves, and the destruction of nests by turbine construction activities during the breeding season. On average, 5.9 birds are killed per turbine per year. Scaling up to a national level, an estimated 16 700 birds (range 13 300–21 600) die from collisions with wind turbines each year (Zimmerling et al. 2013).

Some species are particularly vulnerable to collisions with wind turbines, for example, raptors flying along a land/water interface. For smaller, more common passerine species (warblers, thrushes, kinglets, etc.), the relatively small number of birds affected does not appear to pose a population level threat. However, the anticipated proliferation of wind turbines means we should continue to ensure that turbines are sited to avoid important bird habitats and migration corridors whenever possible.

At the 43 wind farms in Canada for which data are available, total habitat loss per turbine is 1.23 ha on average. Based on this average, the predicted total habitat loss for wind farms nationwide is 3635 ha. Using published estimates of nest densities, the total number of affected nests, not accounting for construction that might occur outside the breeding season, is approximately 5700 (Zimmerling et al. 2013). See Table 30 for conservation objectives and actions.

Prince Edward Island currently produces 156 MW from 9 wind farms, with a total of 163 turbines (Canadian Wind Energy Association 2008). The Government of Prince Edward Island recognizes its province's capacity to increase production and has made the commitment to do so when economic conditions allow (Prince Edward Island 2008a; Blackwell 2010).

Communication Towers

There are currently almost 8000 communication towers in Canada >60m high (Longcore et al. 2012), each of which can pose a hazard to birds during migration. Birds are attracted to the lights of communication towers and are killed when they collide with the structures and guy wires. Mortality increases exponentially with tower height, in part because the use of

guy wires also increases with tower height. Poor weather also plays a significant role in increasing migrant fatality; foggy and cloudy conditions increase the lit area around towers and block celestial clues used by migrating birds. The result is that birds circle to exhaustion in the halo of artificial light, or collide with each other, the tower, or its guy wires (American Bird Conservancy 2012).

Avian mortality at towers is unequally distributed among species and regions, but estimates suggest that over 220 000 birds are killed in Canada each year (Longcore et al. 2012). In the Canadian portion of BCR 14, more than 18 000 birds are estimated to be killed from collisions with towers every year (Longcore et al. 2012).

Neotropical migrants in the families *Parulidae* (wood-warblers) and *Vireonidae* (vireos) are the species most commonly killed by communication towers. These families include threatened species and many that are of conservation concern in Canada and/or the United States. When considered in concert with mortality at towers in the United States (which is 20 times higher due to the larger number and greater height of towers in the United States), and the mortality from other stationary structures, mortality from collisions with communications towers may negatively affect the population trends of some birds. See Table 30 for conservation objectives and actions.

Power Lines

Birds may be killed by colliding with power lines, or they may be electrocuted. Species with high wing-loading and thus low maneuverability, such as waterfowl, appear particularly at risk for collisions (Bevanger 1998). Electrocutions are most likely for large birds such as raptors and herons, whose bodies are large enough to span the distances between wires and create a short-circuit. Raptors' habit of using power poles as perches further increases their risk. However, estimates of total mortality due to collisions and electrocutions can vary widely (Manville 2005) and population-level impacts are difficult to determine. Canadian estimates are that 161 000 – 802 000 birds are killed annually by electrocution and another 5.3–20.6 million birds are killed each year by colliding with electrical transmission lines (Calvert et al. 2013). See Table 30 for conservation objectives and actions. There are approximately 5000 km of power lines on Prince Edward Island with 4400 for distribution and 600 for transmission (Maritime Electric Company 2012). See Table 30 for conservation objectives and actions.

Vehicles

There are over 1.4 million km of roads and hundreds of airports in Canada (World Bank Indicators 2012) that are often bordered by fences and vegetation providing convenient places for birds to perch, forage, and nest. The paved surfaces can attract birds through the heat they emit, the puddles that form beside roads, and the salt and grit used for de-icing. The province of Prince Edward Island's highway system is comprised of 3798 km of paved

highways and 1448 km of unpaved or clay roads (Encyclopedia of Canadian Provinces 2007). Current estimates for one- and two-lane paved roads outside of major urban centres in Canada are that between 4.65 and 13.8 million birds are killed annually (Bishop and Brogan 2013).

Bird collisions with cars are influenced by the location of the road, proximity of vegetation and vehicle speed. Raptors and owls that hunt and forage near roads are particularly vulnerable, but many species forage for grit and road salt or are otherwise attracted to roads have a high likelihood of being hit by vehicles. The population level effects of this source of mortality are not known. See Table 30 for conservation objectives and actions.

Predation by Domestic Cats

Based on the number of pet cats in Canada and published kill rates by cats elsewhere, roughly 204 million birds (range 105–348 million) are killed by domestic and feral cats in Canada each year (Blancher 2013). The broad range on this estimate reflects imprecise information on the average number of bird kills per cat, especially for rural and feral cats, and a lack of information on the number of feral cats (versus owned or pet cats) in Canada. In 1999, 1600 cats were euthanized at the Prince Edward Island Humane Society; of this number, 75% were thought to be feral cats (Gibson et al. 2002). In spite of such high rates of euthanasia, the feral cat population on Prince Edward Island continues to be a problem for bird populations (Gibson et al. 2002).

The birds most susceptible to cat predation are those that nest or forage on or near the ground, or spend substantial time in human-dominated landscapes (both rural and urban) where cats are abundant. The proportion of Canada's birds killed by cats would be higher if additional cat predation when migrating through, or wintering in, the U.S. is factored in.

Without detailed study of the individual species affected, it is difficult to assess whether mortality caused by cat predation impacts population trends of birds in Canada. Nevertheless, it is likely that bird populations are depressed or extirpated locally in areas with very high cat populations; areas with high densities of cats may function as population sinks. In BCR 14 PEI, Common Nighthawk has been identified as a priority species affected by predation from cats in coastal habitats (low ranked threat). See Table 30 for recommended conservation objectives and actions.

Pollution

Pollution caused by industrial chemicals, pesticides and heavy metals can have both direct and indirect effects on survival and reproduction in birds. Sometimes the effects of exposure to pollutants are unexpected and do not result in immediate, measurable impacts on bird populations (Eeva and Lehikoinen 2000; Franceschini et al. 2008; North American Bird Conservation Initiative, U.S. Committee 2009; Mineau 2010). However, persistent

exposure can result in sharp declines in bird populations as happened with Peregrine Falcons in eastern Canada prior to the ban of DDT.

Pesticides

The most recent estimate suggests that 0.96–4.4 million birds are killed by pesticides annually in Canada (Mineau 2010). Provinces such as Saskatchewan, which have a large agricultural land base, account for the majority of the estimated kill, and pesticides are thought to be an important contributor to the decline in grassland bird species in Canada (Mineau 2010). Pesticides can kill birds rapidly following contact or may have sub-lethal impacts such as suppressed immune function and reduced stress response. There may also be indirect effects of pesticides such as reduction in prey and changes in vegetation that reduce habitat quality. While the use of the many toxic pesticides has been eliminated in Canada, migratory birds are still exposed while on wintering grounds in countries where their use is still permitted (Mineau 2010).

In 2006, on Prince Edward Island, commercial fertilizer was applied on 1120 km² of land; herbicides were applied on 875 km²; insecticides on 400 km²; and fungicides on 420 km² (Statistics Canada 2006). However, Statistics Canada notes that the area of land treated with herbicides, insecticides and fungicides was under-reported due to confusion in its questionnaire. The agricultural industry is the dominant industry on Prince Edward Island (\$122M net value in 2010). The most frequently identified and among the highest ranked threats discussed in this strategy are due to contamination from pesticides (9.3 Agricultural & forestry effluents; Fig. 8; Table A-3), which either directly affects the survival of priority birds or their food sources. These threats have been identified as medium or low ranked threats for 42 priority bird species in BCR 14 PEI.

The effect of agricultural run-off extends to marine waters surrounding the island (Table 30; Table A-3). Twenty-three (23) priority bird species in MBU 12 PEI (in both coastal habitats and marine waters) were found to be affected by pesticides (though the rank is low). In addition, shellfish and finfish aquaculture industries are also important industries on Prince Edward Island (\$22M gross value in 2010; Statistics Canada 2011c). Finfish aquaculture uses pesticides to control crustacean parasites such as sea lice; however, no information could be found on the quantities used.

Toxic Chemicals and Heavy Metals

Toxic organic chemicals and heavy metals released into the environment can also negatively impact bird populations. While some industrial chemicals such as PCBs are regulated, there is concern about new chemicals such as flame retardants (PBDE) that are used in computers, car parts and upholstery, and whose effects on wildlife are largely unknown (Environment Canada 2003). Scavengers experience toxic effects when they ingest lead shotgun pellets or bullet fragments embedded in carcasses of game animals, and loons and

other waterbirds are exposed to lead from shotgun pellets, sinkers and jigs that they ingest either while collecting grit for their gizzards or by eating bait fish with line and sinker still attached (Scheuhammer and Norris 1996; Scheuhammer et al. 2003). In some areas lead poisoning from sinkers and jigs can account for approximately half of the mortality of adult Common Loons on their breeding grounds (Scheuhammer and Norris 1996). Birds are also susceptible to bioaccumulation of other toxic metals such as methylmercury, selenium, and others when they consume prey that has been exposed to these substances.

Decreases in diet quality and/or decreases in prey availability due to chemical or heavy metal contamination were identified as threats to 6 priority species in BCR 14 PEI; and for 12 priority species in MBU 12 PEI in herbaceous, urban, waterbodies (inland and marine), wetlands and coastal (above and below high tide) habitats (Table A-3). See Table 30 for conservation objectives and actions.

Oil Pollution

Oil may enter the environment either accidentally, through deliberate dumping, or in contained tailings ponds. It may be a single large event, as occurred in the Gulf of Mexico in 2010, or numerous smaller events. Annual estimates are that between 217 800 and 458 600 birds are killed by ship-source oil spills annually (Calvert et al. 2013). Typically, diving birds are most at risk of oiling; however, any birds that come into contact with oil are vulnerable. Oil can impact birds through direct effects such as hypothermia (resulting from lost water-proofing of feathers following oil contamination), toxicity (from ingesting oil as they preen or by inhaling volatile organic compounds), and indirect effects, such as reduced prey availability and decreased quality of habitat. While techniques exist to clean and rehabilitate oiled birds, many birds die before, during and after rescue attempts (Brown and Lock 2003). See Table 30 for conservation objectives and actions.

The Gulf of St. Lawrence is the gateway for shipping traffic to New Brunswick, Quebec and Ontario. In 2007, 65 million tonnes of domestic shipping and 161 million tonnes of international shipping passed through the Gulf (Statistics Canada 2010). With regard to the marine sector, the petroleum industry dominates shipping (crude oil from domestic and international markets) as well as potash (Vasarhelyi and Kirk 2007).

Given the extensive traffic through or near the MBU 12 PEI, the area is susceptible to oil spills both accidental and intentional, and not surprisingly, decreases in food availability and/or hypothermia caused by oil spills and discharges were identified as threats to all priority species in MBU 12 PEI in coastal habitats and in marine waters (Table A-3).

Table 30. Conservation objectives and actions associated with bird mortality from collisions, cats and contaminants.

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
Collision mortality						
Collisions with buildings cause bird mortality.	1.1 Housing and urban areas 1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with windows/buildings	2.7 Reduce incidental mortality from collisions	Follow beneficial management practices for bird-friendly buildings including using bird-friendly glass, reducing reflection from windows, providing visual markers to enable birds to perceive windows, and reducing light pollution.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with wind turbines cause bird mortality.	3.3 Renewable energy	Reduce incidental mortality from collisions with wind turbines	2.7 Reduce incidental mortality from collisions.	<p>Follow beneficial management practices for reducing bird mortality when designing and locating wind turbines.</p> <p>Ensure that offshore wind energy developments will not present significant migration barriers.</p> <p>Locate offshore wind energy developments away from seabird breeding colonies and important waterbird foraging areas.</p> <p>Utilize techniques such as radar monitoring to determine pre-construction flight paths and assess the degree to which wind farms present migration barriers, and infrared camera systems to quantify strike rates.</p>	<p>2.1 Site/area management 5.3 Private sector standards and codes</p> <p>1.2 Resource and habitat protection</p> <p>8.2 Monitoring</p>	All species

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
Collisions with communications towers cause bird mortality, particularly during migration.	1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with man-made structures	2.7 Reduce incidental mortality from collisions.	<p>Follow beneficial management practices for reducing mortality to birds when constructing new communications towers.</p> <p>Switch off solid lights on existing towers and ensure that remaining lights have a synchronized, complete dark phase.</p> <p>Take steps to ensure that new towers avoid guy wires and minimize height, and avoid topographic locations where migrating birds are likely to be found in abundance.</p> <p>Retrofit existing towers to adhere to as many guidelines as possible.</p>	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with power lines and accidental electrocution cause bird mortality.	4.2 Utility and service lines	Reduce mortality from collisions with utility lines / transmission towers	2.7 Reduce incidental mortality from collisions.	<p>In high-risk areas, retrofit power lines so that the risk of electrocution of raptors is minimized. In new developments, locate transmission lines underground.</p> <p>Use markers or paint to increase visibility of power lines in high-strike areas. Avoid siting lines over or near wetlands.</p>	2.1 Site/area management	Waterfowl, herons, raptors
Collisions with vehicles cause bird mortality.	4.1 Roads and railroads	Reduce mortality from collisions with vehicles	2.7 Reduce incidental mortality from collisions.	<p>Erect road signs or speed bumps to lower vehicle speeds where bird activity is frequent.</p> <p>Remove plants that attract birds from roadsides and medians. Landscape along roads using taller trees and</p>	2.1 Site/area management	Bald Eagle, Barn Owl, Barn Swallow, Common Nighthawk, Cooper's Hawk, Northern Pygmy-Owl, Northern Saw-whet Owl (<i>acadicus</i>), Northern Saw-whet

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
				bushes to cause birds to fly higher. Encourage the use of salt management plans to avoid unnecessary use of particulate salt (a bird attractant) on roads. Avoid locating roads in valuable bird habitat.	1.1 Site/area protection	Owl (<i>brooksi</i>), Pine Siskin, Red Crossbill, Red-breasted Sapsucker, Rough-legged Hawk, Short-eared Owl, Snowy Owl, Western Screech-owl (<i>kennicotti</i>)
Population effects of collisions are unknown.	12.1 Information lacking	Improve understanding of population effects of mortality from collisions	7.4 Improve understanding of causes of population declines.	Assess the biological importance of bird kills from all sources of collisions.	8.1 Research	All species
Predation by domestic cats						
Predation by domestic and feral cats.	8.1 Invasive non-native/ alien species	Reduce mortality from domestic and feral cats	2.4 Reduce incidental mortality.	Implement a "Cats Indoors!" Campaign following the guidelines of the American Bird Conservancy (http://www.abcbirds.org/abcprograms/policy/cats/index.html). Work to reduce feral cat overpopulation through cat control regulations.	5.3 Private sector standards and codes 5.2 Policies and regulations	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
Population effects of cat predation are unknown.	12.1 Information lacking	Improve understanding of population effects of cat predation	7.4 Improve understanding of causes of population declines.	<p>Evaluate which species are most vulnerable to cat predation.</p> <p>Investigate the population-level effects of cat predation through better monitoring of kill rates and the number of feral cats.</p> <p>Continue to monitor bird populations so changes in numbers and distributions can be identified and management of cats can be altered to reflect these changes.</p> <p>Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.</p>	<p>8.1 Research</p> <p>8.2 Monitoring</p>	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
Environmental contaminants						
Mortality, sub-lethal effects, reductions in prey populations and habitat alteration caused by exposure to/use of pesticides.	9.3 Agricultural & forestry effluents	<p>Reduce mortality and sub-lethal effects of pesticides on birds</p> <p>Reduce the effects of pesticides on prey species</p>	<p>2.1 Reduce mortality and/or sub-lethal effects from pesticide use.</p> <p>5.1 Maintain natural food webs and prey sources.</p>	<p>Substantially reduce the use of pesticides/rodenticides/herbicides in Canada. Where elimination is not possible, they should be used as part of an integrated pest management system.</p> <p>Improve regulation of pesticides/rodenticides/herbicides in Canada to reduce bird mortality.</p>	<p>5.2 Policies and regulations</p> <p>5.3 Private sector standards and codes</p>	<p>Direct or indirect poisoning by pesticides: Barrow's Goldeneye (Eastern), Sharp-shinned Hawk, Short-eared Owl, Tennessee Warbler</p> <p>Reductions in prey due to pesticide use: Bank Swallow, Barn Swallow, Bay-breasted Warbler, Common Nighthawk, Cape May Warbler, Eastern</p>

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
						Kingbird, Eastern Wood-Pewee, Olive-sided Flycatcher, Osprey, Sharp-shinned Hawk
Mortality from ingestion of lead shot or tackle.	5.1 Hunting & collecting terrestrial animals 5.4 Fishing & harvesting aquatic resources	Reduce mortality and sub-lethal effects of lead shot and fishing tackle on birds	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants .	Work with hunters, anglers and industry to eliminate the exposure of birds to shot, sinkers and jigs made of lead. Enforce the use of non-toxic shot in waterfowl hunting, and encourage adoption of non-toxic alternatives in target shooting, upland game bird hunting, and fishing.	4.3 Awareness and communications 5.4 Compliance and enforcement	Bald Eagle, Black Scoter, Canada Goose (Atlantic), Common Loon, Green-winged Teal, Mallard
Mortality of waterbirds from oil pollution.	9. Pollution	Reduce mortality from oil pollution	2.3 Reduce mortality and/or sublethal effects of oil pollution.	Improve monitoring and enforcement capacity to reduce chronic oil pollution from illegal dumping of bilge waste and cleaning of oil tanks. Improve education/outreach to make	5.4 Compliance and enforcement	Lethal and sublethal effect of oil exposure: Barrow's Goldeneye (Eastern) Bonaparte's Gull Canada Goose (North

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
			5.1 Maintain natural food webs and prey sources.	sure that the oil industry and its regulators are aware of the potential impacts on birds and take measures to prevent exposure of birds to oil.	4.3 Awareness and communications	Atlantic) Common Goldeneye Common Loon Common Tern Great Cormorant Harlequin Duck (Eastern) Horned Grebe Long-tailed Duck Mallard Pied-billed Grebe Piping Plover (melodus) Purple Sandpiper Red Knot (rufa) Red-throated Loon Surf Scoter Declines in prey due to oil spills: American Black Duck Black-bellied Plover Dunlin Green-winged Teal Hudsonian Godwit Least Sandpiper Lesser Yellowlegs Sanderling Semipalmated Sandpiper Solitary Sandpiper Whimbrel Willet

Table 30 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Bird Species Affected
Mortality from heavy metals and other contaminants.	9.2 Industrial & military effluents	Reduce mortality from heavy metals and other contaminants	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants	Work with industry and policy makers to reduce the quantity of heavy metals and other contaminants released into the environment.	5.3 Private sector standards and codes 5.2 Policies and regulations	Heavy metals and other contaminants: Bank Swallow
Population effects of pollution are unknown.	12.1 information lacking	Improve understanding of population effects of pollution	7.4 Improve understanding of causes of population declines.	<p>Evaluate the affects of PBDEs and other chemicals on vital rates in birds.</p> <p>Evaluate the extent to which pesticides are reducing prey availability for aerial insectivores.</p> <p>Improve the ability to monitor and understand the effects of contaminant concentrations in birds.</p> <p>Continue to acquire information on oiling of waterbirds through programs like Birds Oiled at Sea.</p>	8.1 Research 8.2 Monitoring	All species

Climate Change

The effects of climate change are already measurable in many bird habitats and have resulted in range shifts and changes in the timing of migration and breeding in some species (National Audubon Society 2009; North American Bird Conservation Initiative, U.S. Committee 2009). Birds in all habitats will be affected by climate change. The most vulnerable are predicted to be those that are dependent on oceanic ecosystems and those found in coastal, island, grassland, arctic and alpine habitats (North American Bird Conservation Initiative, U.S. Committee 2010). Changing climate may also facilitate the spread of disease, the introduction of new predators and the invasion of non-native species, which alter habitat structure and community composition (North American Bird Conservation Initiative, U.S. Committee 2009; Faaborg et al. 2010). See tables 31 and 32 for a summary of impacts of climate change and conservation objectives.

A recent exercise used bioclimatic modeling to predict changes in bird species ranges based on anticipated climate change for different time periods and under different emissions scenarios (Lawler et al. unpublished; Lawler et al. 2009). Bioclimatic models use statistical associations between the current range of a species and a suite of climate variables to predict future ranges under new climate conditions. The study focused on bird species currently found within BCRs in Canada. The results suggest that bird species turnover in Canada will be highest in northern BCRs as species ranges continue to shift northward in the coming decades.

Sea-level rise is expected to be the strongest impact of climate change on Prince Edward Island. This is due to the highly erodible sandstone bedrock, indented sandy shoreline with many estuaries and marshes, and the ongoing submergence of Prince Edward Island's coast (Prince Edward Island 2008b). Furthermore, the longer ice-free season in the southern Gulf of St. Lawrence, particularly in the early winter when storm-surge activity is at a peak, (Parkes et al. 1997) is expected to accelerate geomorphic change on the gulf coast of Prince Edward Island, where there is already rapid erosion (Shaw et al. 1996).

In the Gulf of St. Lawrence (MBU 12), some of the impacts of climate change are expected to be: changes in surface and intermediate waters and ice cover (Galbraith et al. 2010), changes in storm climatology and sea-level rise (Shaw et al. 1996), as well as a decrease in freshwater from the St. Lawrence River, which could affect the water circulation and stratification in the Gulf (Saucier et al. 2009). Some impacts could include a decrease of salinity due to an increase of Arctic-derived fresher water (Greene et al. 2008). In addition, the naturally low oxygen levels in the mouth of the Gulf of St. Lawrence are expected to decrease further as the water warms; this is a concern along the Gulf's coastal areas and harbours (Gilbert et al. 2005).

In MBU 12 PEI, more than half the priority bird species are affected by climate change through habitat alterations resulting in loss of suitable habitat, and reduced productivity due to extreme weather (Tables 31 and 32).

To maintain healthy bird populations in the face of a changing climate, conservation must be carefully planned and must be implemented so as to buffer birds from the negative impacts of climate change wherever possible (Faaborg et al. 2010).

Table 31. Examples of the current and anticipated effects of climate change on bird populations in Canada and examples of bird species impacted by each climate change effect.

Note: the species shown here do not represent an exhaustive list, rather, they provide examples of bird species found in BCR 14 PEI and MBU 12 PEI for which the effects of climate change have been suggested or documented.

Potential and Realized Effects of Climate Change	Examples of Species Affected in BCR 14 PEI or MBU 12 PEI
Mismatch between peak hatch and peak food abundance	Aerial insectivores, Willet, Great Cormorant, Common Tern, American Black Duck
Extended breeding season	Red-winged Blackbird, Song Sparrow
Habitat loss as a result of ecosystem changes (e.g., advances in treeline)	American Black Duck, Semipalmated Sandpiper, Surf Scoter, Whimbrel
Increase in severe weather events	Horned Lark, Savannah Sparrow, Piping Plover (melodus), Common Tern
Sea-level rise	Piping Plover (melodus)
Introduction of new predators and competitors	Red-necked Grebe
Increased incidence of disease either directly as the species' range increases with changing temperature or indirectly by increasing the range of vectors	American Crow
Range shifts to the north and from coastal to inland sites	American Goldfinch
Changes in ocean temperature and currents impact marine productivity and food webs	Common Tern

Table 32. Proposed conservation objectives and actions to address climate change.

Threats Addressed	Threat sub-Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Bird Species Affected
Climate change impacts habitat and negatively affects survival and productivity of birds	11.1 Habitat shifting and alteration	<p>Reduce greenhouse gas emissions</p> <p>Mitigate the effects of climate change on bird habitat</p>	<p>6.1 Support efforts to reduce greenhouse gas emissions</p> <p>6.2 Manage for habitat resilience as climate changes</p>	<p>Support efforts to reduce greenhouse gas emissions.</p> <p>Manage for habitat resilience to allow ecosystems to adapt despite disturbances and changing conditions. Minimize anthropogenic stressors (such as development or pollution) to help maintain resilience.</p> <p>Manage buffer areas and the matrix between protected areas to enhance movement of species across the landscape.</p> <p>Manage ecosystems to maximize carbon storage and sequestration while simultaneously enhancing bird habitat.</p> <p>Incorporate predicted shifts in habitat into landscape level plans (e.g., when establishing protected areas ensure the maintenance of north-south corridors to facilitate northward range shifts of bird species).</p>	<p>5.2 Policies and regulations</p> <p>1.1 Site/area protection</p> <p>2.1 Site/area management</p> <p>5.2 Policies and regulations</p>	<p>In BCR 14 PEI: American Woodcock (L) and Tennessee Warbler (L)</p> <p>In MBU 12 PEI: No priority species</p>

Table 32 continued

Threats Addressed	Threat sub-Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Bird Species Affected
Population-level effects of climate change are unknown	12.1 Information lacking	Improve understanding of climate change on birds and their habitats	7.5 Improve understanding of potential effects of climate change	<p>Evaluate which species are most vulnerable to climate change.</p> <p>Investigate the cumulative effects of climate change.</p> <p>Investigate behavioural responses to climate change (such as range shifts, changes in demographic rates, and changes in timing of breeding and migration) through long-term studies.</p> <p>Continue to monitor bird populations so changes in numbers and distributions can be identified.</p> <p>Undertake monitoring to evaluate the effectiveness of mitigation activities.</p>	<p>8.1 Research</p> <p>8.2 Monitoring</p>	All

Research and Population Monitoring Needs

Population Monitoring

An estimate of population trend for each species is necessary for the development of elements 1 and 3 (Species Assessment and Population Objectives). However, there are many species for which we are currently unable to estimate a population trend (PT) score. These species were typically assigned a population objective of “assess/maintain”. Our inability to estimate a PT score may be the result of a lack of monitoring data for the BCR as a whole or may be because certain species are not well captured by common monitoring techniques. To be able to effectively evaluate species believed to be of conservation concern, and to track those not yet of concern for future changes in status, we require more comprehensive monitoring that enables us to generate population trends for all species of birds in Canada. However, it is important to note that for some species, population trends are better understood at scales larger or smaller than the BCR unit, and lack of BCR-scale population trend data should not preclude acting to conserve these species.

A lack of information about population status was determined to be a significant conservation concern for 45 of the 51 priority bird species in BCR 14 PEI and 25 of the 29 priority bird species in MBU 12 PEI. Table 33 provides a list of recommendations to improve knowledge gaps to reliably estimate population trends for these species and/or to investigate factors causing population declines.

A recent Environment Canada review (Avian Monitoring Review Steering Committee 2012) of avian monitoring programs in Canada made the following recommendations for each of the four main species groups:

Landbirds

- Evaluate the ability of migration monitoring and checklist surveys to contribute to Environment Canada’s monitoring needs; and
- Evaluate the feasibility and cost-effectiveness of improving demographic monitoring to help understand causes of population change.

Shorebirds

- Develop more reliable sampling methods for counting shorebirds in migration to address concerns about bias; and
- Increase Latin American involvement in monitoring shorebirds on the wintering grounds, including Red Knot.

Waterbirds

- Evaluate alternative strategies for filling gaps in coverage for both colonial waterbirds and marsh birds;
- Consider both costs and potential reduction in risks; and

- Carry out any necessary pilot work to evaluate options.

Waterfowl

- Develop strategies to reduce expenditures on the eastern waterfowl breeding surveys, while retaining acceptable precision in population estimates; and
- Review the information needs and expenditures for duck banding programs.

With the Avian Monitoring Review recommendations (Avian Monitoring Review Steering Committee 2012), and this document and associated database are available, there will be further discussions with other government officials and key bird and habitat conservation players about bird population monitoring needs and priorities for not only BCR 14 PEI and its associated marine unit but for all priority birds within the Atlantic region.

Table 33. Possible monitoring objectives for priority bird species for which there are currently insufficient data to reliably estimate population trend at the BCR 14 PEI and MBU 12 scales.

Objective	Example Priority Bird Species Affected
1. Develop/improve population monitoring techniques for priority birds wintering in BCR 14 PEI and MBU 12 (trend direction and magnitude) not effectively monitored using existing techniques.	For BCR 14 PEI: Ruffed Grouse, Bald Eagle, Short-eared Owl, Evening Grosbeak, Boreal Chickadee and for MBU 12 PEI: Red-throated Loon, Common Loon, Red-necked Grebe, Horned Grebe, Long-tailed duck, Common Goldeneye, Surf Scoter, Black Scoter
2. Develop/improve migration monitoring techniques for priority birds migrating through BCR 14 PEI and MBU 12 PEI (trend direction and magnitude) not effectively monitored using existing techniques.	American Golden-Plover, Solitary Sandpiper, Whimbrel, and all shorebird priority species for MBU 12 PEI Belted Kingfisher, Bay-breasted warbler and other landbird priority species in BCR 14 PEI and all priority non-waterfowl species in MBU 12 PEI
3. Develop/improve monitoring techniques for priority birds breeding in BCR 14 PEI (trend direction and magnitude) not effectively monitored using existing techniques.	Pied-billed Grebe, Virginia Rail, Sora, Common Tern, Nelson's Sparrow, Rusty Blackbird, Green-winged Teal, Ring-necked Duck, Wilson's Snipe, Ruffed Grouse, Bay-breasted Warbler, White-throated Sparrow, Boreal Chickadee, Bank Swallow, Osprey, Short-eared Owl
4. Develop appropriate habitat monitoring techniques across spatial scales (associations, trend direction and magnitude).	All priority bird species in both BCR 14 PEI and MBU 12
5. Develop appropriate monitoring techniques to quantify sources, magnitude and extent of identified threats to priority waterfowl, waterbirds and shorebirds related to practices in adjacent upland habitat (boating, ATV, tourism, coastal recreation, fishing, wind farms, development, aquaculture).	All priority bird species of waterbirds, waterfowl and shorebirds in BCR 14 PEI and all priority bird species associated with coastal habitats below high tide in MBU 12 PEI
6. Develop appropriate monitoring techniques to quantify sources, magnitude and extent of identified threats to priority species related to practices within watersheds (agriculture, forestry, development).	All priority bird species in BCR 14 PEI and MBU 12 PEI
7. Develop appropriate monitoring techniques to quantify sources, magnitude and extent of identified threats to priority waterfowl, waterbirds and shorebirds related to practices in offshore habitat (boating, fishing, offshore wind farm development, resource extractions (energy), etc.).	All priority bird species associated with offshore habitats in MBU 12 PEI

Research

The focus of this section is to outline the main areas where a lack of information hindered our ability to understand conservation needs and make conservation recommendations. Research objectives presented here are bigger-picture questions, and not necessarily a schedule of studies, that are needed to determine the needs of individual species (Table 34). Undertaking research will allow us to improve future iterations of BCR strategies and to focus future implementation, and will also enable the development of new tools for conservation.

The Table 34 provides a preliminary list of research needs for BCR 14 PEI and will be used as a starting point for further discussions with other government officials and key bird and habitat conservation players as well as scientists about research needs and priorities for not only the BCR 14 PEI and its associated marine unit but for all priority birds within the Atlantic region.

Table 34. General research objectives in BCR 14 PEI and in MBU 12 PEI.

Objective	Example Priority Species Affected
1. Determine primary drivers of population decline (e.g. adult or juvenile survival, productivity, habitat quality in Canada or elsewhere on the species' range).	Priority species with declining population trends e.g. aerial insectivores in BCR 14 PEI and shorebirds in MBU 12 PEI
2. Generate priority species-habitat relationships (during breeding, roosting, foraging, staging, and wintering) using up-to-date habitat (e.g. land cover), bird distribution and abundance data (correcting for species-specific detectability estimates); identify species thresholds, link to conservation objectives and inform determination of quantitative population and habitat targets.	All priority bird species of both BCR 14 PEI and MBU 12
3. Develop a spatially explicit habitat/threat framework for identifying spatial priorities for bird conservation.	All priority bird species of both BCR 14 PEI and MBU 12
4. Conduct research, using stable isotopes, geolocators and/or other approaches as appropriate for each priority species, in order to identify either habitat requirements, assess threats in order to help target conservation efforts.	All priority bird species of both BCR 14 PEI and MBU 12
5. Continue to engage in interdisciplinary climate change research to understand environmental changes, impact on habitat requirements for priority birds, changes in the ecosystem and food web, etc. and identify potential mitigation solutions	All priority bird species of both BCR 14 PEI and MBU 12
6. Determine the population-level impact of anthropogenic structures of all types, including direct effects (e.g. attraction, avoidance, collision mortality) and indirect effects (e.g. habitat loss related to redistribution of prey, fragmentation of habitat, etc); identify species most vulnerable.	All priority bird species of both BCR 14 PEI and MBU 12

Table 34 continued

Objective	Example Priority Species Affected
7. Determine the population-level significance of mortality from predation by domestic and feral cats. Identify particularly vulnerable priority birds.	All priority bird species in BCR 14 PEI
8. Determine the population-level significance of direct and indirect impacts of development within watersheds on priority birds; conduct research on the direct and indirect effects of sedimentation and chemical contamination (e.g. watershed-based agricultural runoff).	All priority bird species of both BCR 14 PEI and MBU 12
9. Assess impacts of disturbance on priority species behaviour, specifically related to practices in coastal zones (existing and anticipated finfish and shellfish aquaculture, clamming, ATV, beach recreation, tourism, wind farms), and cumulative effects.	Priority species for BCR 14 PEI: Pied-billed Grebe, Virginia Rail, Sora, Common Tern, American Golden-Plover, Piping Plover, Spotted Sandpiper, Solitary Sandpiper, Whimbrel, Bank Swallow, Nelson's Sparrow and All priority species using the intertidal zone of MBU 12 PEI.
10. Assess impacts of coastal development on priority bird habitats, specifically related to practices in coastal zones (existing and anticipated finfish and shellfish aquaculture, clamming, ATV, beach recreation, tourism, wind farms, shoreline hardening), and cumulative effects.	Priority species for BCR 14 PEI: Pied-billed Grebe, Virginia Rail, Sora, Common Tern, American Golden-Plover, Piping Plover, Spotted Sandpiper, Solitary Sandpiper, Whimbrel, Bank Swallow, Nelson's Sparrow and All priority species using the intertidal zone of MBU 12 PEI.
11. Participate in national assessment, including cost/benefit analysis, of the possibilities for demographic monitoring of landbirds in Canada to determine value of demographic monitoring.	All Priority bird species of landbirds of BCR 14 PEI
12. Assess impacts of offshore development on priority bird habitats (existing and anticipated resource extraction projects, offshore wind development, etc.), and cumulative effects.	All priority bird species using offshore habitats in MBU 12 PEI

Threats Outside Canada

Many bird species found in Canada spend a large portion of their lifecycle outside of the country (Fig. 40). These species face threats while they are outside Canada; in fact, threats to some migratory species may be most severe outside of the breeding season (Calvert et al. 2009). Of the 52 priority species in BCR 14 PEI, 15 (28%) are migratory and spend part of their annual cycle—up to half the year or more—outside Canada.

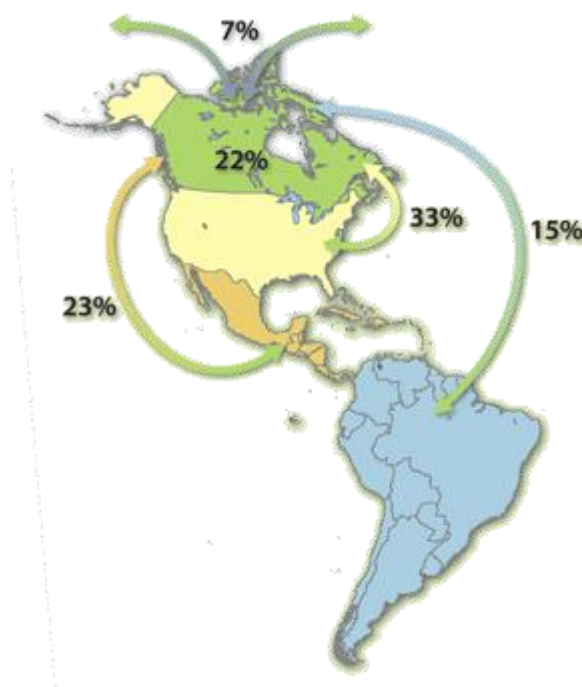


Figure 40. Percent of Canadian breeding birds that migrate to regions outside of Canada for part of their life cycle (North American Bird Conservation Initiative 2012).

Similar to the assessment of threats facing priority species within Canada, we conducted a literature review to identify threats facing priority species while they are outside Canada. A lack of data was a pervasive issue for this exercise. For many species, little is known about threats they face during migration or while on their wintering grounds. Indeed, for some species, their wintering ranges and habitat use are only poorly known, if at all. There is also little information linking specific wintering areas to particular breeding populations, making it difficult to connect declines in breeding populations to potential problems on the wintering grounds. In addition, what data exist on wintering migrant species are heavily biased towards work done in the United States and little research is available from Mexico, Central and South America. While many of the threats identified in the United States likely affect species throughout their range, unique issues outside of the United States may have

been missed. An absence of threats in a region may reflect that the necessary research has not yet been conducted (or may not be published in English). Because information on bird distributions during the non-breeding season is limited, we were unable to assess the scope and severity of threats to priority species while they are outside of Canada.

Despite this, some information is available to inform conservation work outside Canada (Figs. 41, 42). Priority birds from BCR 14 PEI and MBU 12 PEI face the loss or degradation of key migration, and wintering habitats. The primary sources of habitat loss and degradation include 1.1 Housing and urban areas, the conversion of grasslands, wetlands and forests for agricultural use (2.1 Annual and perennial non-timber crops) and deforestation (for BCR 14 only; 5.3 Logging and wood harvesting).

The threat of loss and degradation of stopover or overwinter habitat is greater for species that have relatively small and concentrated wintering ranges. Others, such as Semipalmated Sandpiper are particularly vulnerable as large numbers of the species concentrate at just a handful of key migratory stopover sites; degradation or loss of these sites could have devastating impacts on the species.

In addition to habitat loss, other significant threats encountered by priority birds from BCR 14 PEI and MBU 12 PEI are the lethal and sub-lethal impacts of exposure to industrial and agricultural contaminants (9.2 Agricultural and Forestry effluents and 9.3 Industrial and military effluents), particularly industrial contaminants for species found in MBU 12 PEI. Oil pollution, heavy metals and pesticides cause mortality during migration and on the wintering grounds either directly by poisoning, or indirectly through reductions in prey. Other large sources of mortality for priority species outside of Canada are related to legal and illegal hunting activities and poisoning from lead shot (5.1 Hunting and collecting terrestrial animals), and collisions with buildings and towers (1.2 Commercial and industrial areas). Priority species from MBU 12 PEI are also susceptible to impacts from fishing and harvesting aquatic resources (5.4 Fishing and harvesting aquatic resources); these include incidental fisheries bycatch and habitat alteration from rockweed harvesting.

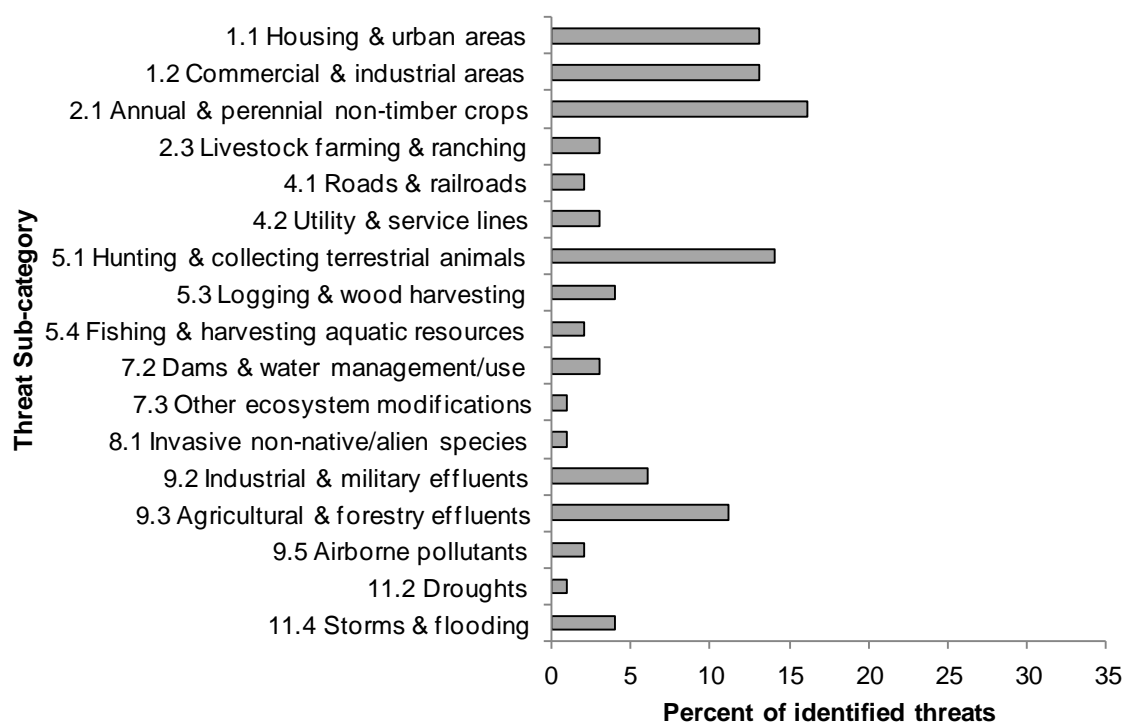


Figure 41. Percent of identified threats to priority species (by threat sub-category) in BCR 14 PEI when they are outside Canada.

Note: Magnitudes could not be assigned for threats outside Canada due to lack of information on scope and severity.

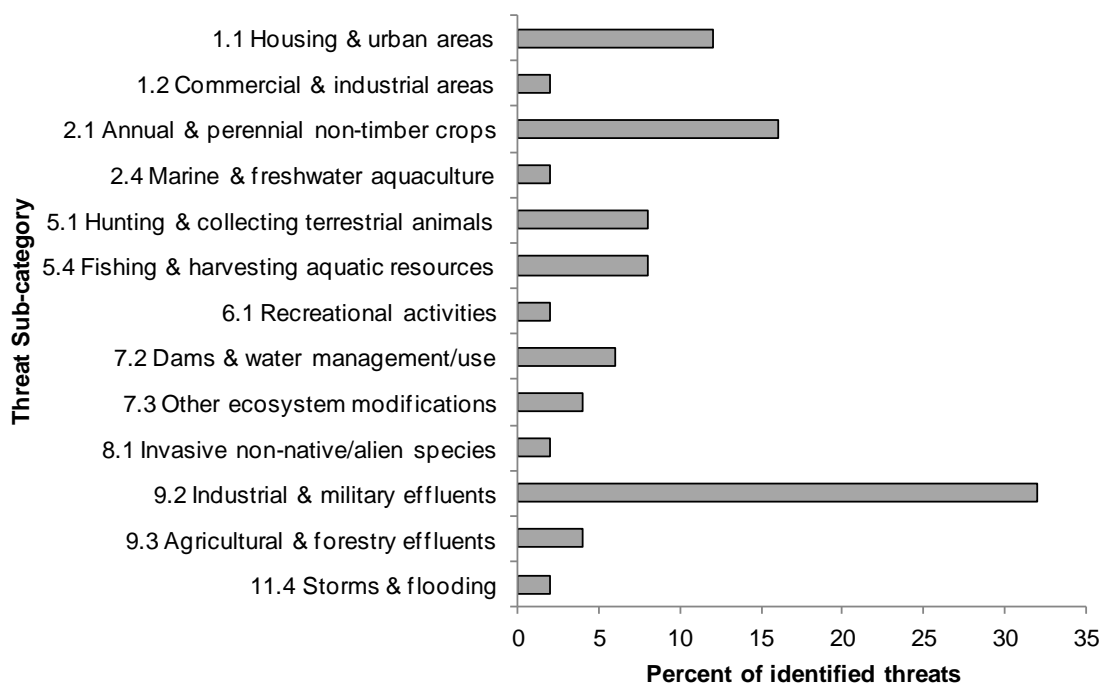


Figure 42. Percent of identified threats to priority species (by threat sub-category) in MBU 12 PEI when they are outside Canada.

Note: Magnitudes could not be assigned for threats outside Canada due to lack of information on scope and severity.

Next Steps

The primary aims of BCR strategies are to present Environment Canada's priorities with respect to migratory bird conservation, and to provide a comprehensive overview of the conservation needs of bird populations to practitioners who may then undertake activities that promote bird conservation in Canada and internationally. Users from all levels of government, Aboriginal communities, the private sector, academia, NGOs and citizens will benefit from the information. BCR strategies can be used in many different ways depending on the needs of the user, who may focus on one or more of the elements of the strategy to guide their conservation projects.

BCR strategies will be updated periodically. Errors, omissions and additional sources of information may be provided to [Environment Canada](#) at any time for inclusion in subsequent versions.

References

- Aboriginal Affairs and Northern Development Canada. Aboriginal and Treaty Rights Information System (ATRIS). Accessed Jan. 23, 2013. <http://atris-sidait.aandc-aadnc.gc.ca/atris/Treaties.aspx?id=1&type=1&language=en>
- American Bird Conservancy. 2012. *Bird Collisions at Communication Towers*. www.abcbirds.org/abcprograms/policy/collisions/towers.html. Accessed: 19 March 2012.
- Andres, B.A. 2009. *Analysis of Shorebird Population Trend Datasets*. Unpublished document for the North American Bird Conservation Initiative, U.S. Committee, 2009. The State of the Birds. U.S. Department of Interior: Washington, DC, 36 pp.
- Atlantic Flyway Technical Section of the Canada Goose Committee. 2008. *Management Plan for the North Atlantic Population of Canada Geese*. July 2008. 37 pp. http://s3.amazonaws.com/zanran_storage/www.dnr.state.md.us/ContentPages/4876404.pdf
- Avian Monitoring Review Steering Committee. 2012. *Environment Canada Avian Monitoring Review – Final Report*. Environment Canada, Ottawa ON, xii + 170 pages + 3 appendices.
- Benoît, A.R. 2007. *Aboriginal harvest of waterfowl in the Maritimes*. Technical Report Series No. 488. Canadian Wildlife Service, Environment Canada, Atlantic Region.
- Benoît, H.P., J.A. Gagné, C. Savenkoff, P. Ouellet, and M.N. Bourassa. 2012. *State-of-the-Ocean Report for the Gulf of St. Lawrence Integrated Management (GOSLIM) Area*. Can. Manuscr. Rep. Fish. Aquat. Sci. 2986: xi + 73 pp.
- Berneshawi, S. 1997. *Resource Management and the Mi'kmaq Nation*. Can. J. Native Studies, 17(1): 115-148.
- Bevanger, K. 1998. *Biological and conservation aspects of bird mortality caused by electricity power lines: a review*. Biological Conservation, 86: 64-76.
- Bishop, C.A., and J.M. Brogan. 2013. *Estimates of avian mortality due to vehicle collisions on the Canadian road network*. Avian Conservation and Ecology. In press.
- Blackwell, R. 2010. *Why PEI's wind plan is dying*. Globe and Mail. October 11, 2010.
- Blancher, P. J. 2013. Estimated number of birds killed by house cats (*Felis catus*) in Canada. Avian Conservation and Ecology (in press).
- Boates, J.S., J. Chardine, R. Curley, R. Elliot, M. Gloutney, J. Goulet, A. Hanson, P. Hicklin, R. Melanson, J. Paquet, S. Richard, G. Yetman. 2008. Atlantic Canada Shorebird Conservation Plan. Canadian Wildlife Service Technical Report Series No. 481. Environment Canada, Atlantic Region. 105 pp.
- Brown, R.G.B. and A.R. Lock. 2003. *Oil pollution and birds*. Hinterland Who's Who. Minister of the Environment, Environment Canada. www.hww.ca/en/issues-and-topics/oil-pollution-and-birds.html. Accessed: 4 May 2012.
- Calvert, A.M., C.A. Bishop, R.D. Elliot, E.A. Krebs, T.M. Kydd, C.S. Machtans, and G.J. Robertson.. 2013. *A synthesis of human-related avian mortality in Canada*. Avian Conservation and Ecology. In press.
- Calvert, A. M., S. J. Walde and P. D. Taylor. 2009. *Non-breeding drivers of population dynamics in seasonal migrants: conservation parallels across taxa*. Avian Conservation and Ecology – Écologie et conservation des oiseaux 4(2): 5. www.ace-eco.org/vol4/iss2/art5/

- Canadian Council on Ecological Areas. 2011. *Conservation Areas Reporting and Tracking System*. www.ccea.org/en_carts.html. Accessed: October 2012.
- Canadian Heritage. 2012. *Atlantic Maritime Ecozone*. <http://canadianbiodiversity.mcgill.ca/english/ecozones/atlanticmaritime/atlanticmaritime.htm>. Accessed: October 2012.
- Canadian Wind Energy Association. 2008. *List of Wind Farms*. www.canwea.ca. Accessed: June 2012.
- COSEWIC. 2012. *Committee on the Status of Endangered Wildlife in Canada*. www.cosewic.gc.ca. Accessed: May 2012.
- Dettmers, R. 2006. *A Blueprint for the Design and Delivery of Bird Conservation in the Atlantic Northern Forest*. US Fish and Wildlife Service. Vers. 1.0. www.acjv.org/documents/BCR14%20Blueprint.pdf. Accessed: October 2012.
- Donaldson, G. M., C. Hyslop, R. I. G. Morrison, H. L. Dickson, and I. Davidson (editors). 2000. *Canadian Shorebird Conservation Plan*. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 27 pp. www.cws-scf.ec.gc.ca/publications/AbstractTemplate.cfm?lang=e&id=318
- eBird Canada. <http://ebird.org/content/canada>. Accessed: May 2010.
- Eeva, T., and E. Lehikoinen. 2000. *Recovery of breeding success in wild birds*. *Nature* 403: 851-852.
- Encyclopedia of Canadian Provinces. 2007 *Prince Edward Island*. www.nationsencyclopedia.com/canada/Nunavut-to-Yukon/Prince-Edward-Island.html. Accessed: June 2012.
- Environment Canada. 2003. *Great Lakes Fact Sheet. Fish and wildlife health effects in the Canadian Great Lakes areas of concern*. ISBN 0-662-34076-0. www.ec.gc.ca/Publications/A793CA48-2A8C-4F38-8B1C-B3AEBAE2342%5CFishAndWildlifeHealthEffectsInTheCanadianGreatLakesareasofconcern.pdf.
- Erskine, A.J. 1992. *Atlas of Breeding Birds of the Maritime Provinces*. Province of Nova Scotia. ISBN 1-55109-010-4.
- Faaborg, J., R. T. Holmes, A. D. Anders, K. L. Bildstein, K. M. Dugger, S. A. Gauthreaux, P. Heglund, K. A. Hobson, A. E. Jahn, D. H. Johnson, S. C. Latta, D. J. Levey, P. P. Marra, C. L. Merkord, E. Nol, S. I. Rothstein, T. W. Sherry, T. S. Sillett, F. R. Thompson, and N. Warnock. 2010. *Conserving migratory land birds in the New World: Do we know enough?* *Ecological Applications* 20(2): 398-418.
- Fisheries and Oceans Canada. 2008. *Marine Protected Area: Basin Head*. www.dfo-mpo.gc.ca/oceans/marineareas-zonesmarines/mpa-zpm/atlantic-atlantique/factsheets-feuillets/basinhead-eng.htm. Accessed: September 2012.
- Food and Agriculture Organization (FAO). 2000. *Land cover classification system*. United Nations Food and Agriculture Organization, Rome. www.fao.org/docrep/003/x0596e/x0596e00.htm
- Franceschini, M.D., Custer, C.M., Custer, T.W., Reed, J.M., and Romero, L.M. 2008. *Corticosterone stress response in tree swallows nesting near polychlorinated biphenyl- and dioxin-contaminated rivers*. *Environmental Toxicology and Chemistry* 27: 2326–2331.
- Galbraith, P.S., P. Larouche, D. Gilbert, J. Chassé, and B. Petrie. 2010. *Trends in Sea-Surface and CIL Temperatures in the Gulf of St. Lawrence*. AZMP Bulletin No.9. Integrated Science Data Management. Fisheries and Oceans Canada. www.meds-sdmm.dfo-mpo.gc.ca/isdm-gdsi/azmp-pmza/publications-eng.html#bul. Accessed: May 2011.
- Gibson, K.L., K. Keizer, and C. Golding. 2002. *A trap, neuter, and release program for feral cats on Prince Edward Island*. *Can. Veterinary J.* 43(9): 695-698.

- Gilbert, D., B. Sundby, C. Gobeil, A. Mucci, and G.-H. Tremblay. 2005. *A seventy-two-year record of diminishing deep-water oxygen in the St. Lawrence estuary: The northwest Atlantic connection*. *Limnology and Oceanography* 50(5): 1654-1666.
- Greene, C.H., A.J. Pershing, T.M. Cronin, and N. and Ceci. 2008. *Arctic climate change and its impacts on the ecology of the North Atlantic*. *Ecology* 89: S24-S38 (suppl.)
- Hutchinson, J. 2012. *Prince Edward Island's ecosystem forest management, certification and agreements, the island way?* Presentation to ASFWS Spring Seminar. Sackville, NB.
- Kennedy, J.A., E.A. Krebs and A.F. Camfield. 2012. *A Manual for Completing All-bird Conservation Plans in Canada*, May 2012 version. Canadian Wildlife Service, Environment Canada. Ottawa, ON
- Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J.E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. *Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan*, Version 1. Waterbird Conservation for the Americas, Washington, DC, U.S.A., 78 pp.
- Lawler, J.L., J.-F. Gobeil, A. Baril, K. Lindsay, A. Fenech, and N. Comer. 2010. *Potential Range Shifts of Bird Species in Canadian Bird Conservation Regions Under Climate Change*. Canadian Wildlife Service, unpublished technical report.
- Lawler, J. J., S. L. Shafer, D. White, P. Kareiva, E. P. Maurer, A. R. Blaustein, and P. J. Bartlein. 2009. *Projected climate-induced faunal change in the western hemisphere*. *Ecology* 90: 588-597.
- Lock, A.R. 2009. *Atlantic Region Waterbird Conservation Plan*. Canadian Wildlife Service, Atlantic Region, unpublished report. 72 pp.
- Longcore, T., C. Rich, P. Mineau, B. MacDonald, D.G. Bert, L.M. Sullivan, E. Mutrie, S.A. Gauthreaux Jr, M.L. Avery, R.L. Crawford, A.M. Manville II, E.R. Travis, D. Drake. 2012. *An Estimate of Avian Mortality at Communication Towers in the United States and Canada*. *PLoS ONE* 7(4): e34025. doi:10.1371/journal.pone.0034025.
- MacDonald, W. 2001. *Forests and Forestry in Prince Edward Island*. Vers. condensed. www.upei.ca/iis/art_wm_4. Accessed: September 2012.
- Machtans, C. S., C. H. R. Wedeles, and E. M. Bayne. 2013. A First Estimate for Canada of the Number of Birds Killed By Colliding with Buildings. *Avian Conservation and Ecology*. In press.
- Manville, A.M., II. 2005. *Bird strikes and electrocutions at power lines, communication lowers, and wind turbines: state of the art and slate of the science – next steps toward mitigation*. In C.J. Ralph and T.D. Rich. *Bird Conservation Implementation in the Americas: Proceedings 3rd International Partners in Flight Conference*. 2002. U.S.D.A. Forest Service. GRT-PSW-191: Albany, CA.
- Maritime Electric Company. 2012. *Our Island Electricity*. www.maritimeelectric.com/about_us/ab_our_island_electricity.aspx. Accessed: November 2012.
- McMillan, A.D. 1995. *Native Peoples and Cultures of Canada: An Anthropological Overview*. Vancouver, Toronto: Douglas & McIntyre, 2nd Edition.
- Milko, R., L. Dickson, R. Elliot, and G. Donaldson. 2003. *Wings Over Water: Canada's Waterbird Conservation Plan*. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 28pp. www.cws-scf.ec.gc.ca/publications/wow/Wings-EN-2003.pdf
- Mineau, P. 2010. *Avian mortality from pesticides used in agriculture in Canada*. Wildlife and Landscape Science Directorate unpublished report. Environment Canada Science and Technology Branch.

- Mineau, P. 2003. *Avian Species*. In J.R. Plimmer, D.W. Gammon and N.R. Ragsdale "Encyclopedia of Agrochemicals." John Wiley and Sons Inc.
- Morrison, R.I.G., B.J. McCaffery, R.E. Gill, S.K. Skagen, S.L. Jones, G.W. Page, C.L. Gratto-Trevor and B.A. Andres. 2006. *Population estimates of North American shorebirds, 2006*. Wader Study Group Bulletin 111:67–85.
- National Audubon Society. 2009. *Birds in climate change – Ecological disruption in motion*. 16 pages.
- National Audubon Society. Christmas Bird Count. www.audubon.org/bird/cbc/index.html Accessed: May 2010.
- North American Bird Conservation Initiative (NABCI). 2012. *The State of Canada's Birds, 2012*. Environment Canada, Ottawa, Canada. 36 pp.
- North American Bird Conservation Initiative, US Committee. 2010. *The State of the Birds 2010 Report on Climate Change, United States of America*. US Department of Interior: Washington, DC.
- North American Bird Conservation Initiative, US Committee. 2009. *The State of the Birds, United States of America*, US Department of Interior: Washington, DC. 36 pages.
- North American Waterfowl Management Plan, Plan Committee. 2004. North American Waterfowl Management Plan 2004. *Implementation Framework: Strengthening the Biological Foundation*. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales, 106 pp. www.nawmp.ca/pdf/impfr-en-k.pdf
- North American Wetlands Conservation Council. *A Wetland Conservation Vision for Canada*. Wetlands Canada: www.wetlandscanada.org/pubs.html. Accessed: September 2012.
- Panjabi, A. O., E. H. Dunn, P. J. Blancher, W. C. Hunter, B. Altman, J. Bart, C. J. Beardmore, H. Berlanga, G. S. Butcher, S. K. Davis, D. W. Demarest, R. Dettmers, W. Easton, H. Gomez de Silva Garza, E. E. Iñigo-Elias, D. N. Pashley, C. J. Ralph, T. D. Rich, K. V. Rosenberg, C. M. Rustay, J. M. Ruth, J. S. Wendt, and T. C. Will. 2005. *The Partners in Flight handbook on species assessment. Version 2005*. Partners in Flight Technical Series No. 3. Rocky Mountain Bird Observatory website: www.rmbo.org/pubs/downloads/Handbook2005.pdf
- Parkes, G.S., L.A. Ketch, and C.T.O. O'Reilly. 1997. *Storm surge events in the Maritimes*. Proceedings, 1997 Canadian Coastal Conference, 21-24 May 1997. Canadian Coastal Science and Engineering Association, Guelph, ON.
- PEI Eastern Habitat Joint Venture. 2008. *Five Year Plan for the Implementation of the North American Waterfowl Management Plan in Prince Edward Island*. North American Waterfowl Management Plan.
- Prince Edward Island. 2012a. *Tourism Department*. www.tourismpei.com. Accessed: September 2012.
- Prince Edward Island. 2012b. *Streams and Estuaries*. www.gov.pe.ca/environment/index.php3?number=1015823&lang=E. Accessed: September 2012.
- Prince Edward Island. 2008a. *Island Wind Energy: Securing our Future: the 10 Point Plan*. www.gov.pe.ca/photos/original/wind_energy.pdf. Accessed: September 2012.
- Prince Edward Island. 2008b. *Prince Edward Island and Climate Change: A Strategy for Reducing the Impacts of Global Warming*. www.gov.pe.ca/photos/original/env_globalstr.pdf. Accessed: September 2012.
- Prince Edward Island. 2005. *1990 Wetland Inventory*. Vers. 2.8.6. May 13, 2005. www.gov.pe.ca/gis/index.php3?number=1008962&lang=E. Accessed: September 2012.

- Prince Edward Island. 2004. *Discussion paper: Forest Policy for Prince Edward Island*. Prepared by Department of Environment, Energy and Forestry. November 30, 2004. www.gov.pe.ca/photos/original/eef_e_forpolicy.pdf. Accessed: September 2012.
- Prince Edward Island. 2003. *A Wetland Conservation Policy for Prince Edward Island*. www.gov.pe.ca/photos/original/fae_wetland_con.pdf. Accessed: September 2012.
- Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Iñigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rustay, J.S. Wendt, T.C. Will. 2004. *Partners in Flight North American Landbird Conservation Plan*. Cornell Lab of Ornithology. Ithaca, NY.
- Rocky Mountain Bird Observatory. 2005. *Partners in Flight Species Assessment database (online)*. Available at: www.rmbo.org/pif/pifdb.html
- Salafsky, N., D. Salzer, A. J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S. H. M. Butchart, B. Collen, N. Cox, L. L. Master, S. O'Connor, and D. Wilkie. 2008. *A standard lexicon for biodiversity conservation: Unified classifications of threats and actions*. Conservation Biology 22(4):897-911.
- Saucier, F.J., F. Roy, S. Senneville, G.S. Smith, D. Lefavre, B. Zakardjian, and J.F. Dumais. 2009. *Modélisation de la circulation dans l'estuaire et le golfe du Saint-Laurent en réponse aux variations du débit d'eau douce et des vents*. Revue des sciences de l'eau / Journal of Water Science. 22(2): 159-176.
- Scheuhammer, A. M., and L. Norris. 1996. *The ecotoxicology of lead shot and lead fishing weights*. Ecotoxicology 5: 279-295.
- Scheuhammer, A.M., S.L. Money, A.D. Kirk, and G. Donaldson. 2003. *Lead fishing sinkers and jigs in Canada: Review of their use patterns and toxic impacts on wildlife*. Occasional Paper no. 108, Canadian Wildlife Service.
- Shaw, J, R.B. Taylor, D.L. Forbes, S. Solomon, D. Frobel, G. Parkes, and C.T. O'Reilly. *Climate Change and the Canadian Coast*. Vers. last modification: 2003-01-30. http://www2.mar.dfo-mpo.gc.ca/science/review/1996/Shaw/Shaw_e.html. Accessed: May 2011.
- Simpson, J. 2008. *Restoring the Acadian Forest: A Guide to Forest Stewardship for Woodlot Owners in the Maritimes*. Kentville, NS. 155 pp.
- Species at Risk Public Registry. Accessed 4 May 2012. *Schedule 1: List of Wildlife Species at Risk*. www.sararegistry.gc.ca/species/schedules_e.cfm?id=1
- Statistics Canada. 2011a. *2011 Census: Population and dwelling counts*. Vers. date modified: 2012-02-08. www.statcan.gc.ca/daily-quotidien/120208/dq120208a-eng.htm. Accessed: October 2012.
- Statistics Canada. 2011b. *2011 Census of Agriculture*. <http://www29.statcan.gc.ca/ceag-web/eng/index-index>. Accessed: October 2012.
- Statistics Canada. 2011c. *Aquaculture industry – summary tables*. www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/prim56c-eng.htm. Accessed: October 2012.
- Statistics Canada. 2010. *Domestic and international cargo, tonnage loaded and unloaded by water transport, by province and territory*. Vers. modified: 2010-03-02. www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/trad51a-eng.htm. Accessed: October 2012.
- Statistics Canada. 2006. *2006 Census of Agriculture*. Vers. date modified: 2012-04-13. www.statcan.gc.ca/ca-ra2006/index-eng.htm. Accessed: June 2012.

- Stewart, R.L.M., Bredin, K.A., Couturier, A.R., Horn, A.G., Lepage, D., Makepeace, S., Taylor, P., Whittam, R.M., Taylor, P.D. Editors. In preparation. *The Second Atlas of Breeding Birds of the Maritime Provinces*. Expected to be published in 2013 by Bird Studies Canada and Environment Canada.
- Therriault, J.C. 1991. *The Gulf of St. Lawrence: small ocean or big estuary?* Can. Spec. Publ. Fish. Aquat. Sci. 113: 359 pp.
- Vasarhelyi, C., and D.A. Kirk. 2007. *Scan of Atlantic Canada Provincial Policies, Regulations and Land Use Planning for Resource Industries that May Impact Incidental Take*. Unpublished Report prepared by Aquila Applied Ecologists for Canadian Wildlife Service, Atlantic Region.
- White, L.M., W.R. Julien, G. Garron, and M. Leger. 2006. *Ambient air concentrations of pesticides used in potato cultivation in Prince Edward Island, Canada*. Pest Manag. Sci. 62(2): 126-136
- World Bank Indicators. 2012. *Roads; paved (% of total roads) in Canada*. www.tradingeconomics.com/canada/roads-paved-percent-of-total-roads-wb-data.html. Accessed: May 5, 2012.
- Zimmerling, J.R., A. Pomeroy, M.V. d'Entremont and C.M. Francis. 2013. *Canadian Estimate of bird mortality due to collisions and direct habitat loss associated with wind turbine developments*. Avian Conservation and Ecology. In press.

Appendix 1

List of All Bird Species (or population management unit) in Prince Edward Island's BCR 14 and MBU 12

Table A1. Complete list of species in BCR 14 PEI and in MBU 12 PEI, when they are in the BCR or MBU (breeding, migrant, winter, seasonal) and their priority status.

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Empidonax alnorum</i>	Alder Flycatcher	Moucherolle des aulnes	Landbird	BCR 14 PEI				
<i>Corvus brachyrhynchos</i>	American Crow	Corneille d'Amérique	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Spinus tristis</i>	American Goldfinch	Chardonneret jaune	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Falco sparverius</i>	American Kestrel	Crécerelle d'Amérique	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Anthus rubescens</i>	American Pipit	Pipit d'Amérique	Landbird		BCR 14 PEI			
<i>Setophaga ruticilla</i>	American Redstart	Paruline flamboyante	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Turdus migratorius</i>	American Robin	Merle d'Amérique	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Spizella arborea</i>	American Tree Sparrow	Bruant hudsonien	Landbird		BCR 14 PEI	BCR 14 PEI		
<i>Haliaeetus leucocephalus</i>	Bald Eagle	Pygargue à tête blanche	Landbird	BCR 14 PEI MBU 12 PEI		BCR 14 PEI MBU 12 PEI	MBU 12 PEI	BCR 14 PEI
<i>Icterus galbula</i>	Baltimore Oriole	Oriole de Baltimore	Landbird	BCR 14 PEI				
<i>Riparia riparia</i>	Bank Swallow	Hirondelle de rivage	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Hirundo rustica</i>	Barn Swallow	Hirondelle rustique	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Strix varia</i>	Barred Owl	Chouette rayée	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Setophaga castanea</i>	Bay-breasted Warbler	Paruline à poitrine baie	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Megaceryle alcyon</i>	Belted Kingfisher	Martin-pêcheur d'Amérique	Landbird	BCR 14 PEI			MBU 12 PEI	BCR 14 PEI
<i>Mniotilta varia</i>	Black-and-white Warbler	Paruline noir et blanc	Landbird	BCR 14 PEI				
<i>Picoides arcticus</i>	Black-backed	Pic à dos noir	Landbird	BCR 14 PEI		BCR 14 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
	Woodpecker							
<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo	Coulicou à bec noir	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Setophaga fusca</i>	Blackburnian Warbler	Paruline à gorge orangée	Landbird	BCR 14 PEI				
<i>Poecile atricapillus</i>	Black-capped Chickadee	Mésange à tête noire	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Setophaga striata</i>	Blackpoll Warbler	Paruline rayée	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Setophaga caerulescens</i>	Black-throated Blue Warbler	Paruline bleue	Landbird	BCR 14 PEI				
<i>Setophaga virens</i>	Black-throated Green Warbler	Paruline à gorge noire	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Cyanocitta cristata</i>	Blue Jay	Geai bleu	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Vireo solitarius</i>	Blue-headed Vireo	Viréo à tête bleue	Landbird	BCR 14 PEI				
<i>Dolichonyx oryzivorus</i>	Bobolink	Goglu des prés	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Bombcilla garrulus</i>	Bohemian Waxwing	Jaseur boréal	Landbird			BCR 14 PEI		
<i>Poecile hudsonica</i>	Boreal Chickadee	Mésange à tête brune	Landbird	BCR 14 PEI		BCR 14 PEI		BCR 14 PEI
<i>Buteo platypterus</i>	Broad-winged Hawk	Petite Buse	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Certhia americana</i>	Brown Creeper	Grimpereau brun	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Molothrus ater</i>	Brown-headed Cowbird	Vacher à tête brune	Landbird	BCR 14 PEI		BCR 14 PEI		BCR 14 PEI
<i>Cardellina canadensis</i>	Canada Warbler	Paruline du Canada	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Setophaga tigrina</i>	Cape May Warbler	Paruline tigrée	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Bombcilla cedrorum</i>	Cedar Waxwing	Jaseur d'Amérique	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Setophaga pensylvanica</i>	Chestnut-sided Warbler	Paruline à flancs marron	Landbird	BCR 14 PEI				
<i>Spizella passerina</i>	Chipping Sparrow	Bruant familier	Landbird	BCR 14 PEI				
<i>Quiscalus quiscula</i>	Common Grackle	Quiscale bronzé	Landbird	BCR 14 PEI				
<i>Chordeiles minor</i>	Common Nighthawk	Engoulevent d'Amérique	Landbird	BCR 14 PEI				BCR 14 PEI

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Corvus corax</i>	Common Raven	Grand Corbeau	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Acanthis flammea</i>	Common Redpoll	Sizerin flammé	Landbird			BCR 14 PEI		
<i>Geothlypis trichas</i>	Common Yellowthroat	Paruline masquée	Landbird	BCR 14 PEI				
<i>Junco hyemalis</i>	Dark-eyed Junco	Junco ardoisé	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Picoides pubescens</i>	Downy Woodpecker	Pic mineur	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Tyrannus tyrannus</i>	Eastern Kingbird	Tyran tritri	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Sayornis phoebe</i>	Eastern Phoebe	Moucherolle phébi	Landbird	BCR 14 PEI				
<i>Contopus virens</i>	Eastern Wood-Pewee	Pioui de l'Est	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Gros-bec errant	Landbird	BCR 14 PEI		BCR 14 PEI		BCR 14 PEI
<i>Passerella iliaca</i>	Fox Sparrow	Bruant fauve	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Regulus satrapa</i>	Golden-crowned Kinglet	Roitelet à couronne dorée	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Dumetella carolinensis</i>	Gray Catbird	Moqueur chat	Landbird	BCR 14 PEI				
<i>Perisoreus canadensis</i>	Gray Jay	Mésangeai du Canada	Landbird	BCR 14 PEI		BCR 14 PEI		BCR 14 PEI
<i>Bubo virginianus</i>	Great Horned Owl	Grand-duc d'Amérique	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Falco rusticolus</i>	Gyr Falcon	Faucon gerfaut	Landbird			BCR 14 PEI		
<i>Picoides villosus</i>	Hairy Woodpecker	Pic chevelu	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Catharus guttatus</i>	Hermit Thrush	Grive solitaire	Landbird	BCR 14 PEI				
<i>Eremophila alpestris</i>	Horned Lark	Alouette hausse-col	Landbird	BCR 14 PEI	BCR 14 PEI	BCR 14 PEI		
<i>Calcarius lapponicus</i>	Lapland Longspur	Plectrophane lapon	Landbird		BCR 14 PEI	BCR 14 PEI		
<i>Empidonax minimus</i>	Least Flycatcher	Moucherolle tchébec	Landbird	BCR 14 PEI				
<i>Melospiza lincolni</i>	Lincoln's Sparrow	Bruant de Lincoln	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Asio otus</i>	Long-eared Owl	Hibou moyen-duc	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Setophaga magnolia</i>	Magnolia Warbler	Paruline à tête cendrée	Landbird	BCR 14 PEI				
<i>Falco columbarius</i>	Merlin	Faucon émerillon	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Zenaidura macroura</i>	Mourning Dove	Tourterelle triste	Landbird	BCR 14 PEI		BCR 14 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Geothlypis philadelphia</i>	Mourning Warbler	Paruline triste	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Oreothlypis ruficapilla</i>	Nashville Warbler	Paruline à joues grises	Landbird	BCR 14 PEI				
<i>Ammodramus nelsoni</i>	Nelson's Sparrow	Bruant de Nelson	Landbird	BCR 14 PEI MBU 12 PEI				BCR 14 PEI
<i>Cardinalis cardinalis</i>	Northern Cardinal	Cardinal rouge	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Colaptes auratus</i>	Northern Flicker	Pic flamboyant	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Accipiter gentilis</i>	Northern Goshawk	Autour des palombes	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Circus cyaneus</i>	Northern Harrier	Busard Saint-Martin	Landbird	BCR 14 PEI	BCR 14 PEI			
<i>Mimus polyglottos</i>	Northern Mockingbird	Moqueur polyglotte	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Setophaga americana</i>	Northern Parula	Paruline à collier	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Aegolius acadicus</i>	Northern Saw-whet Owl	Petite Nyctale	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Lanius excubitor</i>	Northern Shrike	Pie-grièche grise	Landbird			BCR 14 PEI		
<i>Parkesia noveboracensis</i>	Northern Waterthrush	Paruline des ruisseaux	Landbird	BCR 14 PEI				
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Moucherolle à côtés olive	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Pandion haliaetus</i>	Osprey	Balbuzard pêcheur	Landbird	BCR 14 PEI			MBU 12 PEI	BCR 14 PEI
<i>Seiurus aurocapilla</i>	Ovenbird	Paruline couronnée	Landbird	BCR 14 PEI				
<i>Setophaga palmarum</i>	Palm Warbler	Paruline à couronne rousse	Landbird	BCR 14 PEI				
<i>Falco peregrinus anatum</i>	Peregrine Falcon (anatum)	Faucon pèlerin (anatum)	Landbird		BCR 14 PEI		BCR 14 PEI	
<i>Vireo philadelphicus</i>	Philadelphia Vireo	Viréo de Philadelphie	Landbird	BCR 14 PEI				
<i>Dryocopus pileatus</i>	Pileated Woodpecker	Grand Pic	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Pinicola enucleator</i>	Pine Grosbeak	Durbec des sapins	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Spinus pinus</i>	Pine Siskin	Tarin des pins	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Carpodacus purpureus</i>	Purple Finch	Roselin pourpré	Landbird	BCR 14 PEI		BCR 14 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Loxia curvirostra</i>	Red Crossbill	Bec-croisé des sapins	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Sitta canadensis</i>	Red-breasted Nuthatch	Sittelle à poitrine rousse	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Vireo olivaceus</i>	Red-eyed Vireo	Viréo aux yeux rouges	Landbird	BCR 14 PEI				
<i>Buteo jamaicensis</i>	Red-tailed Hawk	Buse à queue rousse	Landbird	BCR 14 PEI	BCR 14 PEI	BCR 14 PEI		
<i>Agelaius phoeniceus</i>	Red-winged Blackbird	Carouge à épaulettes	Landbird	BCR 14 PEI	BCR 14 PEI	BCR 14 PEI		
<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak	Cardinal à poitrine rose	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Buteo lagopus</i>	Rough-legged Hawk	Buse pattue	Landbird			BCR 14 PEI		
<i>Regulus calendula</i>	Ruby-crowned Kinglet	Roitelet à couronne rubis	Landbird	BCR 14 PEI				
<i>Archilochus colubris</i>	Ruby-throated Hummingbird	Colibri à gorge rubis	Landbird	BCR 14 PEI				
<i>Bonasa umbellus</i>	Ruffed Grouse	Gélinotte huppée	Landbird	BCR 14 PEI		BCR 14 PEI		BCR 14 PEI
<i>Euphagus carolinus</i>	Rusty Blackbird	Quiscale rouilleux	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Passerculus sandwichensis</i>	Savannah Sparrow	Bruant des prés	Landbird	BCR 14 PEI				
<i>Accipiter striatus</i>	Sharp-shinned Hawk	Épervier brun	Landbird	BCR 14 PEI	BCR 14 PEI	BCR 14 PEI		BCR 14 PEI
<i>Asio flammeus</i>	Short-eared Owl	Hibou des marais	Landbird	BCR 14 PEI	BCR 14 PEI	BCR 14 PEI		BCR 14 PEI
<i>Plectrophenax nivalis</i>	Snow Bunting	Plectrophane des neiges	Landbird			BCR 14 PEI		
<i>Bubo scandiacus</i>	Snowy Owl	Harfang des neiges	Landbird			BCR 14 PEI		
<i>Melospiza melodia</i>	Song Sparrow	Bruant chanteur	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Catharus ustulatus</i>	Swainson's Thrush	Grive à dos olive	Landbird	BCR 14 PEI				
<i>Melospiza georgiana</i>	Swamp Sparrow	Bruant des marais	Landbird	BCR 14 PEI				
<i>Oreothlypis peregrina</i>	Tennessee Warbler	Paruline obscure	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Tachycineta bicolor</i>	Tree Swallow	Hirondelle bicolore	Landbird	BCR 14 PEI				
<i>Catharus fuscescens</i>	Veery	Grive fauve	Landbird	BCR 14 PEI				BCR 14 PEI
<i>Pooecetes gramineus</i>	Vesper Sparrow	Bruant vespéral	Landbird	BCR 14 PEI				
<i>Sitta carolinensis</i>	White-breasted	Sittelle à poitrine	Landbird	BCR 14 PEI		BCR 14 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
	Nuthatch	blanche						
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	Bruant à couronne blanche	Landbird		BCR 14 PEI			
<i>Zonotrichia albicollis</i>	White-throated Sparrow	Bruant à gorge blanche	Landbird	BCR 14 PEI	BCR 14 PEI			BCR 14 PEI
<i>Loxia leucoptera</i>	White-winged Crossbill	Bec-croisé bifascié	Landbird	BCR 14 PEI		BCR 14 PEI		
<i>Cardellina pusilla</i>	Wilson's Warbler	Paruline à calotte noire	Landbird	BCR 14 PEI				
<i>Troglodytes hiemalis</i>	Winter Wren	Troglodyte des forêts	Landbird	BCR 14 PEI				
<i>Setophaga petechia</i>	Yellow Warbler	Paruline jaune	Landbird	BCR 14 PEI				
<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher	Moucherolle à ventre jaune	Landbird	BCR 14 PEI				
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	Pic maculé	Landbird	BCR 14 PEI				
<i>Coccyzus americanus</i>	Yellow-billed Cuckoo	Coulicou à bec jaune	Landbird	BCR 14 PEI				
<i>Setophaga coronata</i>	Yellow-rumped Warbler	Paruline à croupion jaune	Landbird	BCR 14 PEI				
<i>Pluvialis dominica</i>	American Golden-Plover	Pluvier bronzé	Shorebird		BCR 14 PEI MBU 12 PEI			BCR 14 PEI
<i>Scolopax minor</i>	American Woodcock	Bécasse d'Amérique	Shorebird	BCR 14 PEI	BCR 14 PEI			BCR 14 PEI
<i>Calidris bairdii</i>	Baird's Sandpiper	Bécasseau de Baird	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Pluvialis squatarola</i>	Black-bellied Plover	Pluvier argenté	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Calidris alpina</i>	Dunlin	Bécasseau variable	Shorebird		BCR 14 PEI MBU 12 PEI			MBU 12 PEI
<i>Tringa melanoleuca</i>	Greater Yellowlegs	Grand Chevalier	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Limosa haemastica</i>	Hudsonian Godwit	Barge hudsonienne	Shorebird		BCR 14 PEI MBU 12 PEI			MBU 12 PEI

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Charadrius vociferus</i>	Killdeer	Pluvier kildir	Shorebird	BCR 14 PEI	BCR 14 PEI MBU 12 PEI			BCR 14 PEI
<i>Calidris minutilla</i>	Least Sandpiper	Bécasseau minuscule	Shorebird		BCR 14 PEI MBU 12 PEI			MBU 12 PEI
<i>Tringa flavipes</i>	Lesser Yellowlegs	Petit Chevalier	Shorebird		BCR 14 PEI MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Calidris melanotos</i>	Pectoral Sandpiper	Bécasseau à poitrine cendrée	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Charadrius melodus melodus</i>	Piping Plover (melodus)	Pluvier siffleur (melodus)	Shorebird	BCR 14 PEI MBU 12 PEI	MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Calidris maritima</i>	Purple Sandpiper	Bécasseau violet	Shorebird		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Calidris canutus rufa</i>	Red Knot (rufa)	Bécasseau maubèche (rufa)	Shorebird		MBU 12 PEI			MBU 12 PEI
<i>Phalaropus lobatus</i>	Red-necked Phalarope	Phalarope à bec étroit	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Arenaria interpres</i>	Ruddy Turnstone	Tournepierrre à collier	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Calidris alba</i>	Sanderling	Bécasseau sanderling	Shorebird		BCR 14 PEI MBU 12 PEI			MBU 12 PEI
<i>Charadrius semipalmatus</i>	Semipalmated Plover	Pluvier semipalmé	Shorebird	BCR 14 PEI	BCR 14 PEI MBU 12 PEI			
<i>Calidris pusilla</i>	Semipalmated Sandpiper	Bécasseau semipalmé	Shorebird		BCR 14 PEI MBU 12 PEI			MBU 12 PEI
<i>Limnodromus griseus</i>	Short-billed Dowitcher	Bécassin roux	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Tringa solitaria</i>	Solitary Sandpiper	Chevalier solitaire	Shorebird		BCR 14 PEI MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Actitis macularius</i>	Spotted Sandpiper	Chevalier grivelé	Shorebird	BCR 14 PEI	MBU 12 PEI			BCR 14 PEI

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Bartramia longicauda</i>	Upland Sandpiper	Maubèche des champs	Shorebird	BCR 14 PEI				
<i>Numenius phaeopus</i>	Whimbrel	Courlis corlieu	Shorebird		BCR 14 PEI MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Calidris fuscicollis</i>	White-rumped Sandpiper	Bécasseau à croupion blanc	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Tringa semipalmata</i>	Willet	Chevalier semipalmé	Shorebird	MBU 12 PEI	BCR 14 PEI MBU 12 PEI			MBU 12 PEI
<i>Phalaropus tricolor</i>	Wilson's Phalarope	Phalarope de Wilson	Shorebird		BCR 14 PEI MBU 12 PEI			
<i>Gallinago delicata</i>	Wilson's Snipe	Bécassine de Wilson	Shorebird	BCR 14 PEI	MBU 12 PEI			BCR 14 PEI
<i>Botaurus lentiginosus</i>	American Bittern	Butor d'Amérique	Waterbird	BCR 14 PEI MBU 12 PEI	MBU 12 PEI	MBU 12 PEI		BCR 14 PEI
<i>Fulica americana</i>	American Coot	Foulque d'Amérique	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			
<i>Sterna paradisaea</i>	Arctic Tern	Sterne arctique	Waterbird	MBU 12 PEI	MBU 12 PEI			
<i>Fratercula arctica</i>	Atlantic Puffin	Macareux moine	Waterbird		MBU 12 PEI			
<i>Cepphus grylle</i>	Black Guillemot	Guillemot à miroir	Waterbird	MBU 12 PEI	MBU 12 PEI	MBU 12 PEI		
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	Mouette rieuse	Waterbird		MBU 12 PEI	MBU 12 PEI		
<i>Rissa tridactyla</i>	Black-legged Kittiwake	Mouette tridactyle	Waterbird		MBU 12 PEI	MBU 12 PEI		
<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull	Mouette de Bonaparte	Waterbird		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		MBU 12 PEI
<i>Hydroprogne caspia</i>	Caspian Tern	Sterne caspienne	Waterbird		MBU 12 PEI			
<i>Gavia immer</i>	Common Loon	Plongeon huard	Waterbird	BCR 14 PEI	MBU 12 PEI	MBU 12 PEI		BCR 14 PEI MBU 12 PEI
<i>Uria aalge</i>	Common Murre	Guillemot marmette	Waterbird		MBU 12 PEI			
<i>Sterna hirundo</i>	Common Tern	Sterne pierregarin	Waterbird	BCR 14 PEI MBU 12 PEI	MBU 12 PEI			BCR 14 PEI MBU 12 PEI

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	Cormoran à aigrettes	Waterbird	BCR 14 PEI MBU 12 PEI	MBU 12 PEI	MBU 12 PEI		
<i>Alle alle</i>	Dovekie	Mergule nain	Waterbird		MBU 12 PEI			
<i>Podiceps nigricollis</i>	Eared Grebe	Grèbe à cou noir	Waterbird		BCR 14 PEI			
<i>Larus hyperboreus</i>	Glaucous Gull	Goéland bourgmestre	Waterbird		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Larus marinus</i>	Great Black-backed Gull	Goéland marin	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Ardea herodias</i>	Great Blue Heron	Grand Héron	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			
<i>Phalacrocorax carbo</i>	Great Cormorant	Grand Cormoran	Waterbird	MBU 12 PEI	MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Ardea alba</i>	Great Egret	Grande Aigrette	Waterbird		BCR 14 PEI MBU 12 PEI			
<i>Puffinus gravis</i>	Great Shearwater	Puffin majeur	Waterbird		MBU 12 PEI		MBU 12 PEI	
<i>Larus argentatus</i>	Herring Gull	Goéland argenté	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Podiceps auritus</i>	Horned Grebe	Grèbe esclavon	Waterbird		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Larus glaucoides</i>	Iceland Gull	Goéland arctique	Waterbird		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Leucophaeus atricilla</i>	Laughing Gull	Mouette atricille	Waterbird		MBU 12 PEI			
<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	Océanite cul-blanc	Waterbird		MBU 12 PEI	MBU 12 PEI		
<i>Larus fuscus</i>	Lesser Black-backed Gull	Goéland brun	Waterbird		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Hydrocoloeus minutus</i>	Little Gull	Mouette pygmée	Waterbird		MBU 12 PEI	MBU 12 PEI		
<i>Puffinus puffinus</i>	Manx Shearwater	Puffin des Anglais	Waterbird		MBU 12 PEI		MBU 12 PEI	
<i>Fulmarus glacialis</i>	Northern Fulmar	Fulmar boréal	Waterbird		MBU 12 PEI	MBU 12 PEI		
<i>Morus bassanus</i>	Northern Gannet	Fou de Bassan	Waterbird		MBU 12 PEI	MBU 12 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Podilymbus podiceps</i>	Pied-billed Grebe	Grèbe à bec bigarré	Waterbird	BCR 14 PEI	MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Alca torda</i>	Razorbill	Petit Pingouin	Waterbird		MBU 12 PEI			
<i>Podiceps grisegena</i>	Red-necked Grebe	Grèbe jougris	Waterbird		BCR 14 PEI MBU 12 PEI	MBU 12 PEI		
<i>Gavia stellata</i>	Red-throated Loon	Plongeon catmarin	Waterbird		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Larus delawarensis</i>	Ring-billed Gull	Goéland à bec cerclé	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Puffinus griseus</i>	Sooty Shearwater	Puffin fuligineux	Waterbird		MBU 12 PEI		MBU 12 PEI	
<i>Porzana carolina</i>	Sora	Marouette de Caroline	Waterbird	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			BCR 14 PEI
<i>Uria lomvia</i>	Thick-billed Murre	Guillemot de Brünnich	Waterbird		MBU 12 PEI			
<i>Rallus limicola</i>	Virginia Rail	Râle de Virginie	Waterbird	BCR 14 PEI	BCR 14 PEI MBU 12 PEI			BCR 14 PEI
<i>Oceanites oceanicus</i>	Wilson's Storm-Petrel	Océanite de Wilson	Waterbird		MBU 12 PEI		MBU 12 PEI	
<i>Anas rubripes</i>	American Black Duck	Canard noir	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		BCR 14 PEI MBU 12 PEI
<i>Anas americana</i>	American Wigeon	Canard d'Amérique	Waterfowl	BCR 14 PEI	BCR 14 PEI MBU 12 PEI			
<i>Bucephala islandica</i>	Barrow's Goldeneye (Eastern)	Garrot d'Islande (de l'Est)	Waterfowl		MBU 12 PEI	BCR 14 PEI MBU 12 PEI		BCR 14 PEI MBU 12 PEI
<i>Melanitta americana</i>	Black Scoter	Macreuse à bec jaune	Waterfowl		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Anas discors</i>	Blue-winged Teal	Sarcelle à ailes bleues	Waterfowl	BCR 14 PEI	BCR 14 PEI MBU 12 PEI			
<i>Branta bernicla</i>	Brant	Bernache cravant	Waterfowl		MBU 12 PEI			
<i>Bucephala albeola</i>	Bufflehead	Petit Garrot	Waterfowl		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Branta canadensis</i>	Canada Goose	Bernache du Canada	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI	BCR 14 PEI MBU 12 PEI		
<i>Branta canadensis</i>	Canada Goose (North Atlantic)	Bernache du Canada (Atlantique Nord)	Waterfowl		BCR 14 PEI MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Branta canadensis</i>	Canada Goose (Temperate-breeding in Eastern Canada)	Bernache du Canada (qui se reproduit dans des régions tempérées de l'est du Canada)	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI	BCR 14 PEI MBU 12 PEI		
<i>Somateria mollissima</i>	Common Eider	Eider à duvet	Waterfowl		MBU 12 PEI	MBU 12 PEI		
<i>Bucephala clangula</i>	Common Goldeneye	Garrot à oeil d'or	Waterfowl		BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		MBU 12 PEI
<i>Mergus merganser</i>	Common Merganser	Grand Harle	Waterfowl	BCR 14 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		
<i>Anas strepera</i>	Gadwall	Canard chipeau	Waterfowl	BCR 14 PEI MBU 12 PEI				
<i>Aythya marila</i>	Greater Scaup	Fuligule milouinan	Waterfowl	BCR 14 PEI	BCR 14 PEI MBU 12 PEI	MBU 12 PEI		
<i>Anas crecca</i>	Green-winged Teal	Sarcelle d'hiver	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			BCR 14 PEI MBU 12 PEI
<i>Histrionicus histrionicus</i>	Harlequin Duck (Eastern)	Arlequin plongeur (de l'Est)	Waterfowl		MBU 12 PEI			
<i>Lophodytes cucullatus</i>	Hooded Merganser	Harle couronné	Waterfowl	BCR 14 PEI	BCR 14 PEI MBU 12 PEI	MBU 12 PEI		
<i>Somateria spectabilis</i>	King Eider	Eider à tête grise	Waterfowl		MBU 12 PEI			
<i>Aythya affinis</i>	Lesser Scaup	Petit Fuligule	Waterfowl		BCR 14 PEI MBU 12 PEI	MBU 12 PEI		
<i>Clangula hyemalis</i>	Long-tailed Duck	Harelde kakawi	Waterfowl		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Anas platyrhynchos</i>	Mallard	Canard colvert	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI		BCR 14 PEI MBU 12 PEI

Table A1 continued

Scientific Name	Common Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
<i>Anas acuta</i>	Northern Pintail	Canard pilet	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			
<i>Anas clypeata</i>	Northern Shoveler	Canard souchet	Waterfowl	BCR 14 PEI MBU 12 PEI	BCR 14 PEI MBU 12 PEI			
<i>Mergus serrator</i>	Red-breasted Merganser	Harle huppé	Waterfowl	BCR 14 PEI MBU 12 PEI	MBU 12 PEI	MBU 12 PEI		
<i>Aythya americana</i>	Redhead	Fuligule à tête rouge	Waterfowl		BCR 14 PEI MBU 12 PEI			
<i>Aythya collaris</i>	Ring-necked Duck	Fuligule à collier	Waterfowl	BCR 14 PEI	MBU 12 PEI			BCR 14 PEI
<i>Chen caerulescens</i>	Snow Goose	Oie des neiges	Waterfowl		BCR 14 PEI MBU 12 PEI			
<i>Melanitta perspicillata</i>	Surf Scoter	Macreuse à front blanc	Waterfowl		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Melanitta fusca</i>	White-winged Scoter	Macreuse brune	Waterfowl		MBU 12 PEI	MBU 12 PEI		MBU 12 PEI
<i>Aix sponsa</i>	Wood Duck	Canard branchu	Waterfowl	BCR 14 PEI	BCR 14 PEI			

List of Priority Bird Species Associated with Each Habitat Class in BCR 14 PEI and MBU 12 PEI

Table A2. List of priority bird species associated with each habitat class in BCR 14 PEI and MBU 12 PEI.

Note that if a priority bird species was not a priority in the planning unit, the box is shaded. Some species are priorities in both planning units.

Priority Species	Bird Group	BCR 14-PE											MBU 12-PE	
		Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated	Urban	Wetlands	Inland Waterbodies	Riparian	Coastal (above high tide)	Coastal (intertidal)	Marine Waters
Total number of priority species in each habitat:		14	17	9	12	7	17	4	24	12	10	17	23	16
American Bittern	Waterbird					Y			Y			Y		
American Black Duck	Waterfowl						Y		Y	Y			Y	Y
American Golden-Plover	Shorebird					Y	Y					Y		
American Redstart	Landbird	Y	Y	Y	Y									
American Woodcock	Shorebird		Y		Y									
Bald Eagle	Landbird										Y	Y		
Bank Swallow	Landbird							Y			Y	Y		
Barn Swallow	Landbird						Y	Y	Y					
Barrow’s Goldeneye (Eastern)	Waterfowl									Y			Y	Y
Bay-breasted Warbler	Landbird	Y	Y								Y			
Belted Kingfisher	Landbird									Y	Y	Y		
Black Scoter	Waterfowl													Y
Black-bellied Plover	Shorebird												Y	
Black-billed Cuckoo	Landbird		Y	Y	Y									

Table A2 continued

Priority Species	Bird Group	BCR 14-PE											MBU 12-PE	
		Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated	Urban	Wetlands	Inland Waterbodies	Riparian	Coastal (above high tide)	Coastal (intertidal)	Marine Waters
Black-throated Green Warbler	Landbird	Y	Y		Y									
Bobolink	Landbird					Y	Y							
Bonaparte's Gull	Waterbird												Y	Y
Boreal Chickadee	Landbird	Y												
Brown-headed Cowbird	Landbird				Y	Y	Y							
Canada Goose (North Atlantic)	Waterfowl						Y		Y	Y		Y	Y	
Canada Warbler	Landbird	Y	Y	Y					Y					
Cape May Warbler	Landbird	Y												
Common Goldeneye	Waterfowl												Y	Y
Common Loon	Waterbird									Y			Y	Y
Common Nighthawk	Landbird	Y	Y		Y	Y		Y	Y			Y		
Common Tern	Waterbird									Y		Y	Y	Y
Dunlin	Shorebird												Y	
Eastern Kingbird	Landbird				Y	Y	Y		Y		Y			
Eastern Wood-Pewee	Landbird		Y	Y										
Evening Grosbeak	Landbird	Y	Y											
Gray Jay	Landbird	Y							Y					
Great Cormorant	Waterbird												Y	Y
Green-winged Teal	Waterfowl								Y	Y			Y	Y
Horned Grebe	Waterbird													Y

Table A2 continued

Priority Species	Bird Group	BCR 14-PE											MBU 12-PE	
		Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated	Urban	Wetlands	Inland Waterbodies	Riparian	Coastal (above high tide)	Coastal (intertidal)	Marine Waters
Hudsonian Godwit	Shorebird												Y	
Killdeer	Shorebird						Y	Y	Y			Y		
Least Sandpiper	Shorebird												Y	
Lesser Yellowlegs	Shorebird								Y				Y	
Long-tailed Duck	Waterfowl													Y
Mallard	Waterfowl						Y		Y	Y	Y		Y	Y
Mourning Warbler	Landbird		Y	Y	Y									
Nelson's Sparrow	Landbird						Y		Y			Y		
Northern Parula	Landbird	Y	Y	Y					Y		Y			
Olive-sided Flycatcher	Landbird	Y	Y						Y		Y			
Osprey	Landbird									Y		Y		
Pied-billed Grebe	Waterbird								Y	Y				Y
Piping Plover (melodus)	Shorebird											Y	Y	
Purple Sandpiper	Shorebird												Y	
Red Knot (rufa)	Shorebird												Y	
Red-throated Loon	Waterbird													Y
Ring-necked Duck	Waterfowl								Y	Y				
Rose-breasted Grosbeak	Landbird		Y	Y	Y									
Ruffed Grouse	Landbird		Y	Y										
Rusty Blackbird	Landbird	Y	Y						Y		Y			
Sanderling	Shorebird												Y	

Table A2 continued

Priority Species	Bird Group	BCR 14-PE											MBU 12-PE	
		Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated	Urban	Wetlands	Inland Waterbodies	Riparian	Coastal (above high tide)	Coastal (intertidal)	Marine Waters
Semipalmated Sandpiper	Shorebird												Y	
Sharp-shinned Hawk	Landbird	Y	Y				Y							
Short-eared Owl	Landbird				Y	Y	Y		Y			Y		
Solitary Sandpiper	Shorebird								Y	Y			Y	
Sora	Waterbird						Y		Y			Y		
Spotted Sandpiper	Shorebird						Y				Y	Y		
Surf Scoter	Waterfowl													Y
Tennessee Warbler	Landbird	Y												
Veery	Landbird		Y	Y	Y									
Virginia Rail	Waterbird								Y			Y		
Whimbrel	Shorebird						Y		Y			Y	Y	
White-throated Sparrow	Landbird				Y		Y							
White-winged Scoter	Waterfowl													Y
Willet	Shorebird												Y	
Wilson's Snipe	Shorebird						Y		Y					

List of All Regional Threats in BCR 14 PEI and MBU 12 PEI

Table A3. List of all the regional threats (with rolled-up rankings at the sub-threat level) sorted by threat sub-category (sub-categories are numbered as per Salafsky et al. 2008) summarized across habitat classes in BCR 14 PEI and MBU 12 PEI. “Yes” means that this threat was associated within that particular habitat class in the planning unit. The rolled up score for each sub-threat for each habitat is also provided: L: Low, M: Medium, H: High.

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
1.1 Housing & urban areas	L	L		L	L	L	L	L	M	M	M	L	L		
Fragmentation or loss of <i>habitat class</i> to urban development	Yes	yes		Yes	Yes	yes		Yes	Yes	yes	Yes				
Loss of saltmarshes by in-filling for recreational and residential development													Yes		
Loss of nesting habitat on private housing structures (gravel roofs)							yes								
Mortality due to collisions with house windows or buildings												Yes			
1.2 Commercial & industrial areas							M								
Loss of nesting habitat on industrial or commercial buildings (gravel roofs, chimneys, old wooden barns and covered bridges)							Yes								
1.3 Tourism and recreation areas								L							

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Loss of nesting sites due to recreational housing development								yes							
2.1 Annual & perennial non-timber crops	L	L	L	L		H			M		L		L		
Fragmentation or loss of moist habitat types within a <i>habitat class</i> due to a conversion of that habitat to cropland	Yes	yes	Yes	Yes					Yes		yes				
Loss of saltmarshes by dyking for agricultural lands													Yes		
Loss of pasture lands to cropland						yes									
Destruction of nests due to early haying						yes									
2.2 Wood & pulp plantations	M	M	M												
Fragmentation or loss of a <i>habitat class</i> due to its conversion to managed coniferous forest	Yes	yes	Yes												
2.3 Livestock farming & ranching						L			L		L		L		
Destruction of nests by cattle grazing in nesting habitat						yes									
Fragmentation or loss of freshwater wetlands or saltmarshes due to a change in									Yes		Yes		yes		

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
land use for cattle grazing habitat															
2.4 Marine & freshwater aquaculture														M	
Competition for prey or foraging areas with industrial or commercial operations (specifically with aquaculture farms)														yes	
3.3 Renewable Energy	L	L	L		L							L	L		L
Fragmentation or loss of <i>habitat class</i> due to the construction and operation of wind farms	Yes	yes	yes		Yes								Yes		
Mortality due to collision with wind turbines												Yes			yes
4.1 Roads & railroads	M	M	L	L	L				L	L	L	L	L		
Fragmentation or loss of <i>habitat class</i> due to the construction and maintenance of roads	Yes	yes	yes	Yes	Yes				yes	yes	Yes				
Loss of saltmarshes due to in-filling for construction and maintenance of roads													Yes		
Mortality due to collisions with vehicles												Yes			
4.2 Utility & service lines	L	L	L	L	L				L	L	L	L	L		

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Fragmentation or loss of <i>habitat class</i> due to the construction and maintenance of right-of-ways for power lines	Yes	yes	yes	Yes	Yes				yes	yes	Yes				
Loss of saltmarshes for in-filling for the construction and maintenance of right-of-ways for power lines													Yes		
Mortality due to collisions with service lines and communication towers												Yes			
5.1 Hunting & collecting terrestrial animals					L			L	L		L			L	
Accidental shooting or mistaken identity					Yes				yes		Yes				
Illegal shooting or poaching								yes						yes	
5.2 Gathering terrestrial plants									L						
Fragmentation or loss of bogs within <i>wetlands</i> for peat extraction									yes						
5.3 Logging & wood harvesting	M	M	L						L	M	L				
Fragmentation or loss of forests due to logging activities	Yes	yes	yes						Yes	yes	yes				
5.4 Fishing & harvesting aquatic resources													L	L	
Competition for prey or resources with the industrial or commercial harvesting													yes		

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
operations of algae (specifically, rockweed harvesting)															
Competition for prey or resources with the industrial or commercial fisheries operations														yes	
Fisheries bycatch or drowning as a result of entanglement in fishing gear														yes	
6.1 Recreational activities					L			L	L	L	M		M	L	
Disturbance at foraging sites by recreational activities in <i>habitat class</i>					yes			yes	yes	yes	yes		yes	yes	
Disturbance at roosting sites by recreational activities in <i>habitat class</i>										yes	yes				
Disturbance at nest sites by recreational activities in <i>habitat class</i>								yes	yes		yes		yes		
Habitat loss or degradation due to a reduction in slope angle in abandoned quarries for safety (e.g. ATVs)							yes								
6.3 Work & other activities							L				L		L		
Disturbance at nest sites due to building and bridge maintenance activities							yes								

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Disturbance at foraging sites due to operational activities of oyster and mussel aquaculture leases											yes		yes		
7.1 Fire & fire suppression	L	L	L							L					
Fire suppression	Yes	yes	Yes							yes					
7.2 Dams & water management/use									L	L	L				
Habitat loss or degradation due to changes to hydrology or stabilization of water regimes within <i>habitat class</i>									yes	yes	yes				
7.3 Other ecosystem modifications				L		L					L		L		
Loss of old or abandoned fields returning to forest				yes											
Reforestation of agricultural land (i.e., as a loss of cultivated and managed areas)				Yes		yes									
Loss of specific habitat features due to changes in sedimentation patterns caused by the installation of riprap											Yes		yes		
8.1 Invasive non-native / alien species							L				L				
Predation from domestic cats							Yes				Yes				
8.2 Problematic native species		L	L	L		L		L	L	L	M		L	L	

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Parasitism by Brown-headed Cowbird		yes	Yes	yes											
Competition with Red-winged Blackbirds									yes	yes					
Hybridization and competition with Mallards						yes		yes	yes				yes	yes	
Competition and displacement by gulls								Yes			yes		yes		
Increased predation due to an increasing populations of predators (e.g., foxes and racoons) as a results of land use practices											yes		yes		
9.1 Household sewage & urban waste water									L		L				
Decrease of diet quality and of health of birds due to the chemical contamination of water and sediments by sewage or urban wastewater operations									yes		yes				
9.2 Industrial & military effluents					L		L	L	L		M		H	M	
Decrease of diet quality and of health of birds due to the chemical or heavy metal contamination of food source					Yes			yes	yes		Yes		yes	yes	
Decrease of prey availability to birds due to the chemical or heavy metal contamination							yes						yes	yes	

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Decrease of availability of food to birds due to oil spills and oil discharges											Yes		Yes	yes	
Hypothermia caused by oil on plumage from oil spills and oil discharges											Yes		yes	yes	
9.3 Agricultural & forestry effluents	M	M	L	L	L	M		M	M	M	M		L	L	
Decrease of diet quality and of health of birds due to the consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide	Yes	yes	Yes	Yes		yes		yes	yes	yes	yes		yes	yes	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	Yes	Yes	yes	yes	yes	yes		yes	yes	yes	yes				
Loss of food source due to an eutrophication from fertilisers								yes			yes				
9.4 Garbage & solid waste								L					L	L	
Mortality from the consumption of plastics or garbage								yes					yes	yes	
9.5 Airborne pollutants	L	L	L					L	L	L					
Habitat degradation due to acid precipitation affecting loss of nesting materials	Yes	Yes	Yes						Yes	Yes					

Table A3 continued

	BCR 14 PEI												MBU 12 PEI		
Regional Threats	Coniferous	Mixedwood	Deciduous	Shrub/Early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland Waters	Wetlands	Riparian	Coastal (above high tide)	Non-habitat	Intertidal	Marine Waters	Non-habitat
Consumption of contaminated fish in lakes and ponds due to mercury								Yes							
11.1 Habitat shifting and alteration												L			L
Habitat degradation due to changes to weather or sea surface temperature affecting food availability												Yes			Yes
Habitat loss due to climate change (especially, coniferous forests and shrub and early successional)												Yes			
11.2 Droughts												M			
Loss of moist forests and wetlands												Yes			
11.3 Temperature extremes												L			
Reduction in survival due to spring climate fluctuations												Yes			
11.4 Storms and flooding												H			M
Reduction in survival of adults or chicks or flooding of nests due to heavy rains												Yes			Yes
Habitat loss due to increased severity or frequency of storms leading to coastal erosion												Yes			

Appendix 2

General Methodology for Compiling the Six Standard Elements

Each strategy includes six required elements to conform to the national standard. An extensive manual (Kennedy et al. 2012) provides methods and other guidance for completing each element. The six elements provide an objective means of moving towards multi-species conservation efforts that are targeted to species and issues of highest priority. The six elements are:

- 1) identifying priority species – to focus conservation attention on species of conservation concern and those most representative of the region
- 2) attributing priority species to habitat classes – a tool for identifying habitats of conservation interest and a means of organizing and presenting information
- 3) setting population objectives for priority species – an assessment of current population status compared to the desired status, and a means of measuring conservation success
- 4) assessing and ranking threats – identifies the relative importance of issues affecting populations of priority species within the planning area as well as outside Canada (i.e., throughout their life-cycle)
- 5) setting conservation objectives – outlines the overall conservation goals in response to identified threats and information needs; also a means of measuring accomplishments
- 6) proposing recommended actions – strategies to begin on-the-ground conservation to help achieve conservation objectives.

The first four elements apply to individual priority species, and together comprise an assessment of the status of priority species and the threats they face. The last two elements integrate information across species to create a vision for conservation implementation both within Canada and in countries that host priority species during migration and the non-breeding season.

Element 1: Species Assessment to Identify Priority Species

The Bird Conservation Strategies identify “priority species” from all regularly occurring bird species in each subregion. The priority species approach allows management attention and limited resources to focus on those species with particular conservation importance, ecological significance and/or management need. The species assessment processes used are derived from standard assessment protocols developed by the four major bird conservation initiatives.¹

¹ Partners in Flight (landbirds), Wings Over Water (waterbirds), Canadian Shorebird Conservation Plan (shorebirds), North American Waterfowl Management Plan (waterfowl)

The species assessment process applies quantitative rule sets to biological data for factors such as:

- population size,
- breeding and non-breeding distribution,
- population trend,
- breeding and non-breeding threats, and
- regional density and abundance.

The assessment is applied to individual bird species and ranks each species in terms of its biological vulnerability and population status. The assessments can be used to assign sub-regional (i.e., provincial section of a BCR), regional (BCR) and continental conservation needs among birds.

For Prince Edward Island, a species was considered “regularly occurring” within the BCR and assessed for priority status if there were 10 or more records in the past 10 years, where there were occurrences every year or almost every year. The priority list excluded vagrant or accidental species. Records were obtained from Partners in Flight (Rocky Mountain Bird Observatory 2005), preliminary data from the Maritimes Breeding Bird Atlas (Stewart et al., in prep.), the Atlantic Canada Shorebird Surveys database (Canadian Wildlife Service–Atlantic Region), the Atlantic Colonial Seabird Bird Database (Canadian Wildlife Service–Atlantic Region), [eBird Canada](#), the Atlantic Coastal Blocks database (Canadian Wildlife Service–Atlantic Region), and the [Christmas Bird Count](#) data. Federally or provincially listed species were also considered, even if there were fewer than 10 records.

Some aspects of the methodology were different for the Atlantic region than other regions. The priority species were not derived from standard assessment protocols developed by the four major bird conservation initiatives due to issues of scale that were not addressed by all the conservation initiatives. The result is that the sub-BCR species priority list includes priorities identified at any or all of three geographic scales: continental, BCR-wide and within the sub-BCR.

Continental waterfowl priority species were assessed by determining the interaction of importance to harvest and population trend. NAWMP’s latest version adds regional prioritization to its continental assessment (NAWMP Plan Committee 2004), and NAWMP’s Waterfowl Conservation Regions (WCRs) are similar to the North American Bird Conservation Initiative’s (NABCI) BCRs. Species have been prioritized in each WCR based on their continental priority level in combination with the region’s relative importance to the species, which is derived from assessments of the percentage and relative density of populations and threats to habitats within the WCR. To translate these strategies to on-the-ground conservation efforts, many states and provinces have developed their own NAWMP Implementation Plans.

The waterfowl species prioritization exercise in this strategy was strongly based on the Eastern Habitat Joint Venture Implementation Plan for Prince Edward Island (PEI EHJV 2008). The “key waterfowl species” were selected from the PEI-EHJV Implementation Plan in each of the planning units. In addition, some species were added for which the NAWMP conservation and/or monitoring rank was “High” or “Highest” if they had not been included in the PEI-EHJV Implementation Plan. Common Goldeneye has a rank of Moderate-High, but was included due to its priority status in other Maritime MBUs.

Instead of using the North American Waterbird Conservation Plan’s (Kushlan et al. 2002) species assessment scores and methods, Lock (2009) adopted certain aspects of the Partners in Flight method (Panjabi et al. 2005) to create his own assessment system. However, he did not assign a cut-off point to his total score, above which species would be considered priority species. We thus used information gathered from Lock’s plan and working files, along with Kushlan et al. (2002), to establish a list of priority species for the Atlantic region, following the Partners in Flight approach for regional species assessment (Panjabi et al. 2005).

Similar to waterbirds, shorebirds do not benefit from having an established regional assessment protocol. We tried to take advantage of previous conservation planning efforts, namely by using results of the Canadian Shorebird Conservation Plan (Donaldson et al. 2000) and the Atlantic Canada Shorebird Conservation Plan (Boates et al. 2008), updating trend information with Morrison et al. (2006) and Andres (2009) and data from the Atlantic Canada Shorebird Surveys.

For landbirds, Partners in Flight has taken the lead role in preparing standard methodology to assess landbird species throughout North America. To identify species on which to focus conservation attention, all landbird species were assessed using the sub-regional adaptation of the Partners in Flight regional assessment guidelines (Blancher, personal communication based on Panjabi et al. 2005).

Element 2: Habitat Important to Priority Species

Identifying the broad habitat requirements for each priority species in the breeding and non-breeding season allows species with shared habitat-based conservation issues or actions to be grouped. If many priority species associated with the same habitat class face similar conservation issues, then conservation action in that habitat class may support populations of several priority species. In most cases, all habitat associations identified in the literature are listed for individual species. Habitat associations do not indicate relative use, suitability ratings or rankings, or selection or avoidance; this could be a useful exercise to undertake in the future.

In order to link with other national and international land classification schemes and to capture the range of habitat types across Canada, habitat classes for all priority species are based, at the coarsest level, on the hierarchical approach of the international Land Cover Classification System (LCCS) developed by the United Nations Food and Agriculture Organization (Food and Agriculture Organization 2000). Some modifications were made to the LCCS scheme to reflect habitat types that are important to birds not included in the classification (e.g., marine habitats). Species often are assigned to more than one of these coarse habitat classes. To retain the link to regional spatial data (provincial forest inventories, etc.), or to group species into regionally relevant habitat classes, individual BCR strategies may identify finer-scale habitat classes. Finer-scale habitat attributes and the surrounding landscape context were also captured when possible to better guide the development of specific conservation objectives and actions.

Element 3: Population Objectives for Priority Species

A central component of effective conservation planning is setting clear objectives that can be measured and evaluated. Bird Conservation Strategies set objectives based upon the conservation philosophies of national and continental bird initiatives, including NABCI, that support conserving the distribution, diversity and abundance of birds throughout their historical ranges. The baselines for population objectives used in this planning exercise (those existing during the late 1960s, 1970s and 1990s for eastern waterfowl) reflect population levels prior to widespread declines. Most of the four bird conservation initiatives under the umbrella of NABCI have adopted the same baselines at the continental and national scale (waterfowl, shorebirds and landbirds; national and continental waterbird plans have not yet set population objectives). Some regions in the current planning effort have adjusted baselines to reflect the start of systematic monitoring. The ultimate measure of conservation success will be the extent to which population objectives have been reached. Progress towards population objectives will be regularly assessed as part of an adaptive management approach.

Population objectives for all bird groups are based on a quantitative or qualitative assessment of species' population trends. If the population trend for a species is unknown, the objective is usually "assess and maintain", and a monitoring objective is set. Harvested waterfowl and stewardship species that are already at desired population levels are given an objective of "maintain". For any species listed under SARA or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. If recovery documents are not available, objectives are set using the same approach as for other species within that bird group. Once recovery objectives are available, they will replace interim objectives.

For Prince Edward Island, population objectives for waterfowl were taken from the PEI Eastern Habitat Joint Venture Implementation Plan (2008) and from the Atlantic Flyway

Management Plan objectives in the case of the Canada Goose North Atlantic population (Atlantic Flyway Technical Section of the Canada Goose Committee 2008). Population objectives for landbirds, inland waterbirds and breeding shorebirds were assigned based on the species population trend (PT) score. For each priority species, the PT score for BCR 14 PEI was calculated using preliminary data from the first four years of the Second Maritimes Breeding Bird Atlas (Stewart et al., in prep.) following Partners In Flight protocols (Panjabi et al. 2005) because the BBS data were not sufficient to calculate trends.

Priority species exhibiting declines (PT=4) were given an objective of “increase by 50%”, while strongly declining species (PT=5) had an objective identified as “increase by 100%”. For species with PT = 3 (uncertain or unknown trend), objectives were set as “maintain and assess”. Finally, species with stable or increasing populations (PT = 1 or 2) had an objective set to “maintain current”.

For PT scores (which are mostly for landbirds with BBS data), we used the new trinational method (May 2010 trinational document *Saving our Shared Birds*). We also adjusted the 30-year period to cover the whole span of BBS data, which is 42 years (1966–2008).

For landbirds, we updated data from the 2004 species assessment (Rocky Mountain Bird Observatory 2005) with more recent data whenever possible. We used new distribution data and population trend scores from the Partners In Flight database (Panjabi et al. 2005), as well as new trend scores from BBS trend analyses (up to 2008). We relied heavily on a preliminary comparison of differences in detection probability between the first and second Maritimes Breeding Bird Atlas (Erskine 1992 and Stewart et al., in prep.). The comparison was preliminary because the last year of the second atlas had not yet happened. This analysis does not provide a trend but is the closest we have to a systematic comparison that allows all birds with results from this method to be compared similarly. We used the atlas data analysis for landbirds but also for other birds where necessary and where results were available.

Element 4: Threat Assessment for Priority Species

Bird population trends are driven by factors that affect reproduction and/or survival during any point in the annual cycle. Threats that can reduce survival include, for example, reduced food availability at migratory stopovers or exposure to toxic compounds. Examples of threats that can reduce reproductive success may include high levels of nest predation or reduced quality or quantity of breeding habitat.

The threat assessment exercise included three main steps:

1. Conducting a literature review to itemize past, current and future threats for each priority species and classifying the threats using a standardized classification scheme (Salafsky et al. 2008).

2. Ranking the magnitude of threats for priority species following a standardized protocol (Kennedy et al. 2012).
3. Preparing a set of threat profiles for the BCR subregion, for broad habitat categories.

Each threat was categorized following the IUCN-CMP threat classification scheme (Salafsky et al. 2008 and see Appendix 3) with the addition of categories to capture species for which we lack information. Only threats stemming from human activity were included in the threat assessment because they can be mitigated; natural processes that prevent populations from expanding beyond a given level were considered and noted, but no actions beyond research and/or monitoring were developed. Threats were ranked by assessing the scope (the proportion of the species' range within the subregion that is affected by the threat) and severity (the relative impact that the threat poses to the viability of the species' populations) of the threat. The scores for scope and severity were combined to determine an overall magnitude low, medium, high or very high. These magnitudes were then rolled up by threat categories and sub-categories across habitat types (see Kennedy et al. 2012 for details on this process). The threats roll-up allows for comparison of the relative magnitude of the threats among threat categories and habitat types. The scoring and ranking of threats not only helps to determine which threats contribute most to population declines in individual species, but also allows us to focus attention on the threats with the greatest effects on suites of species or in broad habitat classes.

In BCR 14 PEI and MBU 12-PEI, a category was added to the threats classification scheme to address species with inadequate monitoring or research information (category 12 "other direct threats" and sub-category 12.1 "information lacking"). However, rankings for this threat category were not conducted.

Element 5: Conservation Objectives

Overall, conservation objectives represent the desired conditions, within the subregion that will collectively contribute to achieving population objectives. Objectives may also outline the research or monitoring needed to improve the understanding of species declines and how best to take action.

Currently, most conservation objectives are measurable using qualitative categories (e.g., decrease, maintain, increase) that will allow an evaluation of implementation progress, but they are not linked quantitatively to population objectives. Implementation that incorporates an active adaptive management process is an underlying principle of this conservation effort and will allow for future evaluation of whether or not reaching conservation objectives contributed to achieving population objectives.

Whenever possible, conservation objectives benefit multiple species, and/or respond to more than one threat. However, where necessary, they focus on the specific requirements of a single species.

Conservation objectives generally fall into one of two broad categories:

- habitat objectives within the BCR subregion (the quantity, quality and configuration of priority habitats),
- non-habitat objectives within the BCR subregion (minimizing mortality by reducing predation, conducting education and outreach to reduce human disturbance, etc.)

Ideally, habitat objectives would reflect the type, amount and location of habitat necessary to support population levels of priority species outlined in the population objectives. Currently, there is a lack of data and tools at the BCR scale to develop these specific quantitative objectives. Threats-based objectives present the direction of change required to move toward the population objectives using the best available information and our knowledge of ecosystem management strategies within broad habitat types.

For BCR 14 PEI and MBU 12 PEI, conservation objectives were developed for all threats regardless of magnitude level. Species at risk were given conservation objectives identifying them as species at risk and directing the reader to available recovery documents. However, since many of the recovery documents are not yet available, species at risk were treated like all other priority bird species and conservation objectives were developed to address identified threats. The same methodology was used for waterfowl species covered under the Eastern Habitat Joint Venture Implementation of the North American Waterfowl Management Plan.

Element 6: Recommended Actions

Recommended conservation actions are the strategies required to achieve conservation objectives. Recommended actions are usually made at the strategic level rather than being highly detailed and prescriptive. Actions were classified following the IUCN-CMP classification of conservation actions (Salafsky et al. 2008 and see [Appendix 3](#):

IUCN Conservation Action Categories) with the addition of categories to address research and monitoring needs. When possible, more detailed recommendations can be included, for example if beneficial management practices, ecosystem plans or multiple recovery documents are available for a subregion. However, actions should be detailed enough to provide initial guidance for implementation.

The objectives for research, monitoring and widespread issues may not have actions associated with them. These issues are often so multi-faceted that actions are best designed in consultation with partners and subject-matter experts. Implementation teams will be better positioned to address these complex issues, drawing input from various stakeholders.

Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but because these strategies are directed at multiple species, actions are usually more general than those developed for individual species. For more detailed recommendations for species at risk, readers should consult recovery documents.

Appendix 3

Tables adapted from Salafsky et al. (2008).

IUCN Threat Categories

Table A4. World Conservation Union-Conservation Measures Partnership (IUCN-CMP) classification of threats to biodiversity.

Note that not all threat categories apply to birds or occur in every BCR or MBU.

Threat Category/sub-category	Definition
<i>1 Residential and commercial development</i>	Human settlements of other nonagricultural land uses with a substantial footprint
1.1 Housing and urban areas	Human cities, towns and settlements including non-housing 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
<i>2 Agriculture and aquaculture</i>	Threats from farming and ranching as a result of agricultural expansion and intensification, including silviculture, 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 or nonlocal resources (farming); also domestic or semi-domesticated 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
<i>3 Energy production and mining</i>	Threats from production of non-biological 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
<i>4 Transportation and service corridors</i>	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
<i>5 Biological resource use</i>	Threats from consumptive use of “wild” biological resources including deliberate and unintentional harvesting effects; also persecution or control of specific species
5.1 Hunting and collecting terrestrial animals	Killing or trapping terrestrial wild animals or animal products for commercial, recreation, subsistence, research or cultural purposes, or for control/persecution reasons; includes accidental mortality/bycatch

Table A4 continued

Threat Category/sub-category	Definition
5.2 Gathering terrestrial plants	Harvesting plants, fungi, and other non-timber/non-animal products for commercial, recreation, subsistence, 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, subsistence, 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 non-consumptive 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 semi-natural 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 management/use	Changing water flow patterns from their natural range of 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
8.1 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
9.1 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, silvicultural, and aquaculture systems that include nutrients, toxic chemicals and/or

Table A4 continued

Threat Category/sub-category	Definition
	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
10.1 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
12 Other direct threats*	Other threats
12.1 Information lacking	Lack of clearly documented threats

* Note that this category is not part of the IUCN classification system and was added as part of the BCR planning process to address species of concern for which threats are not clearly documented and/or are unknown.

IUCN Conservation Action Categories

Table A5. World Conservation Union-Conservation Measures Partnership (IUCN-CMP) classification of conservation actions.

Note that not all categories of actions were applicable or were recommended in each BCR or MBU.

Encouraging industry compliance with voluntary beneficial management practices was classified under 5.3 *Private sector standards and codes*.

Action Category/ sub-category	Definition
1 Land/water protection	Actions to identify, establish or expand parks and other legally protected areas, and to protect resource rights
1.1 Site/area protection	Establishing or expanding public or private parks, reserves, and other protected areas roughly equivalent to IUCN categories I-VI
1.2 Resource and habitat protection	Establishing protection or easements of some specific aspect of the resource on public or private lands outside of IUCN categories I-VI
2 Land/water management	Actions directed at conserving or restoring sites, habitats and the wider environment
2.1 Site/area management	Management of protected areas and other resource lands for conservation
2.2 Invasive/problematic species control	Eradication, controlling, and/or preventing invasive and/or other problematic plants, animals and pathogens
2.3 Habitat and natural process restoration	Enhancing degraded or restoring missing habitats and ecosystem functions; dealing with pollution
3 Species management	Actions directed at managing or restoring species, focused on the species of concern itself
3.1 Species management	Managing specific plant and animal populations of concern
3.2 Species recovery	Maintaining, enhancing, or restoring specific plant and animal populations, vaccination programs
3.3 Species reintroduction	Reintroducing species to places where the formally occurred or benign introductions
3.4 <i>ex situ</i> conservation	Protecting biodiversity out of its native habitats
4 Education and awareness	Actions directed at people to improve understanding and skills, and influence behavior
4.1 Formal education	Enhancing knowledge and skills of students in a formal degree program
4.2 Training	Enhancing knowledge, skills, and information exchange for practitioners, stakeholders, and other relevant individuals in structured settings outside of degree programs
4.3 Awareness and communications	Raising environmental awareness and providing information through various media or civil disobedience
5 Law and policy	Actions to develop, change, influence, and help implement formal legislation, regulations, and voluntary standards
5.1 Legislation	Making, implementing, changing, influencing, or providing input into formal government sector legislation or policies at all levels: international, national, state/provincial, local, tribal
5.2 Policies and regulations	Making, implementing, changing, influencing, or providing input into policies and regulations affecting the implementation of laws at all levels: international, national, state/provincial, local, tribal

Table A5 continued

Action Category/ sub-category	Definition
5.3 Private sector standards and codes	Setting, implementing, changing, influencing, or providing input into voluntary standards and professional codes that govern private sector practice
5.4 Compliance and enforcement	Monitoring and enforcing compliance with laws, policies and regulations, and standards and codes at all levels
6 Livelihood, economic and other incentives	Actions to use economic and other incentives to influence behavior
6.1 Linked enterprises and livelihood alternatives	Developing enterprises that directly depend on the maintenance of natural resources or provide substitute livelihoods as a means of changing behaviors and attitudes
6.2 Substitution	Promoting alternative products and services that substitute for environmentally damaging ones
6.3 Market forces	Using market mechanisms to change behaviors and attitudes
6.4 Conservation payments	Using direct or indirect payments to change behavior and attitudes
6.5 Non-monetary values	Using intangible values to change behavior and attitudes
7 External capacity building	Actions to build infrastructure to do better conservation
7.1 Institutional and civil society development	Creating or providing nonfinancial support and capacity building for nonprofits, government agencies, communities, and for-profits
7.2 Alliance and partnership development	Forming and facilitating partnerships, alliances, and networks of organizations
7.3 Conservation finance	Raising and providing funds for conservation work
8 Research and monitoring*	Gathering information about species or habitat of concern
8.1 Monitoring	Establishing new or supporting, continuing, and/or expanding existing monitoring schemes to gather required data about individual or groups of species or habitats
8.2 Research	Undertaking new or supporting, continuing and/or expanding existing research relating to specific species or threats

* Note that this category is not part of the IUCN classification system, and was added as part of the BCR planning process to address certain actions that do not fit elsewhere in the IUCN scheme.

www.ec.gc.ca

Additional information can be obtained at:

Environment Canada

Inquiry Centre

10 Wellington Street, 23rd Floor

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800

Fax: 819-994-1412

TTY: 819-994-0736

Email: enviroinfo@ec.gc.ca