Environment Canada Environnement Canada

Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in Nova Scotia: Atlantic Northern Forest, Scotian Shelf and Bay of Fundy, and Gulf of St. Lawrence

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Preface

Environment Canada led the development of 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 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, Michael Elliot, 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.

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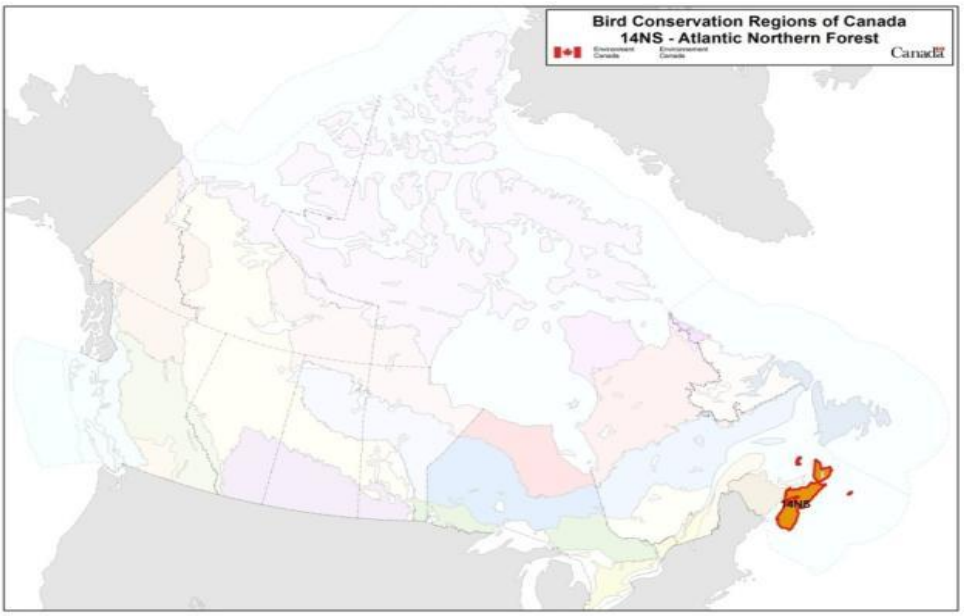
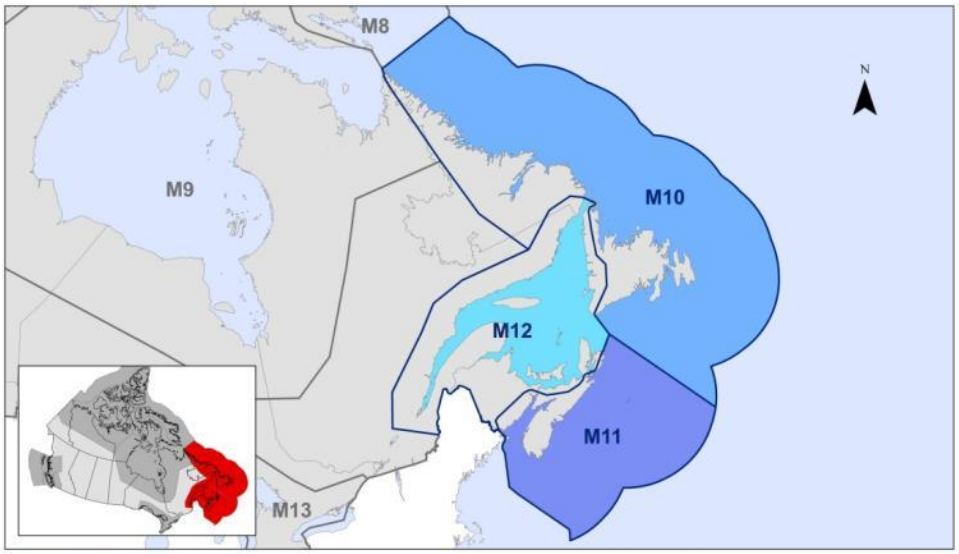
Bird Conservation Strategy for Bird Conservation Region 14 and Marine Biogeographic Units 11 and 12 in Nova Scotia: Atlantic Northern Forest, Scotian Shelf and Bay of Fundy, and Gulf of St. Lawrence





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Executive Summary

The landscape of Nova Scotia is a combination of mountainous terrain, lowland plains and coastal landforms typical of the Atlantic Northern Forest. Northern temperate forests dominate a large portion of Nova Scotia, and the most predominant forest types include spruce-fir conifer followed by mixed deciduous-coniferous forests. None of the resource-extraction industries in Nova Scotia are particularly dominant in terms of their impact on birds: forestry and agriculture are equally important, followed by commercial fisheries, electrical generation and marine transportation.

There are 62 priority bird species on land and 32 priority bird species in marine habitats. Wetlands are used by the greatest number of priority bird species (45%), while 35% use forests and 34% use cultivated and managed areas. There is a variety of current and potential threats to the region's avifauna. Many of these threats are related to land use and, in particular, forestry and agricultural activities and include loss or fragmentation of all forest types because of logging activities; loss or fragmentation of habitats due to conversion into farmlands; and decreases in diet quality, in the health of birds, or in prey availability due to the contamination of food sources from biocides used in the forestry or agricultural industries. There is also a variety of threats related to urban or recreational housing expansion along the coastline including loss of habitat, human disturbances along the coast and shoreline protection of coastal infrastructure (such as roads and houses).

The most frequently identified conservation objective for priority birds in this region is to ensure adequate habitat availability. To meet this conservation objective, 40% of recommended actions are related to either land (or site) management, land (or site) protection, habitat restoration or protection. In Atlantic Canada, Nova Scotia is the province with the largest proportion of land (8%) designated as protected area. Furthermore, in 2007, the provincial government committed to protecting 12% of its land base by 2015.

Nova Scotia has 5 934 km of coastline along three main marine water bodies: the Gulf of St. Lawrence, the Atlantic Ocean and the Bay of Fundy. There are 45 priority bird species that use the coastal habitats of the three planning units: 17 use habitat above the high tide line, 32 use the intertidal coast of the Scotian Shelf and Bay of Fundy, and 28 use the intertidal coast of the Gulf of St. Lawrence.

Common threats to priority bird species in all three coastal habitats include disturbances due to ATV traffic, dogs walking off-leash and other human uses of beaches, and loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap. Priority birds in coastal habitats are also threatened by ocean oil-spill events and oil discharges from shipping activities. Recommended conservation actions to address these threats include managing coastal recreational and commercial activities to minimize disturbance to priority species; raising public awareness of priority birds and their habitat needs and the impacts of disturbance in coastal areas; and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.

The Gulf of Maine and Scotian Shelf Ecozone is largely characterized by waters ≥30 m in depth. This marine unit also encompasses the Bay of Fundy, which is one of the largest semi-enclosed coastal seas in North America and is recognized as one of the world's richest marine ecosystems with various marine and estuarine habitats.

The Gulf of St. Lawrence 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.

There are 31 priority bird species found in the Scotian Shelf and Bay of Fundy waters, and 20 priority bird species in the Gulf of St. Lawrence waters.

There is a variety of common threats to avifauna in both marine regions. Current threats include pollution from boat traffic, oil and gas exploration and exploitation, mineral mining, fishing, and aquaculture activities. A combination of beneficial management practices, public education, changes in legislation and clean-up programs could help alleviate many of these threats.

This conservation strategy builds on existing bird conservation strategies and complements those created for the other BCRs 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 that, in turn, was reviewed by key regional experts on bird conservation. Planning and implementing conservation actions for priority birds in Nova Scotia 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 landbirds[4]) 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 three distinct planning units: Bird Conservation Region 14 in Nova Scotia (BCR 14 NS) as well as the Marine Biogeographic Units 11 and 12 around Nova Scotia (MBU 11 NS and MBU 12 NS). All three units have a distinctive list of priority bird species. The MBUs have two habitat classes based on the IUCN land cover categories: the waterbodies, snow and ice habitat class and the coastal habitat class. In order to distinguish these from the equivalent habitat classes in the BCR 14 NS, they are renamed as follows: for the Gulf of St. Lawrence (MBU 12 NS) – marine waters and coastal (intertidal); for the Scotia Shelf and Bay of Fundy (MBU 11 NS) – marine waters and coastal (intertidal). In BCR 14 NS these habitat classes are: inland waterbodies and coastal (above high tide).

Section 1 of this strategy presents general information about the BCR and MBUs and the subregion, with an overview of the six elements[5] 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 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 Nova Scotia

Bird Conservation Region 14 (Atlantic Northern Forest) encompasses an area greater than 35.6 million ha and includes the Maritime provinces, Quebec's Gaspe 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 (Dettmers 2006). Most of this BCR is low-mountainous or open hilly country interspersed with valleys and plains, with nearly 85% of it classified as some type of forest (including regenerating forest; Dettmers 2006). Geologically, Bird Conservation Region 14 (or the Atlantic Maritime Ecozone) is a mix of sedimentary and igneous bedrock (Canadian Biodiversity Website, Redpath Museum, McGill University 2012).

The portion of BCR 14 in the province of Nova Scotia extends over 52 841 km^2 and reflects the combination of mountainous, lowland plain and coastal landforms found within the Atlantic Northern Forest (Fig. 1). While the maps in this document are drawn at scales and resolutions that differ from the land cover percentage we provide, 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 BCR 14 NS.

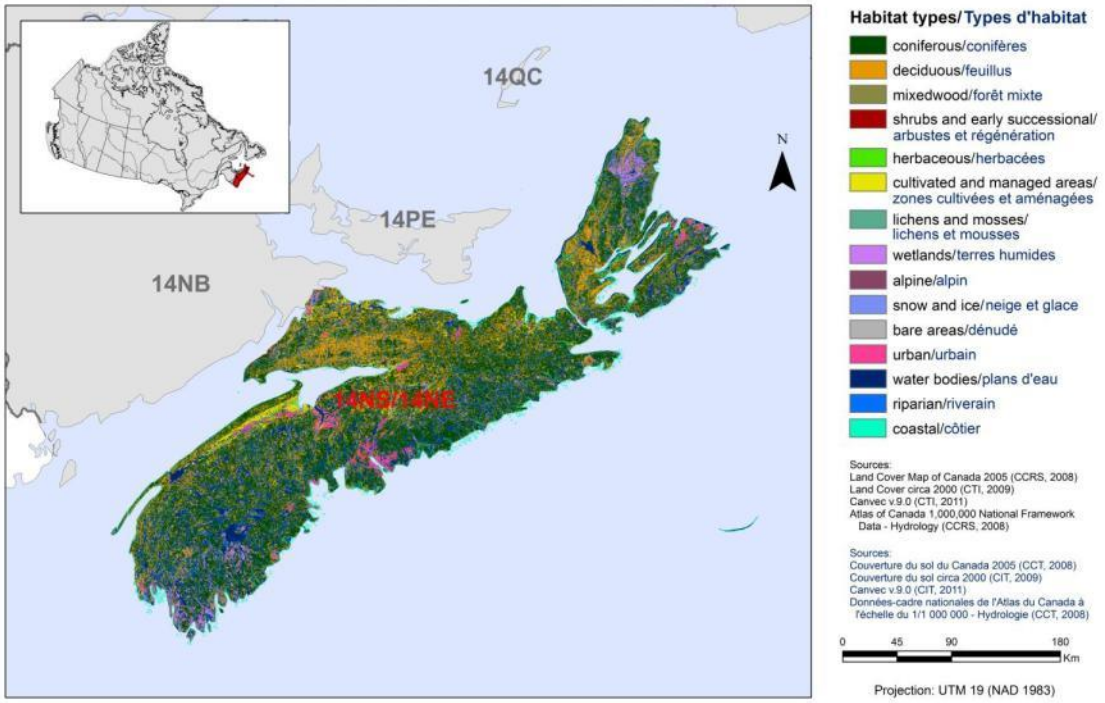

Figure 1. Land cover in BCR 14 in Nova Scotia.

Northern temperate forests dominate a large portion of BCR 14 NS, and the most predominant forest types include spruce-fir conifer (21 877 km^2), northern hardwood (5 246 km^2) and mixed

deciduous-coniferous forests (10 122 km^2). Early successional / shrubland habitat is another widespread habitat type, including regenerating forests (5 080 km^2) and natural shrublands (846 km^2). Nova Scotia also encompasses considerable amounts of wetland habitats, including 5 934 km of mainland (including Cape Breton) coastline (e.g., emergent saltmarsh, mud flats, sandy beaches, and rocky shoreline, and open water areas associated with estuaries and bays), freshwater emergent marshes (2 494 km^2), freshwater forested wetlands (1 278 km^2), and a large number of open freshwater lakes (over 3000), streams and rivers (3 273 km^2; Dettmers 2006; Natural Resources Canada 2010).

Nova Scotia's climate is typified by large seasonal temperature differences, with warm (and often humid) summers and cold winters. Due to the ocean's moderating effect, this is the warmest province in Canada (Environment Canada 2013).

Vasarhelyi and Kirk (2007) ranked the main resource-based industries (forestry, agriculture, fisheries/hunting/trapping, mining and oil/gas extraction, and electrical generation and transmission) in each province based on a composite assessment of their potential impact on the incidental take of migratory birds. In Nova Scotia, both the forestry and agriculture industries ranked highest, followed by electrical generation, marine transport and commercial fisheries (see Table 8 in Vasarhelyi and Kirk 2007). The contribution of these industries to the provincial Gross Domestic Product is highest from the electrical generation industry, followed by mining and oil/gas exploration, fisheries, agriculture and forestry (Vasarhelyi and Kirk 2007).

The aquaculture industry in Nova Scotia is quite different from the other two Maritime provinces in part due to the coastal exposure of Nova Scotia to the cold waters of the Atlantic Ocean. Despite this cold water, there are over 630 aquaculture licences (Vasarhelyi and Kirk 2007), which make this industry relatively more important in Nova Scotia than in Newfoundland and Labrador (the other province exposed to cold water).

Nova Scotia is within the traditional Mi'kmaq territory (Aboriginal Affairs and Northern Development Canada 2013). In fact, the traditional Mi'kmaq territory covers much of BCR 14. At the time prior to European contact, the Mi'kmaq were semi-nomadic and harvested the wildlife available to them: seafood, big 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 value and hold precious all wildlife and life forms within and beyond their territory (Berneshawi 1997).

There is a variety of current and potential threats to the region's avifauna. Many of these threats are related to land use and, in particular, forestry and agricultural activities and include: loss or fragmentation of all forest types because of logging activities; loss or fragmentation of habitats due to conversion into farmlands; decreases in diet quality, in the health of birds, or in prey availability due to the contamination of food sources from biocides used in the forestry or agricultural industries. There is also a variety of threats related to urban or recreational housing expansion along the coastline including loss of habitat, human disturbances along the coast and shoreline protection of coastal infrastructure (such as roads and houses).

In Atlantic Canada, Nova Scotia has the highest proportion of its land base (8%) designated as protected areas (Canadian Council on Ecological Areas 2011; Fig. 2). Environment Canada manages six National Wildlife Areas and eight Migratory Bird Sanctuaries (51.32 km^2 on land and 19.47 km^2 in water) and Parks Canada Agency manages three areas (1 349 km^2 on land and 2.7 km^2 in water). The bulk of the protected areas in Nova Scotia are provincially managed (3 197 km^2). In 2007, the provincial government passed legislation that commits to protecting 12% of Nova Scotia's land by 2015 (Nova Scotia Government 2012a). The ability of governments to establish protected areas is limited by the amount and location of Crown Land. In Nova Scotia, nearly 70% of the land base is privately owned. In addition to protected areas, there are a number of environmental non-governmental organizations engaged in securing and managing lands for conservation. The major organizations engaged in these activities in Nova Scotia are:

- Ducks Unlimited Canada with 184 km^2 of waterfowl habitat in N.S., either owned or with restrictive covenants;
- Nova Scotia Nature Trust with 23 km^2; and
- Nature Conservancy Canada, which owns or has easements on 70 km^2.

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

- 2 Biosphere Reserves: 18 167 km^2 (including Southwest Nova Biosphere Reserve, the largest in Canada);
- the Bay of Fundy Western Hemisphere Shorebird Reserve Network site: 620 km^2;
- 3 wetlands recognized as Ramsar sites under the Ramsar Convention on Wetlands of International Importance: 268 km^2; and
- 16 Important Bird Areas: 3 691 km^2.

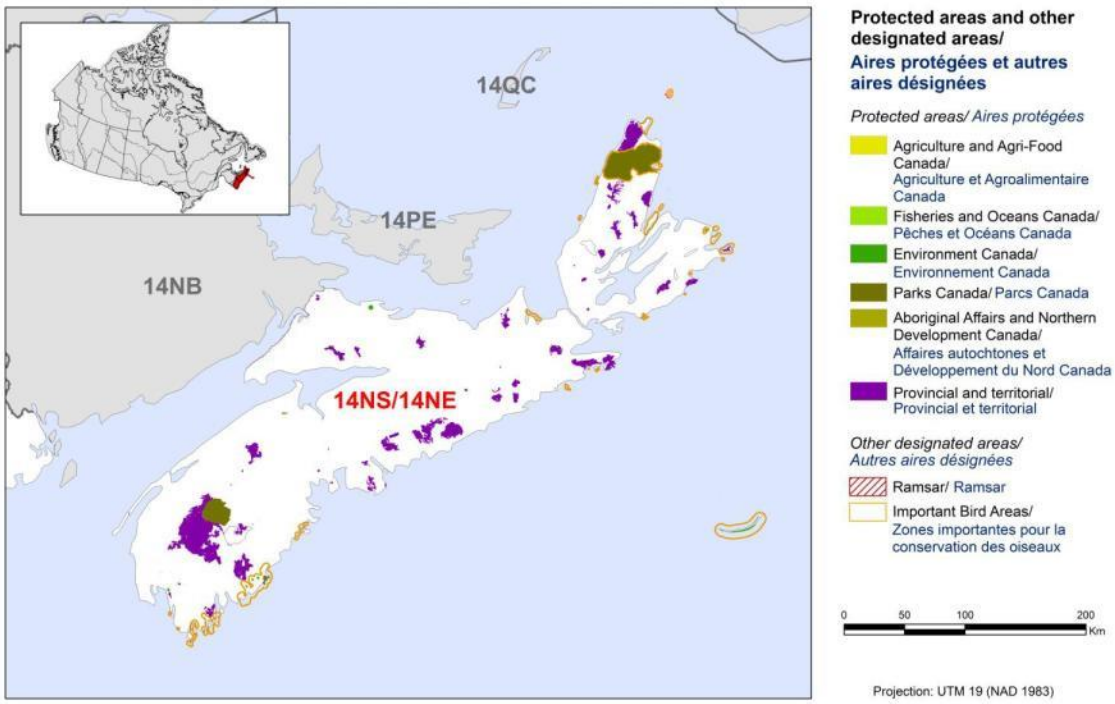

Figure 2. Map of protected and designated areas in BCR 14 in Nova Scotia.

Characteristics of Marine Biogeographic Unit 11: Scotian Shelf and Bay of Fundy of Nova Scotia

The Gulf of Maine and Scotian Shelf Ecozone (corresponding to Marine Biogeographic Unit 11, Fig. 3) is bounded by the Hague Line to the southwest (defining the international border with the United States) and by the southern edge of the Laurentian Channel to the northeast (Fisheries and Oceans Canada 2010). It includes coastal portions of Nova Scotia and New Brunswick, and extends beyond the edge of the continental shelf to the 200 nm limit of the Canadian Exclusive Economic Zone (total area 417 000 km^2). MBU 11 includes shelf margin/continental slope and abyssal plain as the distance from the coast increases, and largely is characterized by waters ≥30 m in depth (Fisheries and Oceans Canada 2010). The North Atlantic Oscillation is the dominant atmospheric pattern in the North Atlantic Ocean and a significant large-scale abiotic driver in this ecozone (Fisheries and Oceans Canada 2010). The circulation patterns on the Scotian Shelf are governed largely by its complex topography and the influence of three major currents: i) the warm, salty Gulf Stream over the continental slope to the south, ii) the downstream influence of the cold Labrador Current from the north, and iii) the cool, fresh Scotian Shelf Current derived from the outflow of the Gulf of St. Lawrence (Fisheries and Oceans Canada 2010).

MBU 11 has experienced a major shift in ecosystem structure (Fisheries and Oceans Canada 2010). For example, some ground fish species have shown declines in the size and condition of individual fish in the past decades, the grey seal population has increased exponentially, and increased stratification has resulted in reduced nutrient and energy flow between bottom and

surface waters. Ocean acidification is expected to affect primary productivity and higher organisms that form shells. Fisheries are also expected to continue to result in large-scale ecosystem effects. Certain alien invasive species (e.g. tunicates and green crab) have already contributed to the displacement of native species and change in community structures.

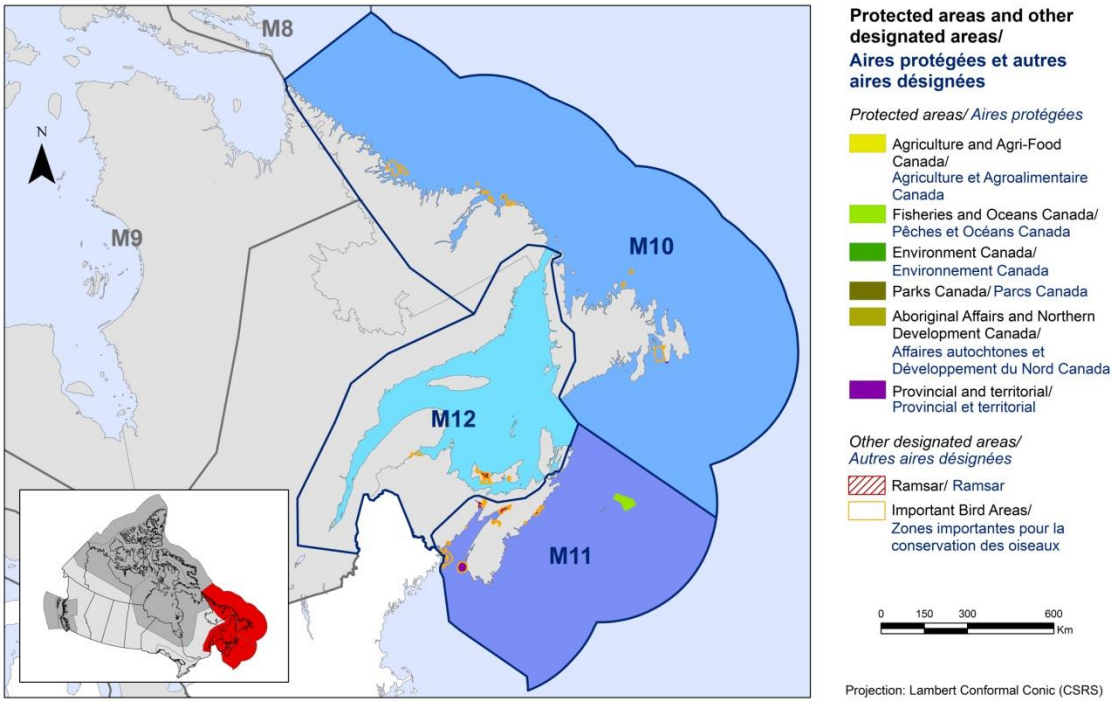

Figure 3. Map of the protected and designated areas in MBU 11 NS (M11) and MBU 12 NS (M12).

MBU 11 also encompasses the Bay of Fundy and part of the Gulf of Maine, which is one of the largest semi-enclosed coastal seas in North America and is recognized as one of the world's richest marine ecosystems with various marine and estuarine habitats (Gulf of Maine Council on the Marine Environment 2010). Some extensive saltmarsh estuaries associated with outflow from important river systems are located on both the New Brunswick and the Nova Scotia coasts.

Nova Scotia MBU 11 has a total area of approximately 408 000 km^2 (Fig. 3). The coastline of MBU 11 NS is varied and includes significant intertidal mudflats, some of which are among the most extensive in North America. Some extensive saltmarsh estuaries are associated with outflow from important river systems located on the Nova Scotia coast. The coastline also hosts large beaches, areas of cliffs and bedrock ledges.

There is a variety of current and potential threats to the region's avifauna. Current threats include pollution from shipping and other boat traffic, oil and gas exploration and exploitation, mineral mining, fishing, and aquaculture activities (e.g., competition for resources, fisheries by-catch mortality, and increased boat traffic and disturbance to specific areas important to birds). Coastal development affects the shoreline through transformation of coastal habitat for

housing and infrastructure development (in-filling of coastal wetlands, irrigation and erosion control, etc.). The impacts of measures currently used to prevent the erosion of the coastline will be further exacerbated by sea-level rise due to changing climate. Climate change is expected to result in a general warming of atmospheric temperatures at these latitudes, with consequences that could include changes in ocean temperatures, ocean currents, ice regimes, frequency of severe weather events, and abundance and distribution of prey and predators (Fisheries and Oceans Canada 2010). Other poorly understood factors, with the potential to severely affect bird survival, include the arrival or changes in occurrence patterns of alien invasive species (such as tunicates and green crab), ecto- and endoparasites, and diseases. A combination of beneficial management practices, public education, changes in legislation and clean-up programs could help alleviate many of these threats.

On the Scotian Shelf, 200 km off the Nova Scotia coast, the Gully was established as a Marine Protected Area in 2004 by Fisheries and Oceans Canada (Fig. 3). The Gully is the largest marine canyon on the east coast of North America. It is 80 km long and at its mouth is almost 50 km wide. It has depths ranging from 200 to 2500 m. Sable Island, near the Gully, is currently a Migratory Bird Sanctuary and a National Park Reserve and hosts important seabirds and landbirds (including the only known breeding site in Canada for the Ipswich Sparrow) and has the largest grey seal colony in the world (Fig. 3). The Bay of Fundy is recognized both as a Biosphere Reserve (4 300 km^2) and as a site of hemispheric importance (620 km^2) within the Western Hemisphere Shorebird Reserve Network.

Characteristics of Marine Biogeographic Unit 12: Gulf of St. Lawrence of Nova Scotia

The Estuary and Gulf of Saint Lawrence (corresponding to Marine Biogeographic Unit 12, Fig. 3) represents one of the largest and most productive estuarine/marine ecosystems in Canada, and in the world (total area of approximately 247 000 km^2; 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).

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, ecotourism 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 aquaculture 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 Nova Scotia portion of MBU 12 (MBU 12 NS) is approximately 27 000 km^2 (Fig. 3) and has a complex coastline resulting from glacial processes, which includes cliffs, cobble and sand beaches, and exposed bedrock. These features are interspersed with estuaries hosting salt marshes and wetlands of varying size and influence. Spatial and temporal variation in environmental conditions and oceanographic processes result in a diverse and productive biological community and trophic structure.

There is a variety of current and potential threats to the region's avifauna. Current threats include pollution from shipping and other boat traffic, fishing and aquaculture activities (e.g., competition for resources, fisheries by-catch mortality, increased boat traffic and disturbance to specific areas important to birds). Coastal development affects the shoreline by transforming coastal habitat for housing and infrastructure development (in-filling of coastal wetlands, irrigation and erosion control, etc.). The measures used to prevent erosion of the coastline will be further exacerbated by sea-level rise due to changing climate. Climate change is expected to result in a general warming of atmospheric temperatures at these latitudes, with consequences that could include changes in ocean temperatures, ocean chemistry (e.g., eutrophication,

hypoxia and salinity), ocean currents, ice regimes, frequency of severe weather events, and abundance and distribution of prey and predators (Benoît et al. 2012). Other poorly understood factors with the potential to severely affect bird survival include the arrival or changes in occurrence patterns of alien invasive species (such as tunicates and green crab), ecto- and endoparasites, and diseases. A combination of beneficial management practices, public education, changes in legislation and clean-up programs could help alleviate many of these threats.

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 and their reason for inclusion in BCR 14 NS, MBU 11 NS or MBU 12 NS. Tables 2 and 3 summarize the number of priority species in BCR 14 NS, MBU 11 NS or MBU 12 NS by bird group and by the reason for priority status.

There are 62 priority species in BCR 14 NS. The list of priority birds is dominated by landbirds (40 species) but also includes 9 species of shorebirds, 6 species of waterbirds and 7 species of waterfowl (Table 1). However, overall 33% of all shorebird species found in BCR 14 NS were identified as priority species, compared with 24% of waterbird species, 26% of waterfowl species and 25% of landbird species (Table 2). Nineteen percent (19%) of the priority species in BCR 14 NS are species at risk, and are protected by federal or provincial legislation (Table 3).

There are 46 priority species in MBU 11 NS. The list of priority birds is dominated by waterbirds (21 species) and includes 15 species of shorebirds and 10 species of waterfowl (Table 1). Forty-eight percent (48%) of all shorebirds found in MBU 11 NS are priority species compared with 38% of waterbirds and 34% of waterfowl (Table 2). Thirteen percent (13%) of the priority bird species in MBU 11 NS are considered at risk, and are protected by federal or provincial legislation (Table 3).

There are 35 priority species in MBU 12 NS. There are 13 species of waterbirds, 13 species of shorebirds and 9 species of waterfowl (Table 1). Fifty-four percent (54%) of all shorebirds found in MBU 12 NS are priority species compared with 28% of waterbirds and 32% of waterfowl (Table 2). Fourteen percent (14%) of the priority bird species in MBU 12 NS are considered at risk and are protected by federal or provincial legislation (Table 3).

Table 1. Priority bird species in BCR 14 NS, MBU 11 NS and MBU 12 NS, population objective, and the reason for priority status.

BCR 14-NS	MBU 11-NS	MBU 12-NS	Priority Species	Bird Group	Population Objective[1]	SARA[2]	COSEWIC[3]	Provinical Listing[4]	National/Continenal Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl[5]	Expert Review[6]
Y			American Redstart	Landbird	Maintain current							Y		
Y			Bald Eagle	Landbird	Maintain current									Added
Y			Bank Swallow	Landbird	Increase 100%									Added
Y			Barn Swallow	Landbird	Increase 100%		TH							Added
Y			Bay-breasted Warbler	Landbird	Increase 50%						Y			
Y			Belted Kingfisher	Landbird	Increase 50%						Y			
Y			Bicknell's Thrush	Landbird	Increase 50%[7]	TH	TH	VU	Y		Y			
Y			Black-and-white Warbler	Landbird	Maintain current							Y		
Y			Black-billed Cuckoo	Landbird	Assess/Maintain				Y		Y			
Y			Blackburnian Warbler	Landbird	Maintain current					Y				
Y			Black-throated Green Warbler	Landbird	Maintain current					Y		Y		
Y			Blue-headed Vireo	Landbird	Maintain current					Y				
Y			Bobolink	Landbird	Increase 100%		TH		Y		Y			

[1] Population objectives apply in all units where the species is priority (BCR 14 NS, MBU 11 NS and/or MBU 12 NS) unless otherwise indicated.
[2] Species listed on Schedule 1 under the *Species At Risk Act* (SARA) 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] Species listed under Nova Scotia's Endangered Species Legislation as Endangered (EN), Threatened (TH) or Vulnerable (VU) (Nova Scotia Government 2007a).
[5] Waterfowl identified as "key species" in the NS 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).
[6] Species added by the provincial Technical Working Group or upon expert review.
[7] The recovery documents for this SARA-listed species are not yet finalized. When the recovery documents for this species at risk are published, the population objectives therein will replace the interim objectives listed here.

Table 1 continued

BCR 14-NS	MBU 11-NS	MBU 12-NS	Priority Species	Bird Group	Population Objective[1]	SARA[2]	COSEWIC[3]	Provinical Listing[4]	National/Continenal Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl[5]	Expert Review[6]
Y			Boreal Chickadee	Landbird	Increase 100%						Y	Y		
Y			Canada Warbler	Landbird	Increase 50%[7]	TH	TH		Y	Y	Y	Y		
Y			Cape May Warbler	Landbird	Increase 50%						Y			
Y			Chimney Swift	Landbird	Increase 100%[7]	TH	TH	EN	Y					
Y			Common Nighthawk	Landbird	Increase 100%[7]	TH	TH	TH						
Y			Eastern Kingbird	Landbird	Increase 100%						Y			
Y			Eastern Whip-poor-will	Landbird	Assess/Maintain[7]	TH	TH		Y					
Y			Eastern Wood-Pewee	Landbird	Increase 50%						Y			
Y			Evening Grosbeak	Landbird	Maintain current							Y		
Y			Gray Catbird	Landbird	Increase 100%									Added
Y			Gray Jay	Landbird	Assess/Maintain									Added
Y			Magnolia Warbler	Landbird	Maintain current					Y				
Y			Mourning Warbler	Landbird	Maintain current							Y		
Y			Nelson's Sparrow	Landbird	Assess/Maintain				Y		Y	Y		
Y			Northern Parula	Landbird	Maintain current							Y		
Y			Olive-sided Flycatcher	Landbird	Assess/Maintain[7]	TH	TH		Y		Y			
Y			Peregrine Falcon (*anatum/tundrius*)	Landbird	Assess/Maintain[7]	SC	SC	VU						
Y			Pine Grosbeak	Landbird	Increase 50%									Added
Y			Purple Finch	Landbird	Maintain current							Y		
Y			Ruffed Grouse	Landbird	Increase 50%						Y			
Y			Rusty Blackbird	Landbird	Increase 100%[7]	SC	SC				Y			
Y			Savannah Sparrow (princeps)	Landbird	Assess/Maintain	SC	SC		Y	Y		Y		
Y			Short-eared Owl	Landbird	Increase 50%[7]	SC	SC							
Y			Spruce Grouse	Landbird	Increase 50%									Added
Y			Tree Swallow	Landbird	Maintain current							Y		

Table 1 continued

BCR 14-NS	MBU 11-NS	MBU 12-NS	Priority Species	Bird Group	Population Objective[1]	SARA[2]	COSEWIC[3]	Provinical Listing[4]	National/Continenal Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl[5]	Expert Review[6]
Y			Veery	Landbird	Maintain current						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	Y	Black-bellied Plover	Shorebird	Assess/Maintain				Y					
	Y	Y	Dunlin	Shorebird	Assess/Maintain[8]				Y					
	Y	Y	Hudsonian Godwit	Shorebird	Assess/Maintain				Y					
Y			Killdeer	Shorebird	Maintain current				Y					
	Y	Y	Least Sandpiper	Shorebird	Assess/Maintain[8]				Y					
Y	Y	Y	Lesser Yellowlegs	Shorebird	Assess/Maintain				Y					
Y	Y	Y	Piping Plover (melodus)	Shorebird	Recovery objective	EN	EN	EN	Y					
	Y	Y	Purple Sandpiper	Shorebird	Assess/Maintain				Y					
	Y	Y	Red Knot (rufa)	Shorebird	Assess/Maintain[7]	EN	EN	EN	Y					
	Y		Red Phalarope	Shorebird	Assess/Maintain				Y					
	Y		Red-necked Phalarope	Shorebird	Assess/Maintain				Y					
	Y	Y	Sanderling	Shorebird	Assess/Maintain				Y					
	Y	Y	Semipalmated Sandpiper	Shorebird	Assess/Maintain				Y					
Y	Y	Y	Solitary Sandpiper	Shorebird	Assess/Maintain[8]				Y					
Y			Spotted Sandpiper	Shorebird	Increase 100%				Y					
Y	Y	Y	Whimbrel	Shorebird	Assess/Maintain				Y					
	Y	Y	Willet	Shorebird	Increase 50%				Y					

[8] A recent assessment (Andres et al. 2012) now suggests that the populations of some of these shorebird species are stable (e.g. Dunlin, Least Sandpiper and Solitary Sandpiper) while others are declining (Ruddy Turnstone). The shorebird priority species were selected in 2009, based on Andres (2009). Subsequent database versions will be modified to account for this new information.

Table 1 continued

BCR 14-NS	MBU 11-NS	MBU 12-NS	Priority Species	Bird Group	Population Objective[1]	SARA[2]	COSEWIC[3]	Provinical Listing[4]	National/Continenal Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl[5]	Expert Review[6]
Y			Wilson's Snipe	Shorebird	Increase 100%				Y					
Y			American Bittern	Waterbird	Increase 50%				Y		Y			
	Y		Black-legged Kittiwake	Waterbird	Maintain current					Y				
	Y	Y	Bonaparte's Gull	Waterbird	Assess/Maintain				Y					
Y	Y	Y	Common Loon	Waterbird	Maintain current (BCR 14) Assess/Maintain (MBU 11, 12)				Y		Y			
	Y		Common Murre	Waterbird	Assess/Maintain				Y					
Y	Y	Y	Common Tern	Waterbird	Assess/Maintain						Y			
	Y		Cory's Shearwater	Waterbird	Assess/Maintain				Y					
	Y	Y	Dovekie	Waterbird	Assess/Maintain				Y					
	Y	Y	Great Cormorant	Waterbird	Assess/Maintain				Y					
	Y	Y	Great Shearwater	Waterbird	Assess/Maintain				Y	Y		Y		
	Y		Great Skua	Waterbird	Assess/Maintain				Y					
	Y	Y	Horned Grebe	Waterbird	Assess/Maintain[7]	EN[9]	EN[9] SC[10]							
	Y	Y	Ivory Gull	Waterbird	Recovery objective	EN	EN		Y		Y			
	Y	Y	Leach's Storm-Petrel	Waterbird	Assess/Maintain					Y	Y	Y		
	Y		Manx Shearwater	Waterbird	Assess/Maintain				Y		Y			
Y			Pied-billed Grebe	Waterbird	Maintain current				Y					
	Y	Y	Razorbill	Waterbird	Assess/Maintain				Y					
	Y	Y	Red-necked Grebe	Waterbird	Assess/Maintain				Y		Y			
	Y	Y	Red-throated Loon	Waterbird	Assess/Maintain				Y					
	Y		Roseate Tern	Waterbird	Recovery objective	EN	EN	EN						

[9] Status applies to the Magdalen Islands population of Horned Grebe, which is a migrant and winters in MBU 11 NS and MBU 12 NS.
[10] Status applies to the Western population of Horned Grebe, which is a migrant and winters in MBU 11 NS and MBU 12 NS.

Table 1 continued

BCR 14-NS	MBU 11-NS	MBU 12-NS	Priority Species	Bird Group	Population Objective[1]	SARA[2]	COSEWIC[3]	Provinical Listing[4]	National/Continenal Concern	National/Continental Stewardship	Regional/Sub-regional Concern	Regional/Sub-regional Stewardship	Waterfowl[5]	Expert Review[6]
	Y	Y	Sooty Shearwater	Waterbird	Assess/Maintain				Y					
Y			Sora	Waterbird	Maintain current				Y					
	Y		South Polar Skua	Waterbird	Assess/Maintain				Y					
	Y		Thick-billed Murre	Waterbird	Assess/Maintain				Y		Y			
Y			Virginia Rail	Waterbird	Assess/Maintain				Y					
Y	Y	Y	American Black Duck	Waterfowl	Maintain current								EHJV, NAWMP	
Y	Y	Y	Barrow's Goldeneye (Eastern)	Waterfowl	Assess/Maintain	SC	SC							
		Y	Black Scoter	Waterfowl	Assess/Maintain									Added
Y	Y	Y	Canada Goose (North Atlantic)	Waterfowl	Maintain current								EHJV	
Y	Y	Y	Canada Goose (Temperate-breeding in Eastern Canada)	Waterfowl	Decrease								EHJV[11]	
	Y	Y	Common Eider	Waterfowl	Maintain current								EHJV, NAWMP	
	Y	Y	Common Goldeneye	Waterfowl	Assess/Maintain								NAWMP	
Y			Green-winged Teal	Waterfowl	Increase 50%								EHJV	
	Y		Harlequin Duck (Eastern)	Waterfowl	Assess/Maintain	SC	SC	EN						
	Y	Y	Long-tailed Duck	Waterfowl	Assess/Maintain								NAWMP	
Y			Mallard	Waterfowl	Maintain current								EHJV[11]	
Y			Ring-necked Duck	Waterfowl	Increase 50%								EHJV	
	Y	Y	Surf Scoter	Waterfowl	Assess/Maintain								NAWMP	Added
	Y		White-winged Scoter	Waterfowl	Assess/Maintain				Y				NAWMP	Added

[11] Species considered a priority species for management reasons (e.g. overabundance, problem geese).

Table 2. Summary of priority bird species, by bird group, in BCR 14 NS, MBU 11 NS, and MBU 12 NS.

Bird Group	Total Species	Total Priority Species	Percent Listed as Priority	Percent of Priority List
BCR 14 NS				
Landbird	163 (67%)	40	25%	64%
Shorebird	27 (11%)	9	33%	15%
Waterbird	25 (10%)	6	24%	10%
Waterfowl	27 (11%)	7	26%	11%
Total	**242**	**62**		**100%**
MBU 11 NS				
Landbird	0	0	0	0
Shorebird	31 (27%)	15	48%	32%
Waterbird	55 (48%)	21	38%	46%
Waterfowl	29 (25%)	10	34%	22%
Total	**115**	**46**		**100%**
MBU 12 NS				
Landbird	0	0	0	0
Shorebird	24 (24%)	13	54%	37%
Waterbird	46 (47%)	13	28%	37%
Waterfowl	28 (29%)	9	32%	26%
Total	**98**	**35**		**100%**

Table 3. Number of priority bird species in BCR 14 NS, MBU 11 NS, and MBU 12 NS by reason for priority status.

Reason for Priority Listing[1]	Landbirds	Shorebirds	Waterbirds	Waterfowl
BCR 14 NS				
COSEWIC[2]	12	1	0	1
Federal SARA listed[3]	10	1	0	1
Provincially listed[4]	4	1	0	0
NAWMP[5]	-	-	-	6
National/Continental Concern	20	7	5	4
Regional/ Sub-regional Concern	11	2	2	1
National/Continental Stewardship	12	0	0	0
Regional/Sub-regional Stewardship	17	1	1	1

[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] Provincially listed indicates species listed as Endangered, Threatened or Vulnerable under the *Nova Scotia Endangered Species Act* (Nova Scotia Government 2007a).

[5] NAWMP indicates "key species" in the NS 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.

Table 3 continued

Reason for Priority Listing[1]	Landbirds	Shorebirds	Waterbirds	Waterfowl
Management Concern	0	0	0	2
Expert review	7	0	0	1
MBU 11 NS				
COSEWIC[2]	0	2	2	2
Federal SARA listed[3]	0	2	3	2
Provincially listed[4]	0	2	1	0
NAWMP[5]	-	-	-	8
National/Continental Concern	0	11	11	9
Regional/ Sub-regional Concern	0	4	10	1
National/Continental Stewardship	0	0	0	0
Regional/ Sub-regional Stewardship	0	0	0	0
Management Concern	0	0	0	1
Expert review	0	0	0	2
MBU 12 NS				
COSEWIC[2]		2	1	1
Federal SARA listed[3]	0	2	2	1
Provincially listed[4]	0	2	0	0
NAWMP[5]	-	-	-	7
National/Continental Concern	0	9	7	8
Regional/ Sub-regional Concern	0	4	6	1
National/Continental Stewardship	0	0	0	0
Regional/ Sub-regional Stewardship	0	0	0	0
Management Concern	0	0	0	1
Expert review	0	0	0	2

Element 2: Habitats Important to Priority Species

Identifying the broad habitat requirements for each priority species within the BCR and the MBUs 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, FAO 2000) to categorize habitats, and species were often assigned to more than one habitat class.

The assignment of habitat associations for priority bird species was primarily done through literature review and expert consultation. For each priority species in BCR 14 NS, MBU 11 NS and MBU 12 NS, all of their known habitat associations were considered, not just the primary habitat associations (Table A-2). Because of the variability and the availability of information related to species-habitat associations, quantifying the relative importance of any given habitat was not possible. In this document, statements regarding the importance of habitat types for priority bird species are related to the number of priority birds associated with each habitat and may not reflect the overall importance of the habitat 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 Nova Scotia, please consult the Second Maritimes Breeding Bird Atlas (Stewart et al. in prep.).

In BCR 14 NS, wetlands are used by the greatest number of priority bird species (45%, 28 priority bird species; Fig. 4). A high percentage of priority bird species is also found in coniferous and mixed forests and cultivated and managed areas. Thirty-five percent (35%) of priority species use forested habitats (22 species), and 34% use cultivated and managed areas (21 species). In the Scotian Shelf and Bay of Fundy (MBU 11 NS), 15 priority species use the coastal (intertidal) habitats exclusively, and 14 use the marine waters exclusively. Seventeen priority species use both the coastal (intertidal) habitats and marine waters (Fig. 5; for the list of species see Table A-2).

In the Gulf of St. Lawrence (MBU 12 NS), 15 priority species use the coastal (intertidal) habitats, and seven species use marine waters, while 13 priority species use both of these habitats (Fig. 6; for the list of species, see Table A-2).

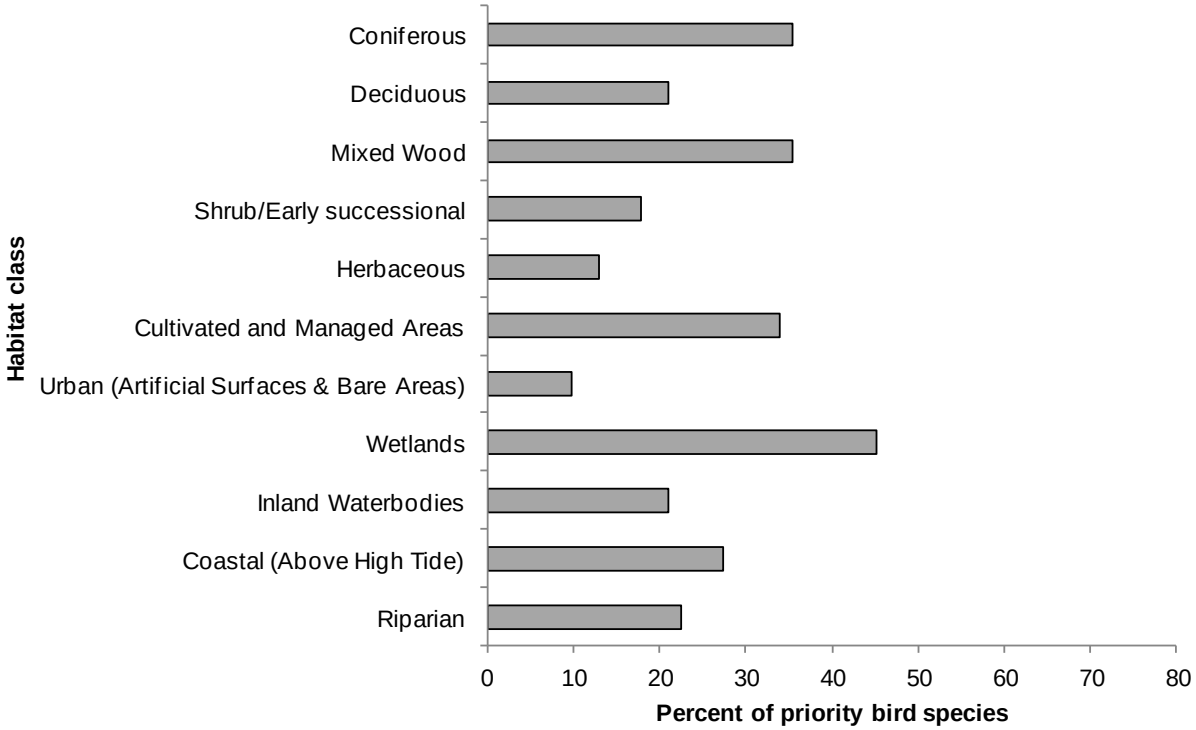

Figure 4. Percent of priority bird species that are associated with each habitat type in BCR 14 NS.
Note: The total exceeds 100% because species may be assigned to more than one habitat.

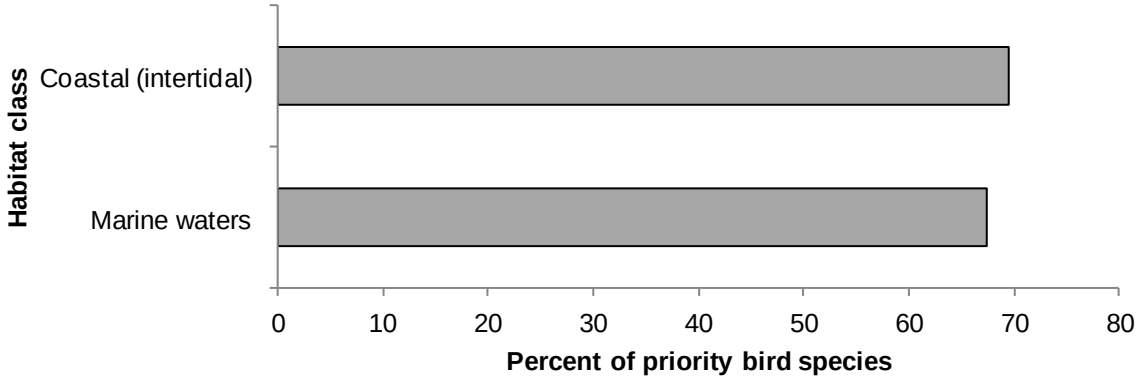

Figure 5. Percent of priority bird species that are associated with each habitat type in MBU 11 NS.
Note: The total exceeds 100% because species may be assigned to more than one habitat.

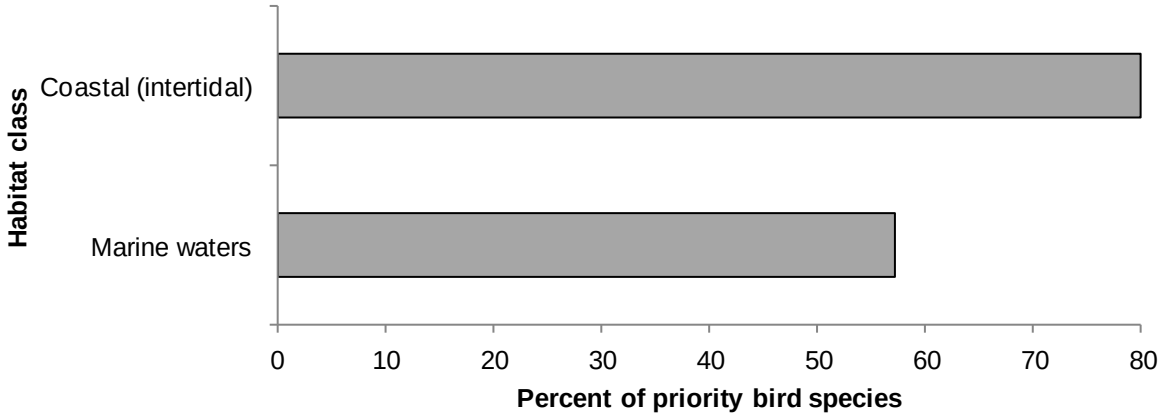

Figure 6. Percent of priority bird species associated with each habitat type in MBU 12 NS.
Note: The total exceeds 100% because species may be assigned to more than one habitat.

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 NS, the population objective for 21 priority bird species (34%) is to maintain current population levels (Fig. 7). However, 26 species (42%) of priority birds have population objectives to increase current levels either by 100%, 50% or to a specific population target from the recovery documents of species at risk. There are 14 priority species (23%) for which the population trend information was insufficient to set a specific population objective; these species were given the objective as assess and maintain. In MBU 11 NS and MBU 12 NS, most priority bird species have a population objective of assess and maintain (80% or 37 species in MBU 11 NS and 80% or 28 species in MBU 12 NS; Figures 8 and 9, respectively).

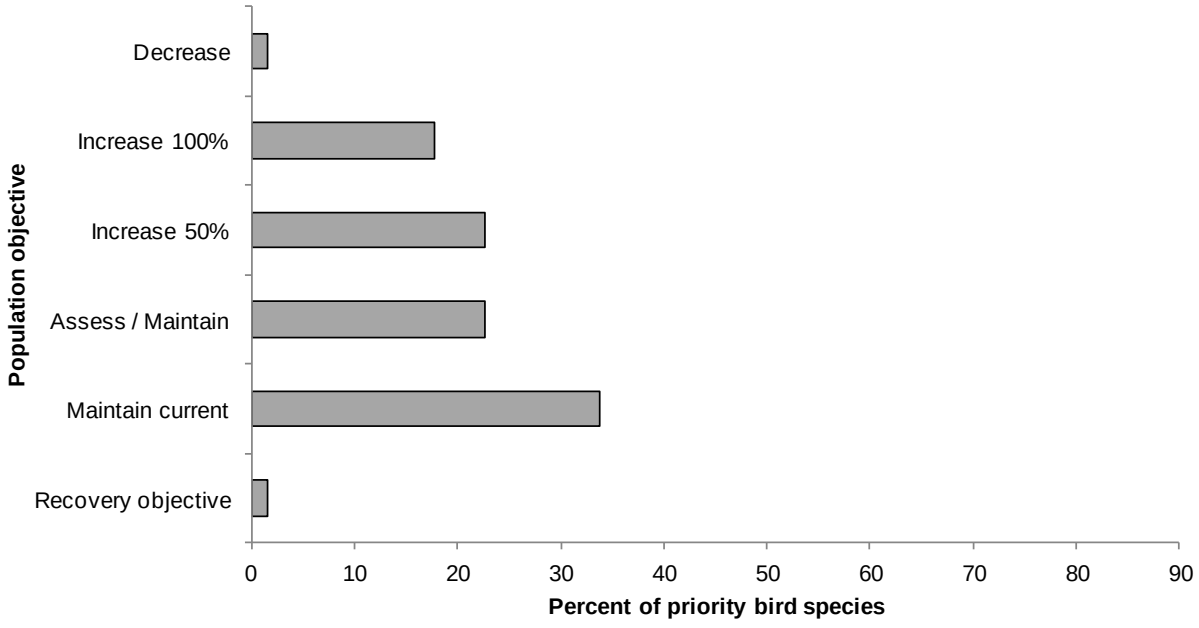

Figure 7. Percent of priority bird species associated with each population objective category in BCR 14 NS.

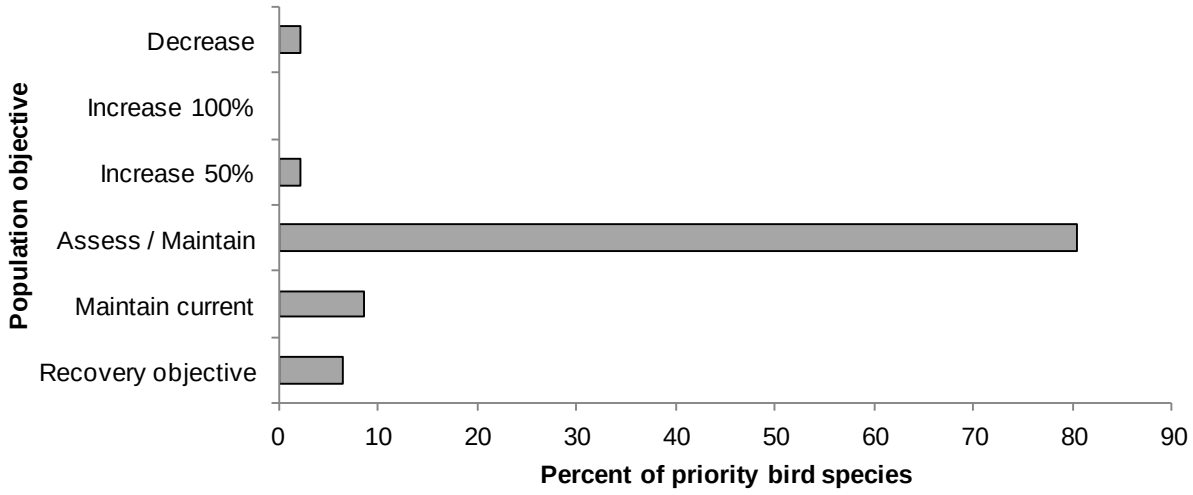

Figure 8. Percent of priority bird species associated with each population objective category in MBU 11 NS.

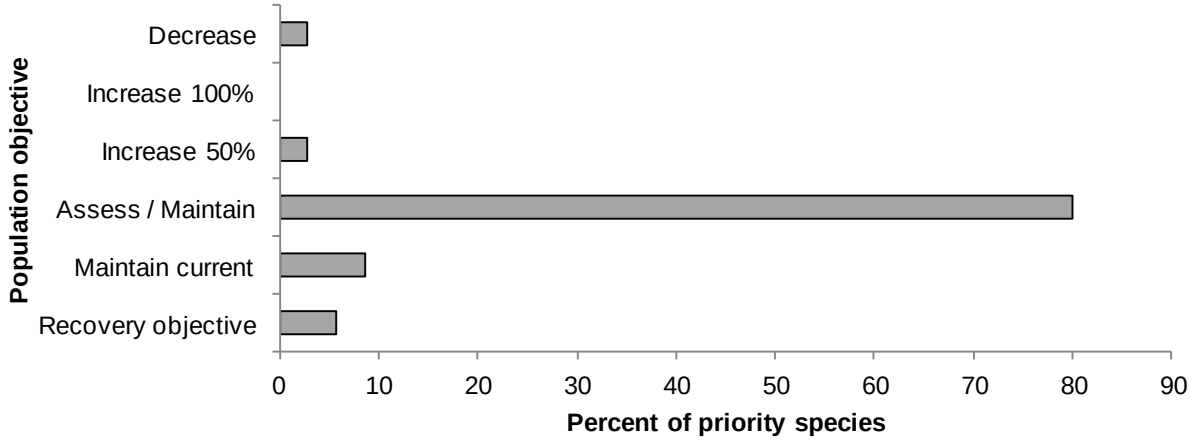

Figure 9. Percent of priority bird species associated with each population objective category in MBU 12 NS.

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), 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.

In BCR 14 NS, MBU 11 NS and MBU 12 NS, a threat 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.

A list of all threats to priority species in each planning unit is included in Appendix 1 (Table A-3). The complete list of threat categories is included in Appendix 3. Some threats are not unique to a particular planning unit or habitat type (for example, fragmentation or loss of 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). Threats are categorized following Salafsky et al. (2008); when their rankings are rolled up for each habitat class (Table 4), the overall magnitude of threats is highest in the deciduous and mixed forests of BCR 14 NS and the intertidal coast of MBU 11 NS. Most other habitat classes have an overall threat magnitude of medium except for the shrub and early successional, the herbaceous and the inland waterbodies habitats of BCR 14 NS, which have a threat magnitude of low (Table 4).

In BCR 14 NS, the highest ranked threats to priority species were related to logging and wood harvesting in all three forest types and in forested wetlands (5. Biological resource use); agricultural practices such as early haying (2. Agriculture & aquaculture); pesticide, fungicide and insecticide uses by the forestry industry (or drifting from the agriculture industry) in deciduous and mixed forests (9. Pollution; Table 4). The most frequently identified threats were decreases in diet quality, in the health of birds, or in prey availability due to the contamination of food sources from biocides such as pesticides, herbicides or fungicides used by the forestry and agricultural industries (9.3 Agricultural & forestry effluents; Fig. 10). These threats were found in all habitat classes except urban areas in BCR 14 NS (Table A-3).

In MBU 11 NS, the highest ranked threats to priority species were related to disturbances at foraging or nest sites from recreational activities in the intertidal coast (6. Human intrusion & disturbance) and oil spills and discharges in both the marine waters and the intertidal coast (9.

Pollution; Table 4 and Table A-3). Threats associated with 9.2 Industrial & military effluents were the most frequently identified and highest ranked threats in both MBU 11 NS and MBU 12 NS. Examples of these types of threats include decreased prey availability due to chemical or heavy metal contamination, oil spills and discharges, and hypothermia caused by oil on plumage (Table A-3; Figures 11 and 12). Lack of information was the second most-frequently identified threat in MBU 11 NS (Fig. 11) and in MBU 12 NS (Fig. 12). The remainder of threats identified for priority birds in MBU 11 NS and MBU 12 NS were ranked as low and are not discussed further (Table A-3).

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.

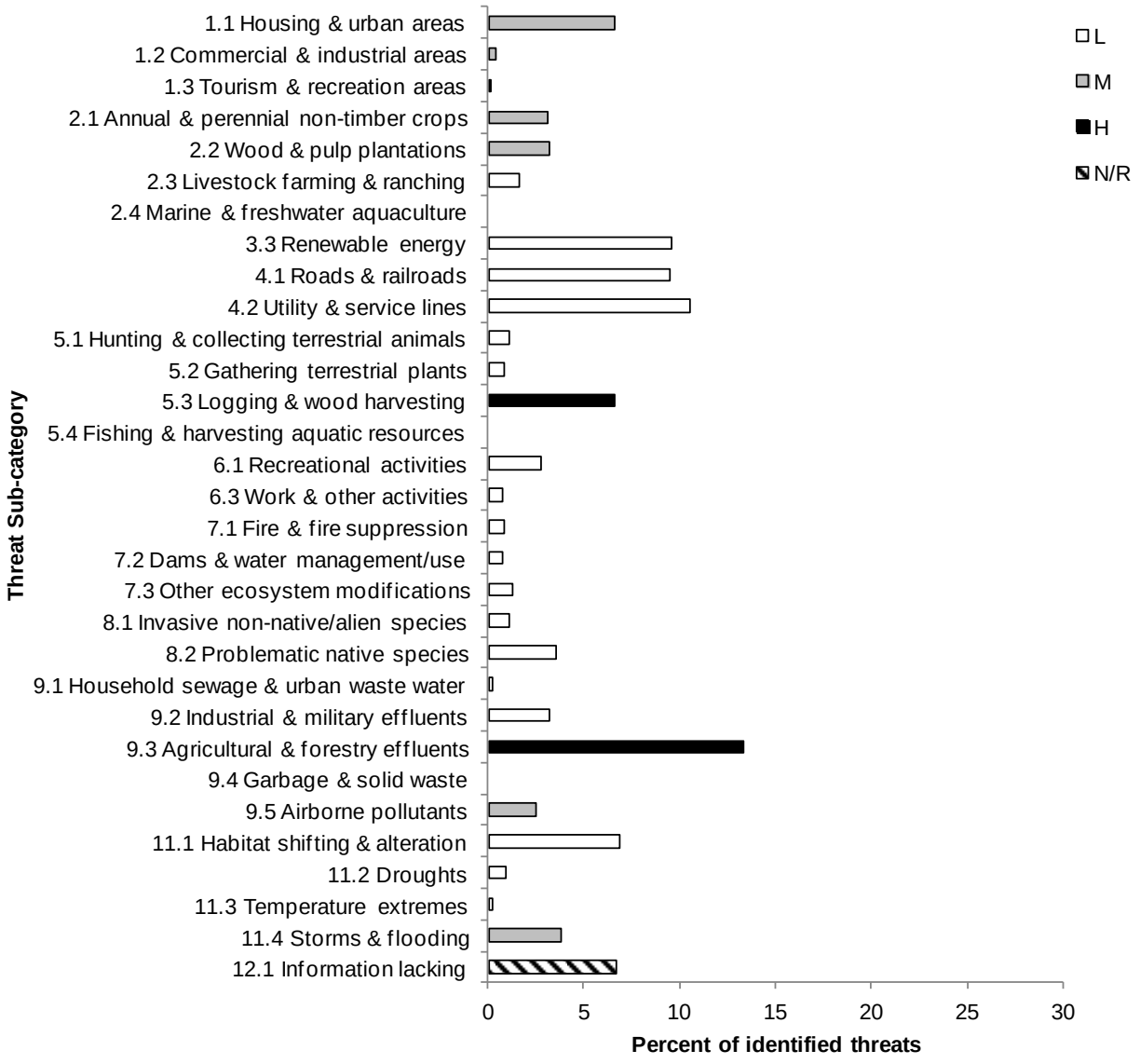

Figure 10. Percent of identified threats to priority bird species within BCR 14 NS by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 14 NS (for example, if 100 threats were identified in total for all priority species in BCR 14 NS, 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 (high, medium and low) represents the rolled-up magnitude of all threats in each threat subcategory in the BCR. (See Appendix 2 for details on how magnitude was assessed.) N/R are unranked threats due to lack of information (12.1).

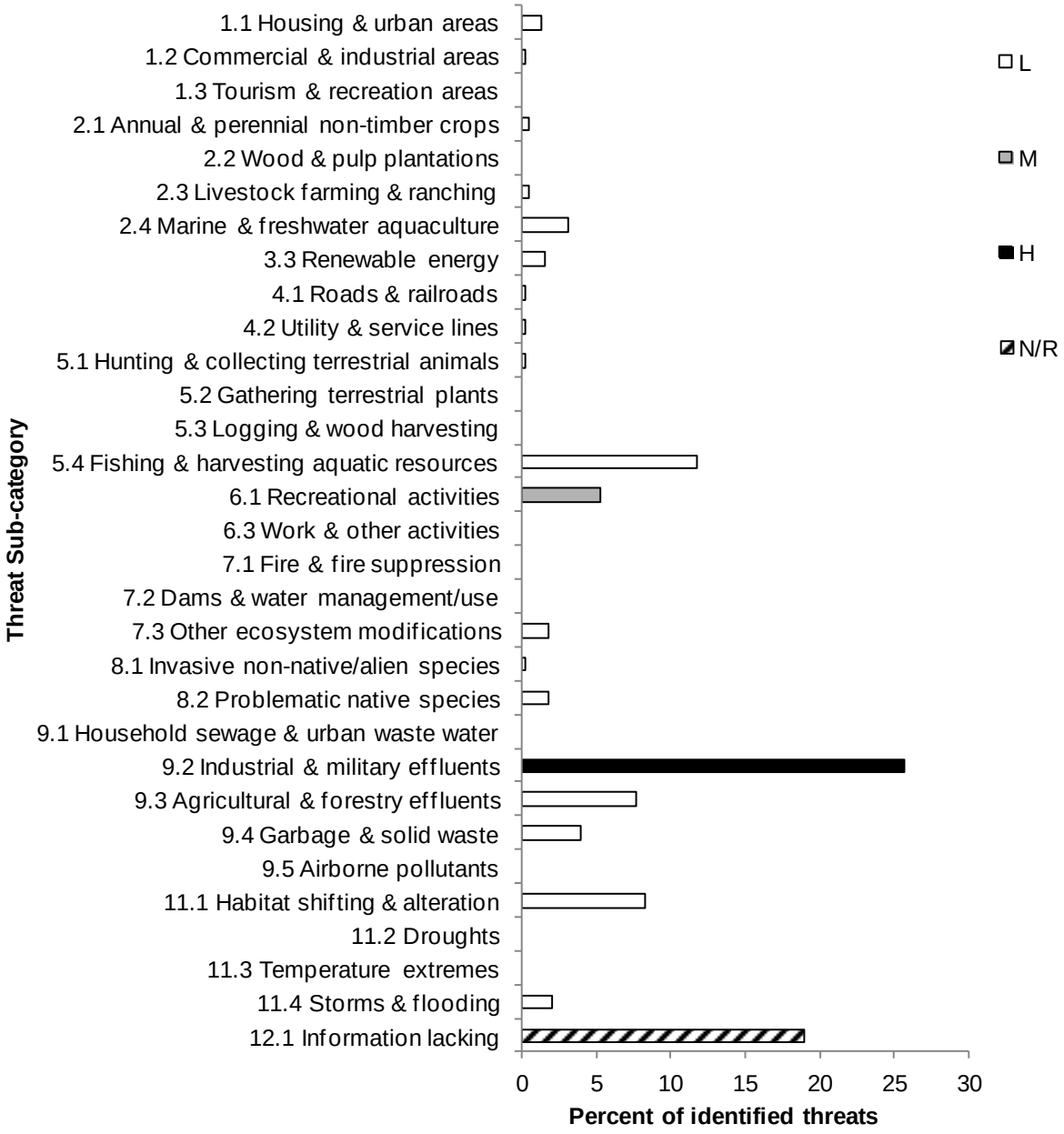

Figure 11. Percent of identified threats to priority bird species within MBU 11 NS by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in MBU 11 NS (for example, if 100 threats were identified in total for all priority species in MBU 11 NS, 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 (high, medium and low) represents the rolled-up magnitude of all threats in each threat subcategory in the BCR. (See Appendix 2 for details on how magnitude was assessed.) N/R are unranked threats due to lack of information (12.1).

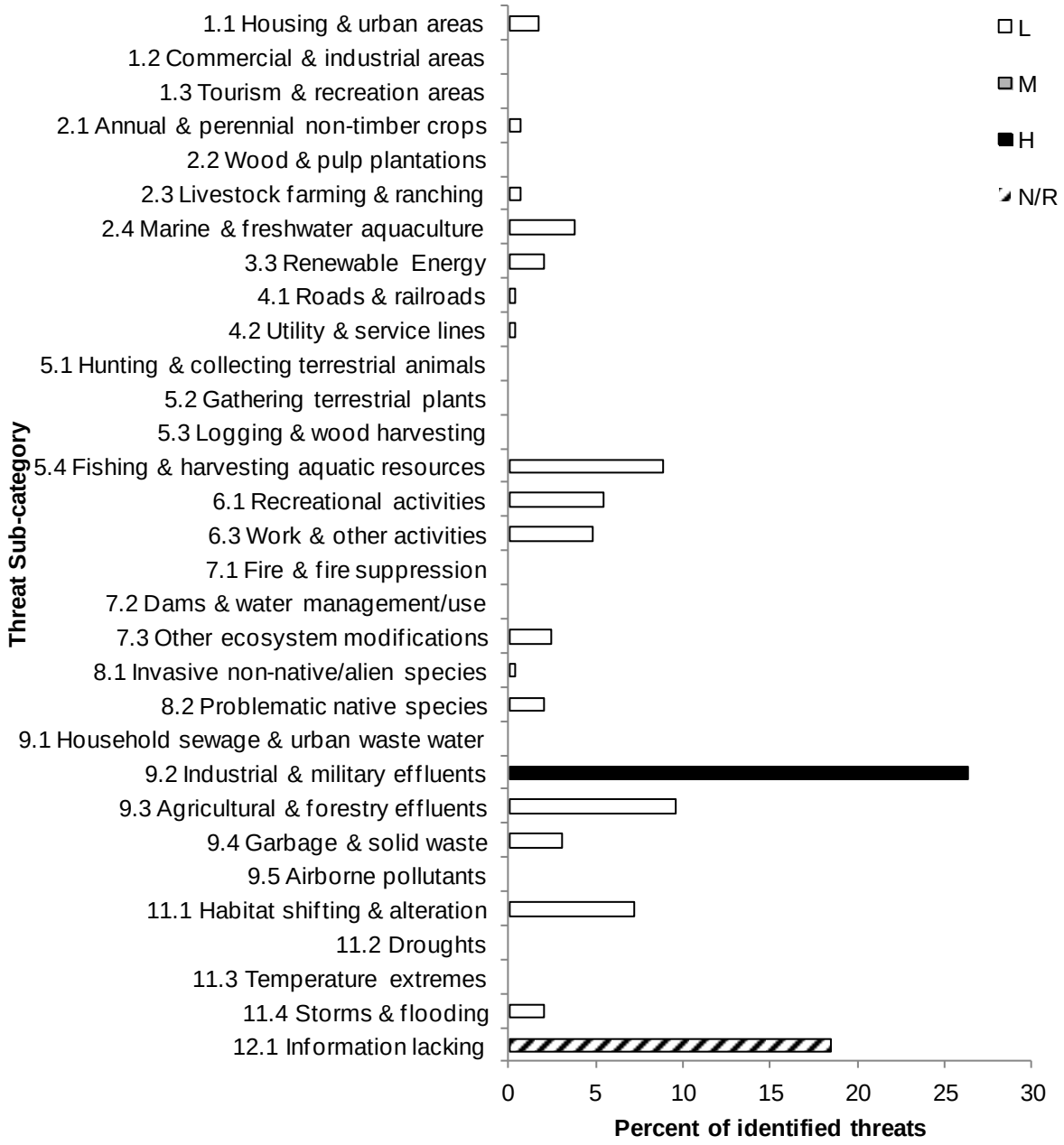

Figure 12. Percent of identified threats to priority bird species within MBU 12 NS by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in MBU 12 NS (for example, if 100 threats were identified in total for all priority species in MBU 12 NS, 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 (high, medium and low) represents the rolled-up magnitude of all threats in each threat subcategory in the BCR. (See Appendix 2 for details on how magnitude was assessed.) N/R are unranked threats due to lack of information (12.1).

Table 4. Relative magnitude of identified threats to priority species within BCR 14 NS, MBU 11 NS and MBU 12 NS 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 bird species had threats identified in the threat category/habitat combination.

	BCR 14 NS													MBU 11 NS				MBU 12 NS			
Threat Category	**Habitat Class**													**Habitat Class**				**Habitat Class**			
	Coniferous	**Deciduous**	**Mixed Wood**	**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**	**Marine Waters**	**Coastal (intertidal)**	**Widespread**	**Overall**
Overall	**M**	**H**	**H**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**M**	**M**		**M**	**H**	**L**		**M**	**M**	**L**	
1. Residential & commercial development	L	L	L	L	L	L	H	M	L	M	M	L	**M**	L	L		**L**		L		**L**
2. Agriculture & aquaculture	M	M	M	L		H		M		L	L		**M**	M	L		**L**	M	L		**L**
3. Energy production & mining	L	L	L		L							L	**L**		L	L	**L**		L	L	**L**
4. Transportation & service corridors	M	L	L	L	L			L		L	L	L	**L**		L		**L**		L		**L**
5. Biological resource use	H	H	H		L			H	L	L	M		**H**	M	L		**L**	M	L		**L**
6. Human intrusions & disturbance					L		L	L	L	M	L		**L**	L	H		**M**	L	M		**L**
7. Natural system modifications	L	L	L	L		L		L		M	L		**L**		M		**L**		M		**L**
8. Invasive & other problematic species & genes	L	L	L	L	L	L	L	L	L	M	L		**L**	L	M		**L**	L	M	L	**L**
9. Pollution	M	H	H	L	L	M	M	M	M	M	M		**H**	H	H		**H**	H	H		**H**
11. Climate change & severe weather												H				M				M	

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 NS, the most frequently identified conservation objective is to ensure adequate habitat availability for priority bird species (Fig. 13) while in MBU 11 NS and in MBU 12 NS, the most frequently identified conservation objective is to reduce mortality (Figures 14 and 15). While the conservation objective category includes both reducing mortality and increasing productivity, most priority bird species do not breed within the MBU, and therefore most of the recommended actions that follow address only the reduction of mortality. Due to our general lack of understanding of factors affecting priority bird species in the marine environment, the conservation objective to improve our understanding of priority bird species appears more frequently for MBUs than for the terrestrial portion of the BCR (Figures 13, 14, 15).

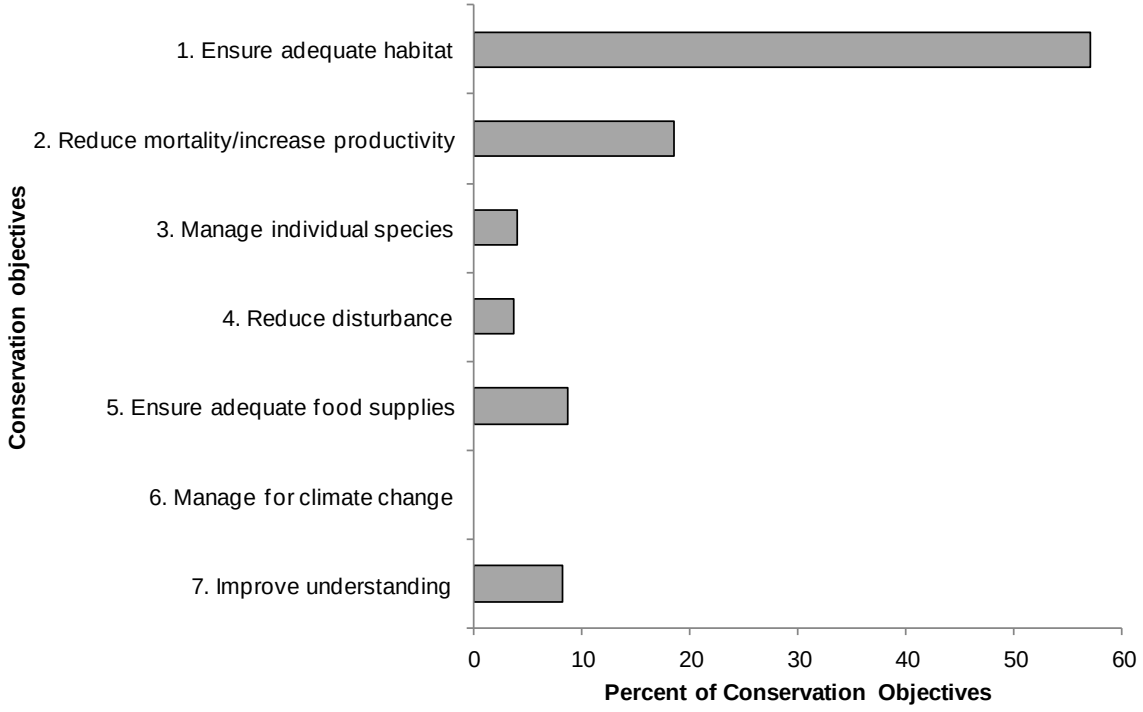

Figure 13. Percent of all conservation objectives assigned to each conservation objective category in BCR 14 NS.

Note: Conservation objectives related to climate change are discussed in Section 3: Climate Change.

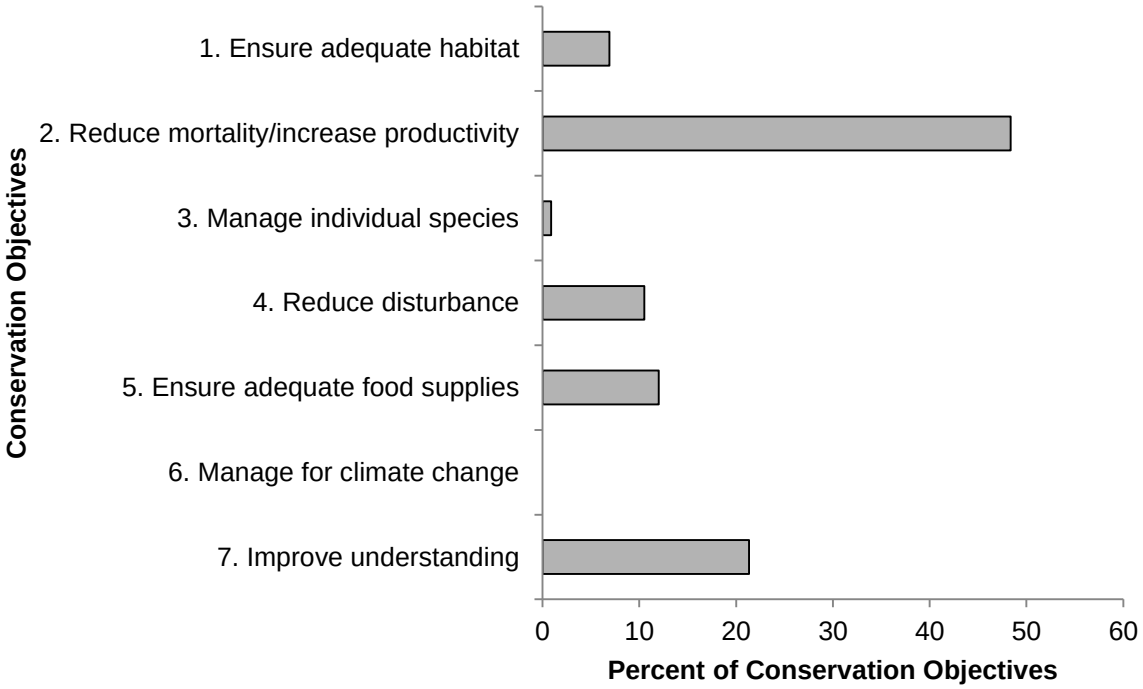

Figure 14. Percent of all conservation objectives assigned to each conservation objective category in MBU 11 NS.

Note: Conservation objectives related to climate change are discussed in Section 3: Climate Change.

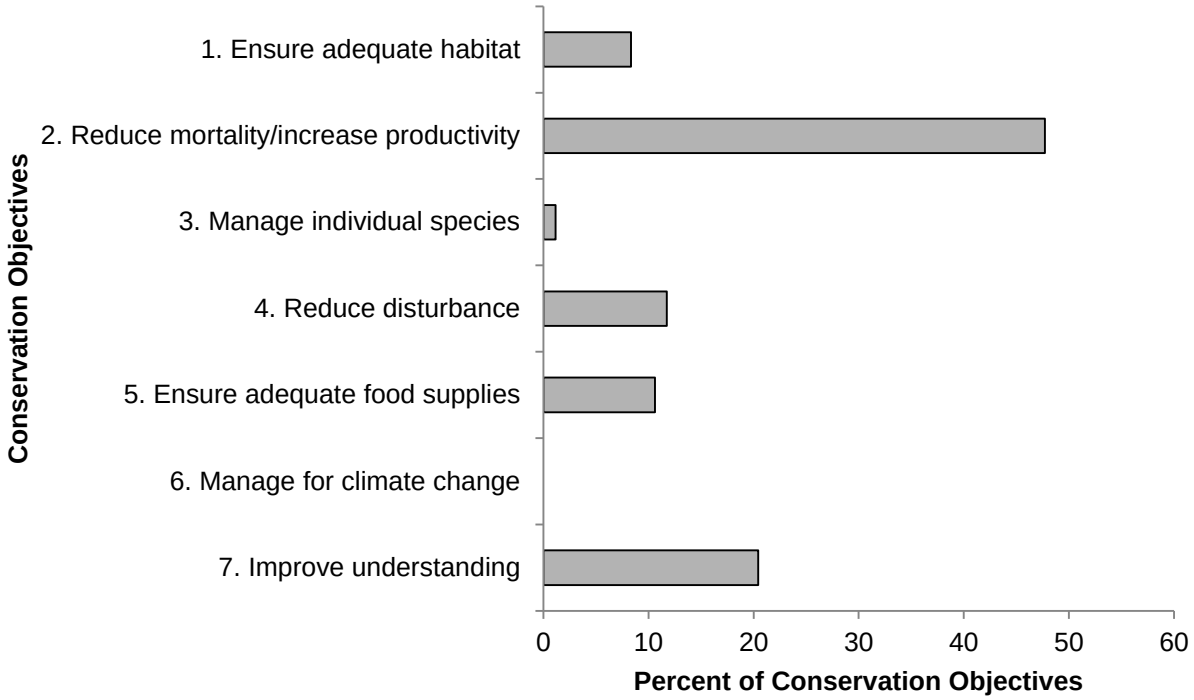

Figure 15. Percent of all conservation objectives assigned to each conservation objective category in MBU 12 NS.

Note: Conservation objectives related to climate change are discussed in Section 3: Climate Change.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (listed in Figures 16, 17 and 18). 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.

Recommended conservation actions follow the categories outlined in Salafsky et al. 2008 (see Table A-5 in Appendix 3 for a complete list of conservation actions categories). In BCR 14 NS, the most frequently recommended conservation actions fall under 2.1 Site/area management and 5.3 Private sector standards and codes (Fig. 16). Examples of recommended conservation actions under 2.1 Site/area management include specific recommendations to maintain patch sizes, the 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 in forests, 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 11 NS and MBU 12 NS, the most frequently recommended conservation actions fall in the law and policy category (5.3 Private sector standards and codes; 5.4 Compliance and enforcement; and 5.2 Policies and regulations; Figures 17 and 18, respectively). Examples of recommended conservation actions under 5.3 Private sector standards and codes that are 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 5.4 Compliance and enforcement include continuing to monitor and enforce compliance with laws, policies and regulations to minimize seabird bycatch or those related to the release of oil and other wastes into marine waters. Examples of recommended conservation actions under 5.2 Policies and regulations include management of recreational activities to minimize disturbances to priority bird species; management of coastal development to limit habitat degradation and development of policies, regulations and beneficial management practices that minimize seabird bycatch, such as the modification of fishing gear (see Section 2 for more examples).

Actions related to 4.3 Awareness and communications are also frequently recommended for both MBU 11 NB and MBU 12 NB (Figures 17 and 18). Examples of recommended conservation actions related to awareness and communications include raising public awareness of shorebird habitat needs and the impacts of disturbance from recreational activities in coastal habitats; of

human disturbance at seabird colonies or in other nesting areas; and of the impact on shorebirds and seabirds when riprap is installed in coastal areas (see Section 2 for more examples).

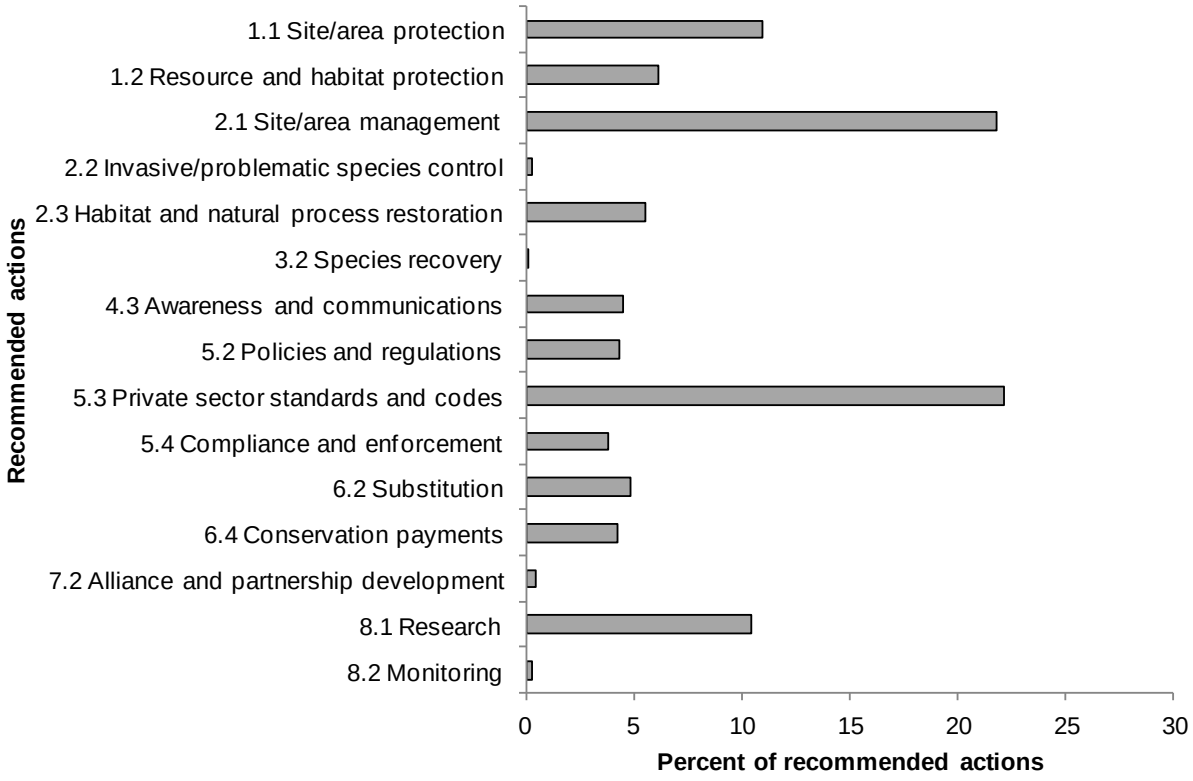

Figure 16. Percent of recommended actions assigned to each sub-category in BCR 14 NS.
"Research" and "monitoring" refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see Research and Population Monitoring Needs in Section 3.

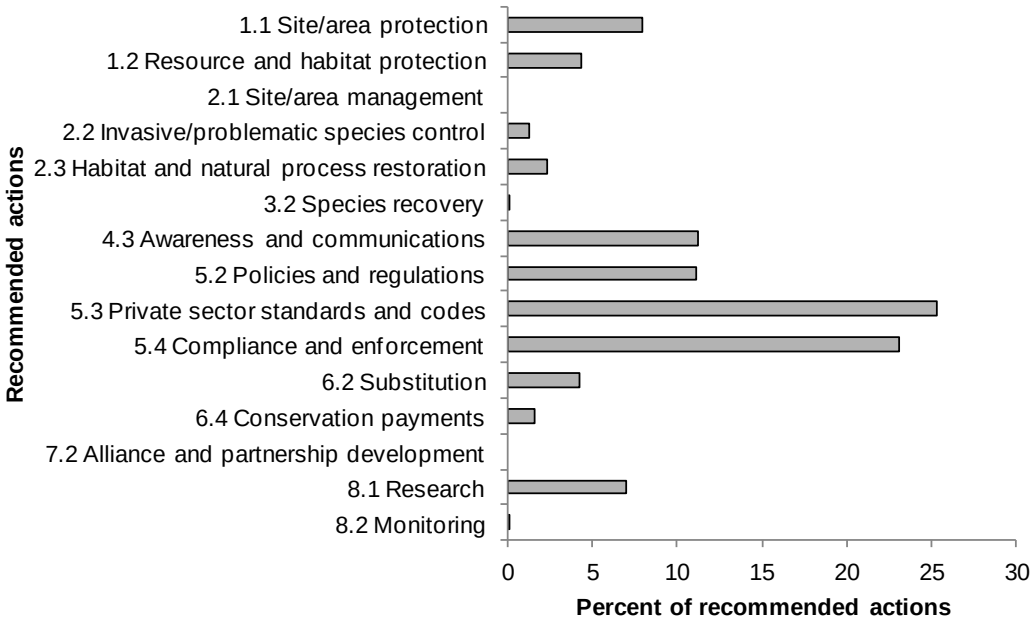

Figure 17. Percent of recommended actions assigned to each sub-category in MBU 11 NS.
"Research" refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see Research and Population Monitoring Needs in Section 3.

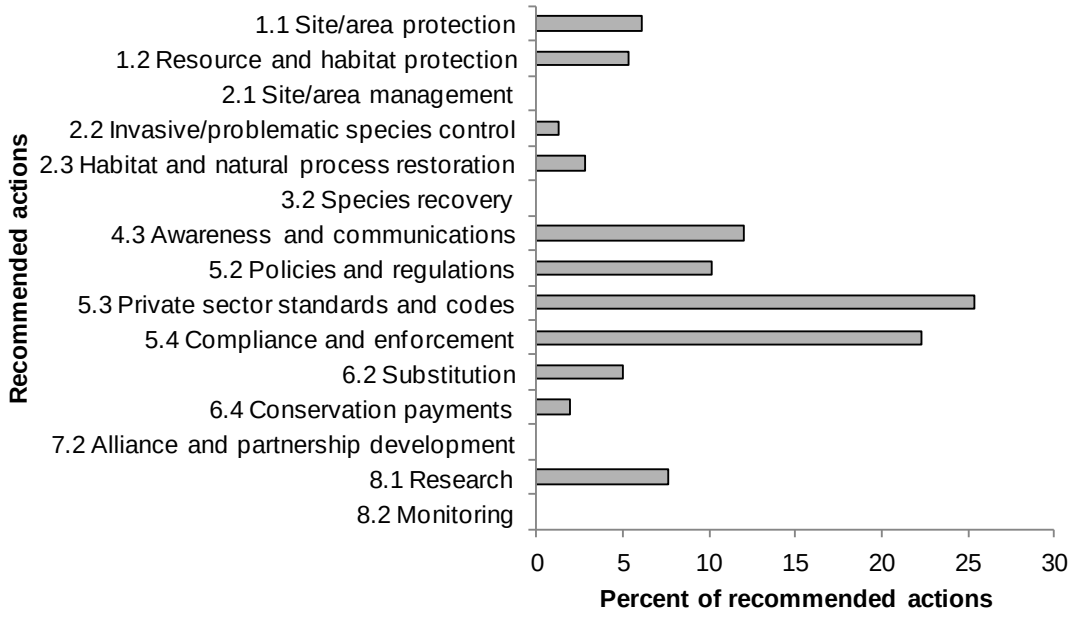

Figure 18. Percent of recommended actions assigned to each sub-category in MBU 12 NS.
"Research" refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see Research and Population Monitoring Needs in Section 3.

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 NS, MBU 11 NS and MBU 12 NS. 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.

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

Coniferous

Coniferous forest is defined as forest stands where over 75% of total tree basal area is composed of coniferous trees. BCR 14 NS is dominated by coniferous forests with 21 800 km^2 of this habitat type (39% of the land base; Dettmers (2006); Fig. 19). The dominant canopy species of this area 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 jack pine (*Pinus banksiana*), 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).

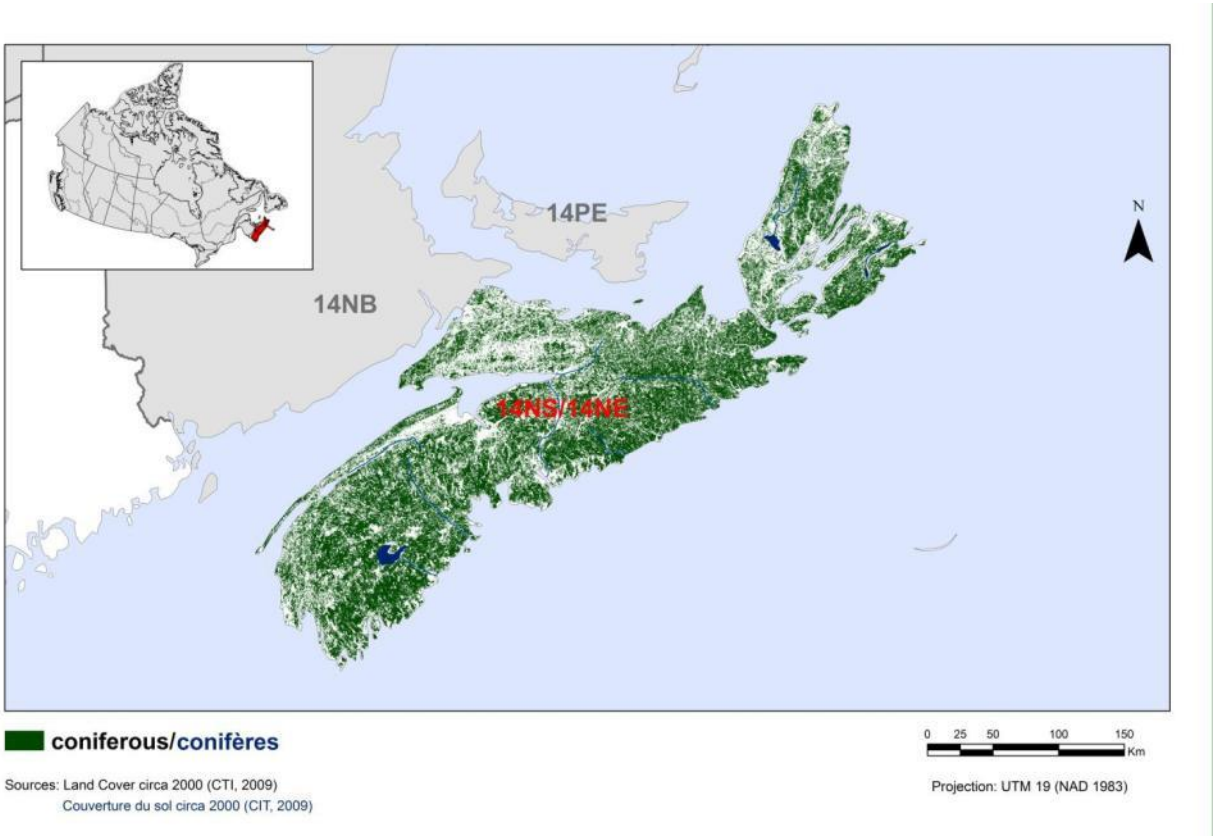

Figure 19. Map of coniferous habitat in BCR 14 NS.

There are 22 priority bird species in the coniferous forests in BCR 14 NS; all are landbirds, and 6 of these are species at risk (Table 5). Six of the priority species are found only in coniferous forests. The other 16 priority species can be found in other forest types as well (Tables 5, 7 and 9). Within the coniferous forests, half of the priority bird species are found in mature or old-growth forests. Priority bird species are also found in open forest, spruce-fir forest, dense forest, second-growth forest and moist forest (Table 5).

The highest ranked threat identified for priority birds that use coniferous forests is the alteration of forest composition and structure through timber harvest (5.3 Logging & wood harvesting; Fig. 20). In addition to logging and wood harvesting, priority bird species in

coniferous habitats are threatened by contamination from pesticides and herbicides from the forestry and agriculture sectors (9.3 Agriculture & forestry effluents; Fig. 20). The conversion of naturally diverse coniferous forest into replanted and managed coniferous forest (2.2 Wood & pulp plantations) was determined to be a medium-ranked threat for three priority bird species: Bicknell's Thrush, Bay-breasted Warbler, Ruffed Grouse (Table 6). In addition, priority birds are affected by habitat fragmentation as a result of road and right-of-way construction (4.1 Roads & railroads, 4.2 Utility & service lines; Fig. 20) and by the development of wind energy projects (3.3 Renewable energy; Fig. 20).

Many bird species will benefit from the conservation objectives and actions presented in Table 6. Recommended conservation actions to address medium- and high-ranked threats to priority birds associated with coniferous forests 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. In addition, it is recommended that 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 bird species that use coniferous habitat in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
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 50%				Y			
Bicknell's Thrush	Dense Forest	close-growing conifers (higher elevations)	Increase 50%	Y	Y		Y			
Black-and-white Warbler	Moist Forest	young, immature	Maintain current					Y		
Blackburnian Warbler	Mature to Old-growth Forest	mature, hemlock	Maintain current			Y				
Black-throated Green Warbler	Middle-aged to Mature Forest	interior, middle/mature forest	Maintain current			Y		Y		
Blue-headed Vireo	Middle-aged to Mature Forest	mid/mature coniferous/mixed forest with >75% closed canopy; some understory (not dense) of shrubs and saplings	Maintain current			Y				
Boreal Chickadee	Spruce-Fir Forest	snags/cavities, boreal, black spruce, Krumholtz in coastal areas	Increase 100%				Y	Y		
Canada Warbler	Moist Forest	dense understory, ground moss, moist, upturned roots	Increase 50%	Y	Y	Y	Y	Y		
Cape May Warbler	Mature to Old-growth Forest	mature	Increase 50%				Y			

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 5 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Chimney Swift	Mature to Old-growth Forest	large pines	Increase 100%	Y	Y					
Common Nighthawk	Open Forest	mature forest and older	Increase 100%	Y						
Evening Grosbeak	Second-growth and Mature Forest	mid/mature open canopy, nesting in bigger trees	Maintain current					Y		
Gray Jay	Mature Forest	mature forest	Assess/Maintain							Y
Magnolia Warbler	Second-growth Forest	young, regenerating, generally balsam fir	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	Assess/Maintain	Y	Y		Y			
Pine Grosbeak	Open Forest	open coniferous forest, mostly spruce	Increase 50%							Y
Purple Finch	Moist Forest	immature stands	Maintain current					Y		
Ruffed Grouse	Second-growth and Mature Forest	coarse woody debris	Increase 50%				Y			
Rusty Blackbird	Moist Forest		Increase 100%	Y			Y			
Spruce Grouse	Second-growth Forest	open areas, regenerating second growth, pine stands	Increase 50%							Y

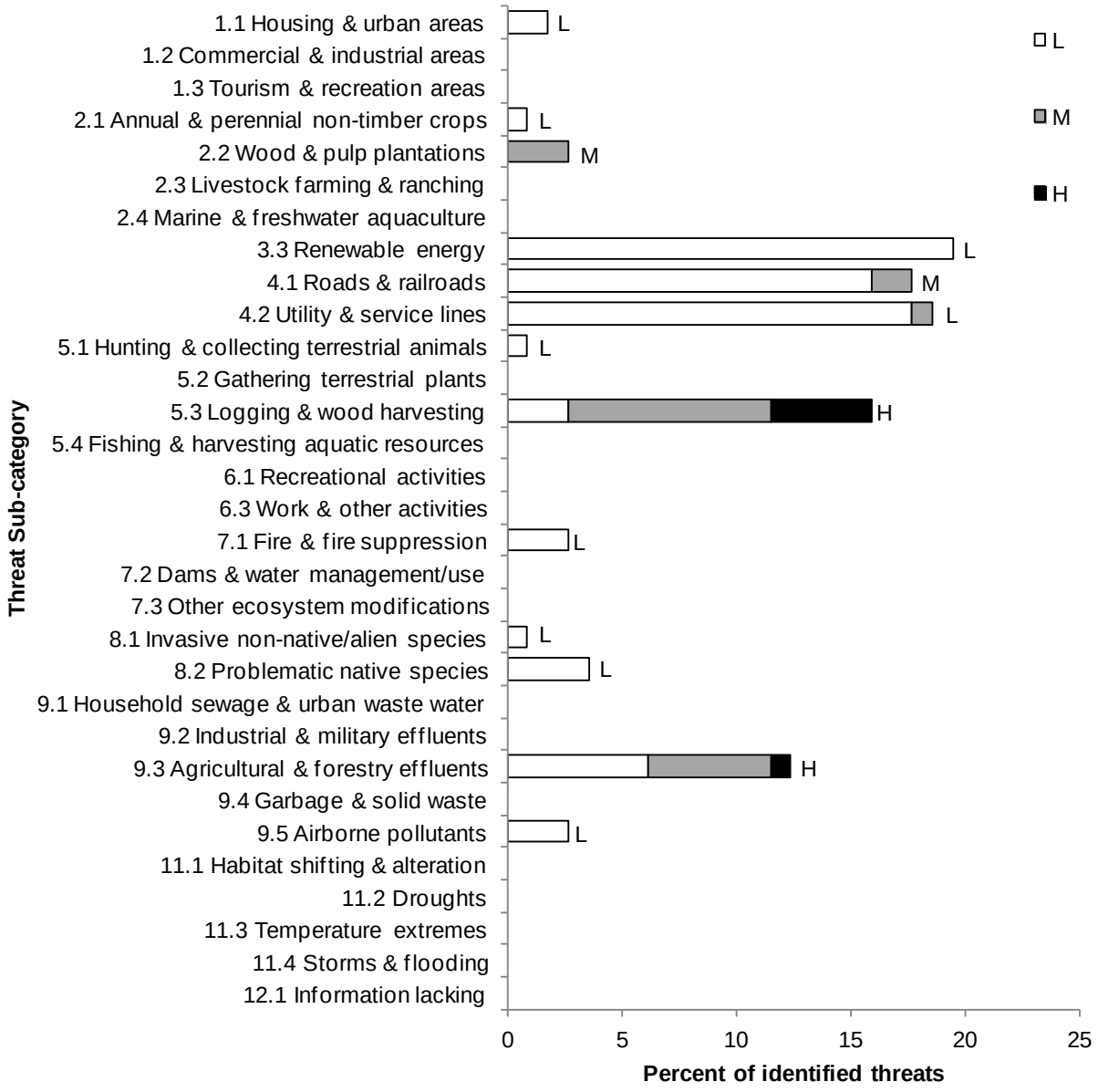

Figure 20. Percent of identified threats to priority bird species in coniferous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coniferous habitat (for example, if 100 threats were identified in total for all priority 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in coniferous habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 bird species affected for coniferous habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
Fragmentation or loss of dense coniferous forest due to its conversion to managed coniferous forest	2.2 Wood & pulp plantations	Maintain/restore dense coniferous forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify core breeding habitat and ensure its protection from forestry and wind energy development.	1.1 Site/area protection	Medium: Bicknell's Thrush
				Manage forest to supply adequate habitat.	5.3 Private sector standards and codes	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
Fragmentation or loss of coniferous forest 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, Ruffed Grouse
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forests 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	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				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	
Fragmentation or loss of coniferous 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	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 forests to support and, where necessary, enhance populations of priority species.	2.1 Site/area management	

† Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 6 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
roads		roads	improve bird 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 dense coniferous forests due to the construction and maintenance of right-of-ways for power lines	4.2 Utility & service lines	Reduce/eliminate habitat fragmentation from power line rights-of-ways and other energy transport lines	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: Bicknell's Thrush
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forests 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 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 dense coniferous forests due to logging activities	5.3 Logging & wood harvesting	Maintain/restore dense coniferous forests	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Identify core breeding habitat and ensure its protection from forestry and wind energy development.	1.1 Site/area protection	High: Bicknell's Thrush
				Manage forest to supply adequate habitat.	5.3 Private sector standards and codes	
				Improve linkages between bird conservation needs and forest management guidelines.	5.2 Policies and regulations	
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	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	High: Gray Jay, Chimney Swift, Blackburnian Warbler, Spruce Grouse
				Maintain sufficient patch sizes, configuration, and connectivity of coniferous forests to support and, where	2.1 Site/area management	

Table 6 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
			maintain or improve bird habitat	necessary, enhance populations of priority species.		Medium: Cape May Warbler, Bay-breasted Warbler, Black-throated Green Warbler, Blue-headed Vireo, Black-and-white Warbler, Canada Warbler, Purple Finch, Pine Grosbeak, Boreal Chickadee, Evening Grosbeak
				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	
				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	
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	High: Bay-breasted Warbler Medium: Blackburnian Warbler, Black-throated Green Warbler, Cape May Warbler, Chimney Swift, Common Nighthawk, Olive-sided Flycatcher
				Promote pesticide free products.	6.2 Substitution	

Deciduous

Deciduous forests (where over 75% of total tree basal area is deciduous trees) occur throughout BCR 14 NS. Deciduous forests are fairly abundant, with 5 246 km^2 (18%) of BCR 14 NS classified as deciduous habitat (Fig. 21). Dominant canopy species include sugar maple (*Acer saccharum*) and yellow birch (*Betula alleghaniensis*. Other common species include white ash (*Fraxinus americana*), red maple (*Acer rubrum*) and striped maple (*Acer pensylvanicum*). White birch (*B. papyrifera*), grey birch (*B. populifolia*), trembling aspen (*Populus tremuliodes*) and largetooth aspen (*P. grandidentata*) are commonly found in regenerating stands.

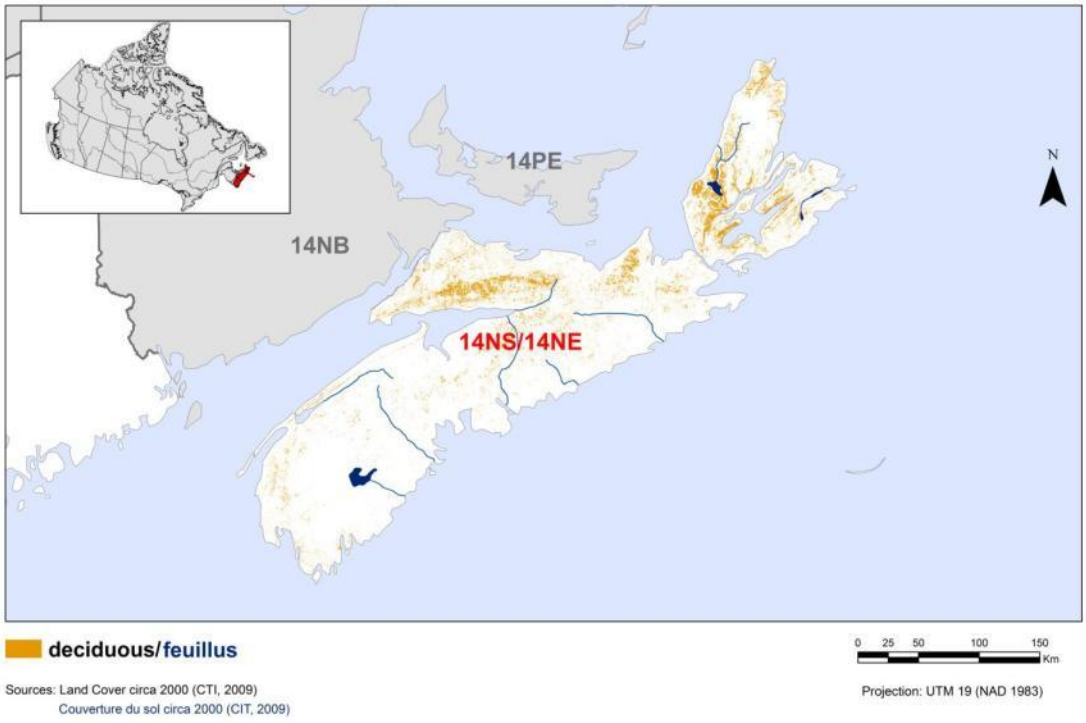

Figure 21. Map of deciduous habitat in BCR 14 NS.

There are 13 priority bird species in the deciduous forests of BCR 14 NS; all are landbirds and 3 of these are species at risk (Table 7). All priority species associated with deciduous forests are also associated with mixed wood forests (5 priority species) or are found in all 3 forest types (8 priority species; Tables 5, 7 and 9). Within the deciduous forests, 6 priority bird species are found in second-growth forest habitat. Additional habitat sub-classes where priority bird species are found include open forests (1 priority species), mature or old-growth forests (5 priority species) and moist forests (3 priority species).

The highest ranked threat to priority bird species found in deciduous habitat is the alteration of forest composition and structure through timber harvest (5.3 Logging & wood harvesting; Fig. 22). The selective cutting of hardwood forest within short time intervals changes forest structure resulting in fewer and more scattered mature closed-canopy stands (Villard 2000).

Forests are being fragmented as a result of road and right-of-way construction (4.1 Roads & railroads and 4.2 Utility & service lines) and the development of wind farms (3.3 Renewable energy; Fig. 22). In addition, other important threats to priority birds in deciduous forests include chemical contamination of the birds' food sources and decreases in prey availability due to pesticides, fungicides and insecticides used by either the forestry industry or from nearby agriculture (9.3 Agricultural & forestry effluents; Mineau 2003; Fig. 22).

Many bird species will benefit from the conservation objectives and actions presented in Table 8. Recommended conservation actions to address medium- and high-ranked threats for this habitat include identifying, establishing or expanding protected areas of existing old-growth or late-successional deciduous habitats and maintaining sufficient patch sizes, configuration and connectivity of deciduous habitats. It is equally important to develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation. Managing post-logging sites and permitting or encouraging deciduous regeneration is also recommended. The use of 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 bird species that use deciduous habitat in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Redstart	Second-growth Forest	abundant shrubs and saplings, near water and/or forest edge	Maintain current					Y		
Black-and-white Warbler	Moist Forest	young, immature	Maintain current					Y		
Black-billed Cuckoo	Second-growth Forest	Shrubs	Assess/Maintain		Y		Y			
Blackburnian Warbler	Mature to Old-growth Forest	mature, several coniferous trees	Maintain current			Y				
Canada Warbler	Moist Forest	dense understory, ground moss, moist, upturned roots	Increase 50%	Y	Y	Y	Y	Y		
Chimney Swift	Mature to Old-growth Forest	old poplar stands	Increase 100%	Y	Y					
Eastern Whip-poor-will	Open Forest	proximity to open areas, well-developed leaf litter without a lot of herbaceous cover	Assess/Maintain	Y	Y					
Eastern Wood-Pewee	Middle-aged to Mature Forest	intermediate to mature	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		
Purple Finch	Moist Forest	immature stands	Maintain current					Y		
Ruffed Grouse	Second-growth and Mature Forest	coarse woody debris	Increase 50%				Y			
Veery	Second-growth Forest	dense understory, moist	Maintain current				Y			

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (NS Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

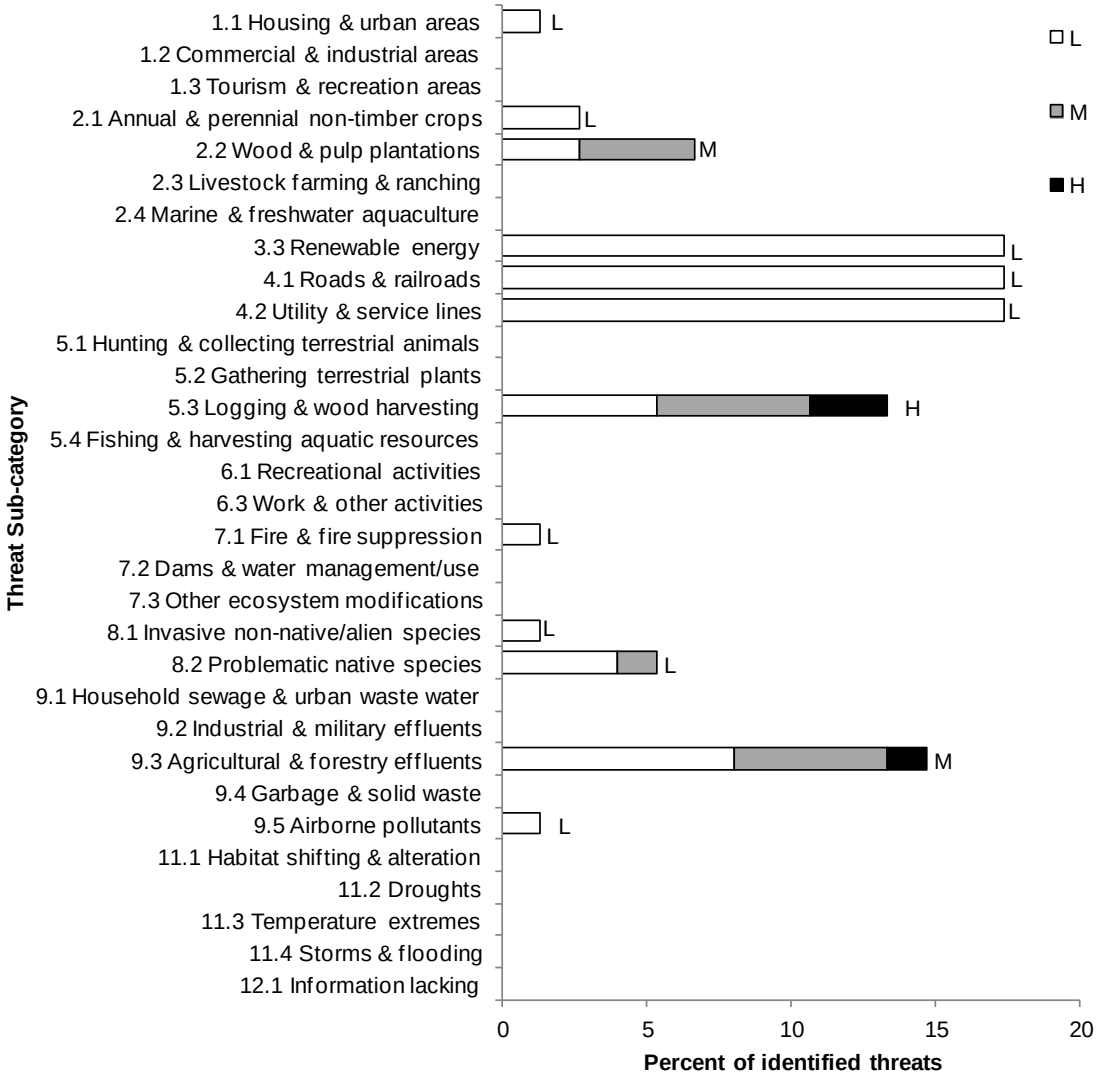

Figure 22. Percent of identified threats to priority bird species in deciduous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in deciduous habitat (for example, if 100 threats were identified in total for all priority 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in deciduous habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 bird species affected in deciduous habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Fragmentation or loss of a deciduous forest due to its conversion to managed forest	2.2 Wood & pulp plantations	Maintain/ restore deciduous 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: Ruffed Grouse, Black-billed Cuckoo, Mourning Warbler
				Maintain sufficient patch sizes, configuration, and connectivity of deciduous forests 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 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 maintain or improve bird habitat	Identify, establish, or expand protected areas of existing old-growth/late-successional forest habitats.	1.1 Site/area protection	High: Chimney Swift, Blackburnian Warbler Medium: Canada Warbler, Purple Finch, Black-and-white Warbler,
				Maintain sufficient patch sizes, configuration, and connectivity of deciduous forests 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	2.1 Site/area management	

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 8 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
				for priority species.		Black-billed Cuckoo
				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 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	
Increased predation due to an increasing populations of predators (foxes, gulls and raccoons) as a results of land use practices	8.2 Problematic native species	Reduce predation by foxes and raccoons	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. raccoons, foxes, gulls).	2.2 Invasive/problematic species control	Medium: Eastern Whip-poor-will
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	High: Black-billed Cuckoo Medium: Blackburnian Warbler, Eastern Whip-poor-will, Chimney Swift, Eastern Wood-Pewee
				Promote pesticide-free products.	6.2 Substitution	

Mixed Wood

Mixed wood forests, defined as a mixture of deciduous and coniferous trees where neither tree type is dominant (make up >75% of the total tree basal area; Frisk 2011), occur throughout BCR 14 NS (Fig. 23). Mixed wood forests are fairly common, with 10 122 km^2 (nearly 20%) of BCR 14 NS classified as mixed wood habitat (Dettmers 2006). Dominant canopy species include red spruce (*Picea rubens*), sugar maple (*Acer saccharum*) and yellow birch (*Betula alleghaniensis*). Other common canopy associates include white pine (*Pinus strobus*) and balsam fir (*Abies balsamea*).

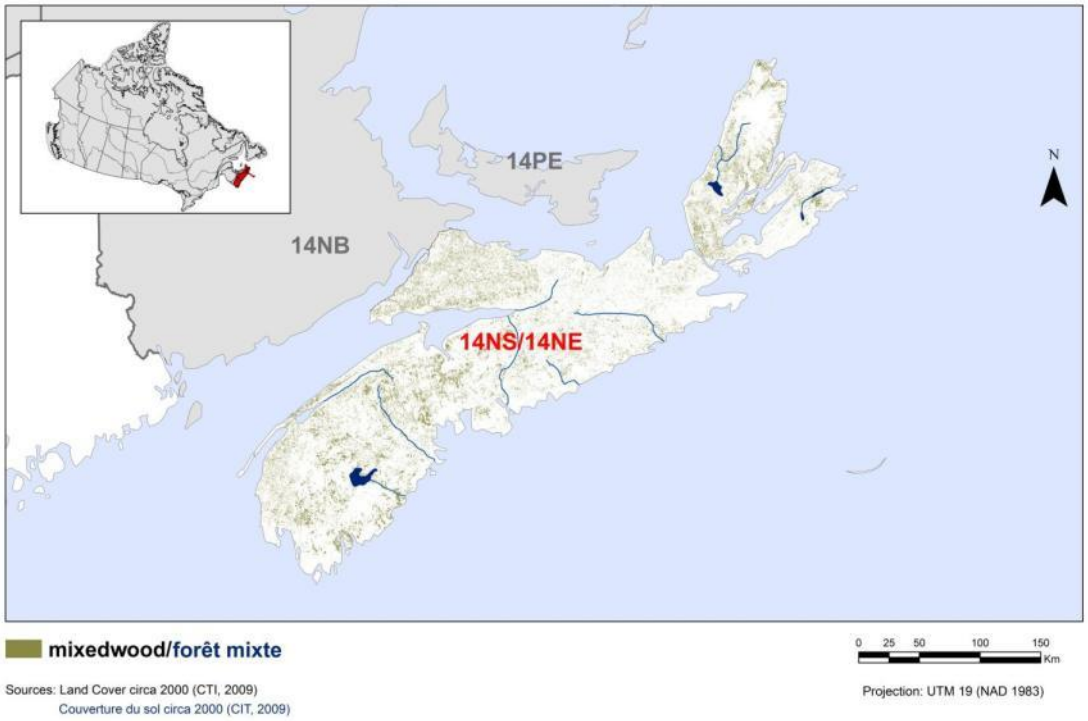

Figure 23. Map of mixed wood habitat in BCR 14 NS.

There are 22 priority bird species in the mixed wood forests in BCR 14 NS; all are landbirds, and 6 of these are species at risk (Table 9). The American Woodcock is the only priority species in the mixed wood forests that is not found in either coniferous or deciduous forests, though it is found in shrub habitat. All other priority species are also found in deciduous (5 priority species) or coniferous forests (8 priority species) or are found in all 3 forest types (8 priority species; Tables 5, 7 and 9). Within mixed wood forests, 10 priority bird species are found in mature or old-growth forests and 10 priority bird species are found in second-growth forests. Additional Habitat sub-class where priority bird species are found include open forest (2 priority species) and moist forest (4 priority species).

The highest ranked threat to priority bird species found in the mixed wood forests of BCR 14 NS was the alteration of forest composition and structure through timber harvest (5.3 Logging &wood harvesting; Fig. 24). Forests are additionally being fragmented as a result of road and right-of-way construction (4.1 Roads & railroads and 4.2 Utility & service lines) and the development of wind farms (3.3 Renewable energy; Fig. 24). The conversion of naturally diverse mixed wood forest into replanted and managed coniferous forest (2.2 Wood & pulp plantations) is a medium-ranked threat for four priority bird species: Bay-breasted Warbler, Ruffed Grouse, Black-billed Cuckoo and Mourning Warbler (Table 10). In addition, priority bird species in mixed wood forests are threatened by contamination from pesticide and herbicide used by the forestry industry (9.3 Agricultural & forestry effluents; Fig. 24).

Many bird species will benefit from the conservation objectives and actions presented in Table 10. Recommended actions to address medium- and high-ranked threats include the promotion of the integration of bird conservation needs into forest management practices by protecting areas of existing old-growth and late-successional 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 bird species that use mixed wood habitat in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP EHJV[6]	Review[7]
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 50%				Y			
Black-and-white Warbler	Moist Forest	young, immature	Maintain current					Y		
Black-billed Cuckoo	Second-growth Forest	shrubs	Assess/Maintain		Y		Y			
Blackburnian Warbler	Mature to Old-growth Forest	mature	Maintain current			Y				
Black-throated Green Warbler	Middle-aged to Mature Forest	interior, middle/mature forest	Maintain current			Y		Y		
Blue-headed Vireo	Middle-aged to Mature Forest	mid/mature coniferous/mixed forest with >75% closed canopy; some understory (not dense) of shrubs and saplings	Maintain current			Y				
Canada Warbler	Moist Forest	dense understory, ground moss, moist, upturned roots	Increase 50%	Y	Y	Y	Y	Y		
Chimney Swift	Mature to Old-growth Forest	snags/hollow trees	Increase 100%	Y	Y					
Common Nighthawk	Open Forest	mature forest and older	Increase 100%	Y						

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (NS Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 9 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP EHJV[6]	Review[7]
Eastern Whip-poor-will	Open Forest	proximity to open areas, well-developed leaf litter without a lot of herbaceous cover	Assess/Maintain	Y	Y					
Eastern Wood-Pewee	Middle-aged to Mature Forest	intermediate to mature	Increase 50%				Y			
Evening Grosbeak	Second-growth and Mature Forest	mid/mature open canopy, nesting in bigger trees	Maintain current					Y		
Magnolia Warbler	Second-growth Forest	young, regenerating, generally balsam fir	Maintain current			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	Assess/Maintain	Y	Y		Y			
Purple Finch	Moist Forest	immature stands	Maintain current					Y		
Ruffed Grouse	Second-growth and Mature Forest	coarse woody debris	Increase 50%				Y			
Rusty Blackbird	Moist Forest		Increase 100%	Y			Y			
Veery	Second-growth Forest	dense understory, moist	Maintain current				Y			

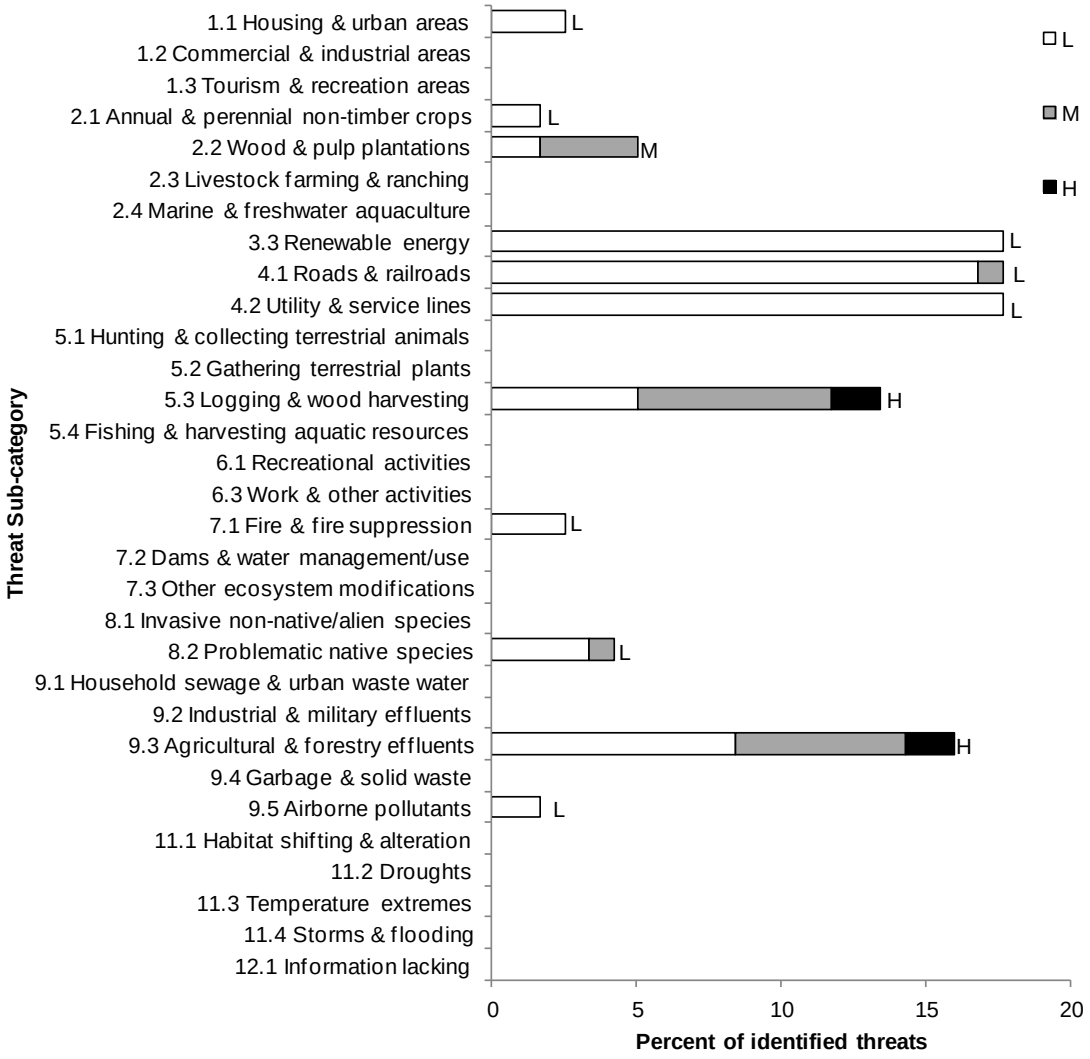

Figure 24. Percent of identified threats to priority bird species in mixed wood habitat in each threat sub-category.

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 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in mixed wood habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 10. Threats addressed, conservation objectives, recommended actions and priority bird species affected in mixed wood habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
Fragmentation or loss of a mixed wood forest due to its conversion to managed forest	2.2 Wood & pulp plantations	Maintain/restore mixed 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, Ruffed Grouse, Black-billed Cuckoo, Mourning Warbler
				Maintain sufficient patch sizes, configuration, and connectivity of mixed 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	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				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	
Fragmentation or loss of mixed wood forest 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
				Maintain sufficient patch sizes, configuration, and connectivity of mixed 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 beneficial management practices to limit habitat fragmentation from development (e.g. power lines, road construction).	5.3 Private sector standards and codes	

† Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 10 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
				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 mixed 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	High: Chimney Swift, Blackburnian Warbler Medium: Bay-breasted Warbler, Black-throated Green Warbler, Blue-headed Vireo, Black-and-white Warbler, Canada Warbler, Purple Finch, Evening Grosbeak, Black-billed Cuckoo
				Maintain sufficient patch sizes, configuration, and connectivity of mixed 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	
				Manage post-logging sites for tree species, age and structural diversity.	2.3 Habitat and natural process restoration	
				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	
Increased predation due to an increasing populations of predators (foxes, gulls and raccoons) as a results of land use practices	8.2 Problematic native species	Reduce predation by foxes and raccoons	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. raccoons, foxes, gulls).	2.2 Invasive/ problematic species control	Medium: Eastern Whip-poor-will
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	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	High: Bay-breasted Warbler, Black-billed Cuckoo Medium: Blackburnian Warbler,Black-throated Green Warbler, Eastern
				Promote pesticide-free products.	6.2 Substitution	

Table 10 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
		industry				Whip-poor-will, Chimney Swift, Common Nighthawk, Eastern Wood-Pewee, Olive-sided Flycatcher

Shrub/Early Successional

Shrub/early successional habitats are generally transient, occurring where disturbances have removed the tree cover and are fairly common in Nova Scotia (Fig. 25), covering 846 km^2 (or 7% of BCR 14 NS; Dettmers 2006). Shrub and early successional 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).*

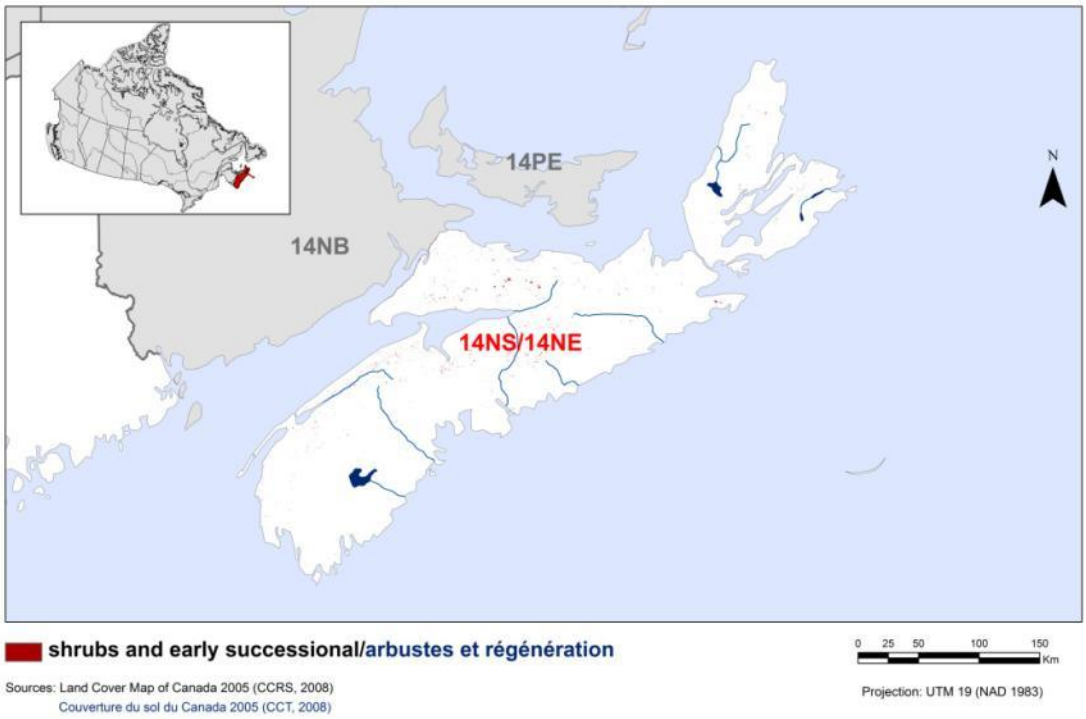

Figure 25. Map of shrubs and early successional habitat in BCR 14 NS.

Eleven priority bird species, 10 landbirds and 1 shorebird, use shrub/early successional habitats in BCR 14 NS. Of these, 2 are species at risk (Table 11). Within this habitat, 8 priority bird species are found in shrubs (either densely, scattered or non-specific) and 3 in non-specific early successional habitats (Table 11).

Shrub and early successional habitat is lost as succession continues and young forests mature. While new patches of early successional habitat are created by timber harvest, they are typically managed for accelerated conifer regrowth, which may reduce the suitability of habitat patches (Betts et al. 2012). Shrub/early successional habitat is also maintained in agricultural areas. However, the changes in land tenure and agricultural practices in Nova Scotia (Statistics Canada 2001) have led to the reversion of shrublands to natural forested states.

The most frequently identified threats to priority birds using shrub and early successional habitats were the loss of old or abandoned fields when they return to forest, the reforestation

of agricultural land (7.3 Other ecosystem modifications) and 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. 26). All identified threats to priority bird species in shrub and early successional habitat were ranked low, therefore specific conservation actions are not presented in this document.

Table 11. Priority bird species that use shrub and/or early successional habitats in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Redstart	Dense Shrub	high shrubs	Maintain current					Y		
American Woodcock	Non-specific Early Successional	high shrub, alder swales	Increase 50%		Y					
Black-billed Cuckoo	Non-specific Shrub	shrubs in old fields	Assess/Maintain		Y		Y			
Eastern Kingbird	Scattered Shrub		Increase 100%				Y			
Gray Catbird	Non-specific Shrub		Increase 100%							Y
Magnolia Warbler	Non-specific Shrub		Maintain current			Y				
Mourning Warbler	Non-specific Early Successional	young, clearcuts, pushups (where clearcut rubble is pushed in piles on edge of cut)	Maintain current					Y		
Short-eared Owl	Scattered Shrub	abundant prey	Increase 50%	Y						
Veery	Dense Shrub	dense understory, moist, alder swamp	Maintain current				Y			
White-throated Sparrow	Non-specific Shrub	any forest type with slash or shrubs	Maintain current			Y				

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

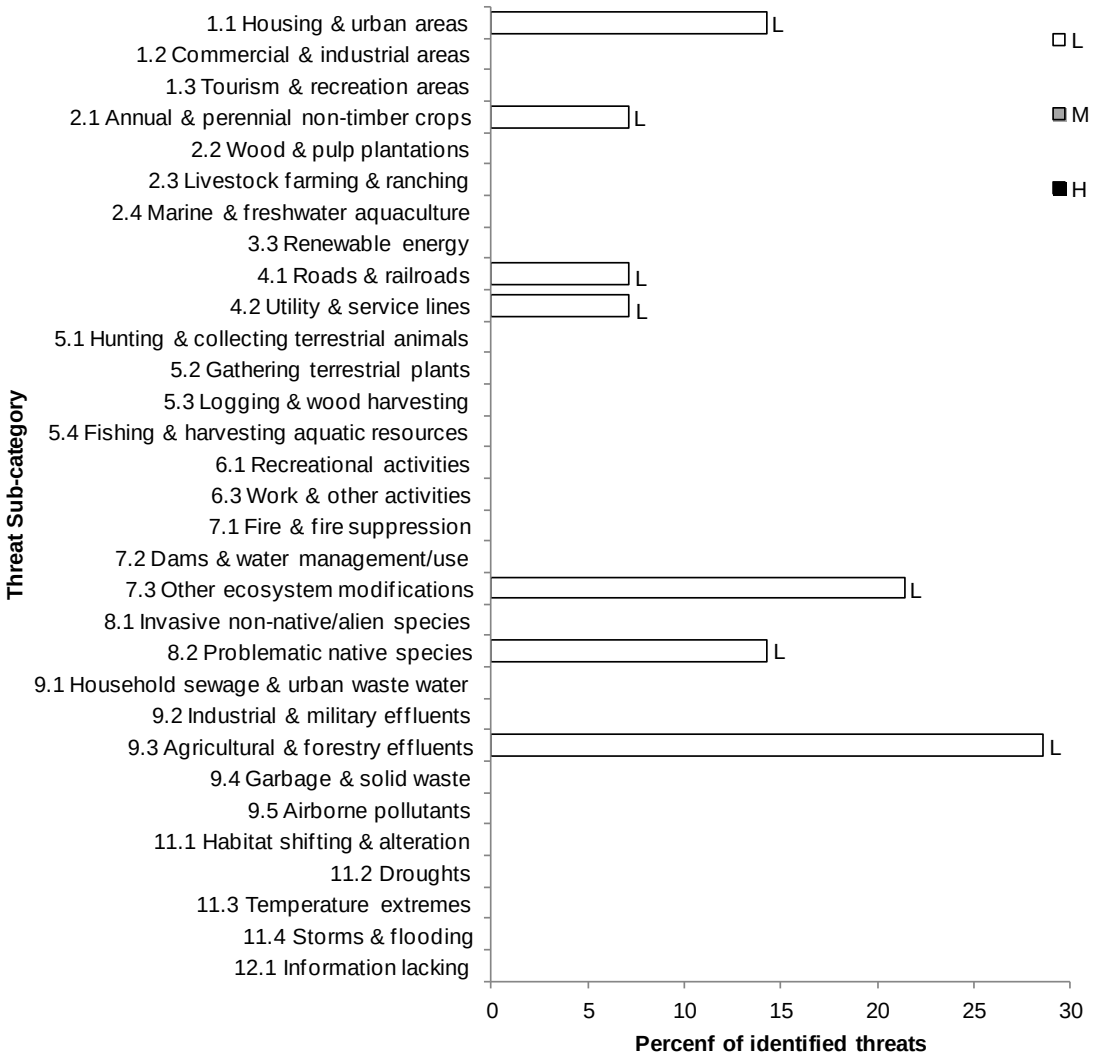

Figure 26. Percent of identified threats to priority bird species in shrub/early successional habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in shrub/early successional habitat (for example, if 100 threats were identified in total for all priority species in shrub/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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in shrub/early successional habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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.

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). In Nova Scotia, 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. Herbaceous plant communities can also be found in disturbed areas as early successional or pioneer species or in traditional pasturelands (Fig. 27).

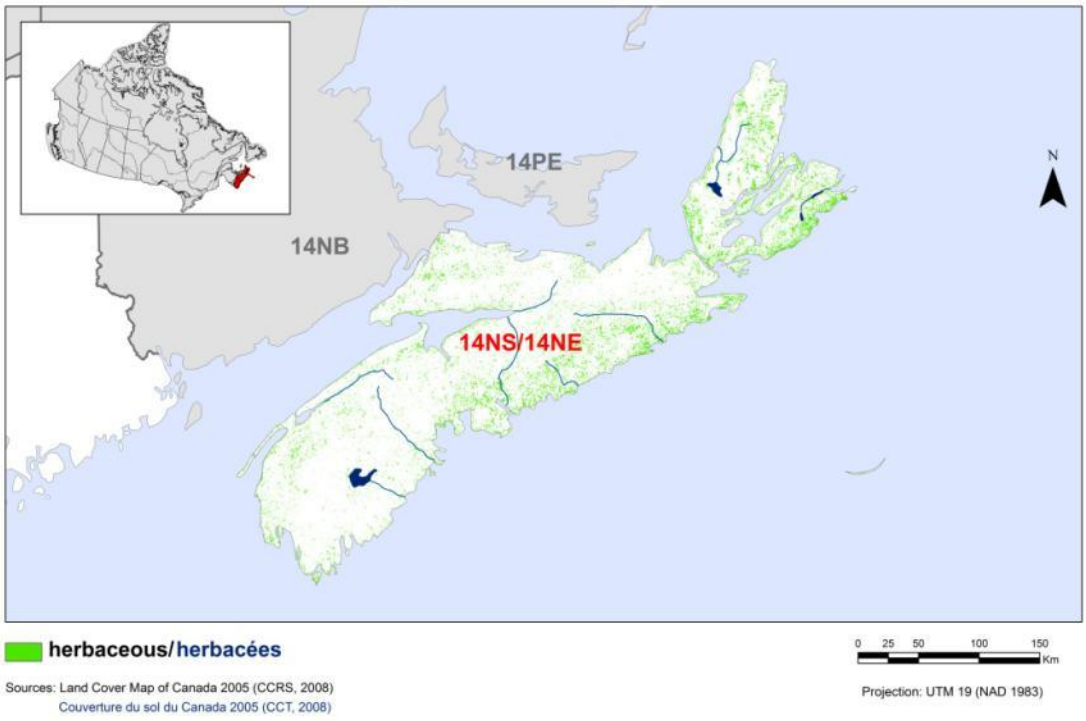

Figure 27. Map of herbaceous habitat in BCR 14 NS.

While there are no estimates of total natural herbaceous area in BCR 14 NS, the Census of Agriculture indicates that 611 km^2 (1.1%) of the province was used as pastureland in 1996 (Statistics Canada 2008).

Grassland associated birds are exhibiting major continent-wide declines (North American Bird Conservation Initiative, U.S. Committee 2009; North American Bird Conservation Initiative 2012). Of the eight priority bird species that have been identified as using herbaceous habitats in BCR 14 NS, four (all landbirds) are species at risk (Table 12).

The highest ranked threat (assessed to be medium) to priority bird species in natural herbaceous habitats is habitat loss due to urban development (1.1 Housing & urban areas; Fig. 28). In addition, because herbaceous habitat is often present in exposed environments

with high wind velocities (e.g. the coast), herbaceous areas are threatened by wind power developments (3.3 Renewable energy; Fig. 28). While wind power development was the most frequently identified threat, the footprint of wind farms is generally relatively small and the impact is most profound in relatively scarce or rare habitat types (see section on Wind Turbines for more details). The threat was therefore ranked low for priority bird species in this habitat type (Fig. 28).

Many bird species will benefit from the conservation objectives and actions presented in Table 13. Recommended conservation actions to address the loss of herbaceous habitat to urban development include securing and managing grassland habitat through a variety of methods, including the re-creation of grassland-like habitats and providing incentives to landowners to maintain grasslands.

Table 12. Priority bird species that use herbaceous habitat in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Bittern	Natural Herbaceous	grasses on the edges of wetlands	Increase 50%		Y		Y			
American Golden-Plover	Natural Herbaceous	Variety of coastal and inland habitats	Assess/Maintain		Y					
Bobolink	Natural Herbaceous	large fields, high grasses	Increase 100%	Y	Y		Y			
Common Nighthawk	Natural Herbaceous	bare areas	Increase 100%	Y						
Eastern Kingbird	Natural Herbaceous		Increase 100%				Y			
Savannah Sparrow (princeps)	Natural Herbaceous	heath-dominated terrain, Marram grass-beach pea dunes	Assess/Maintain	Y	Y	Y		Y		
Short-eared Owl	Natural Herbaceous	abundant prey	Increase 50%	Y						
Tree Swallow	Natural Herbaceous	cavities within 1.5 km of water or open areas for foraging	Maintain current					Y		

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

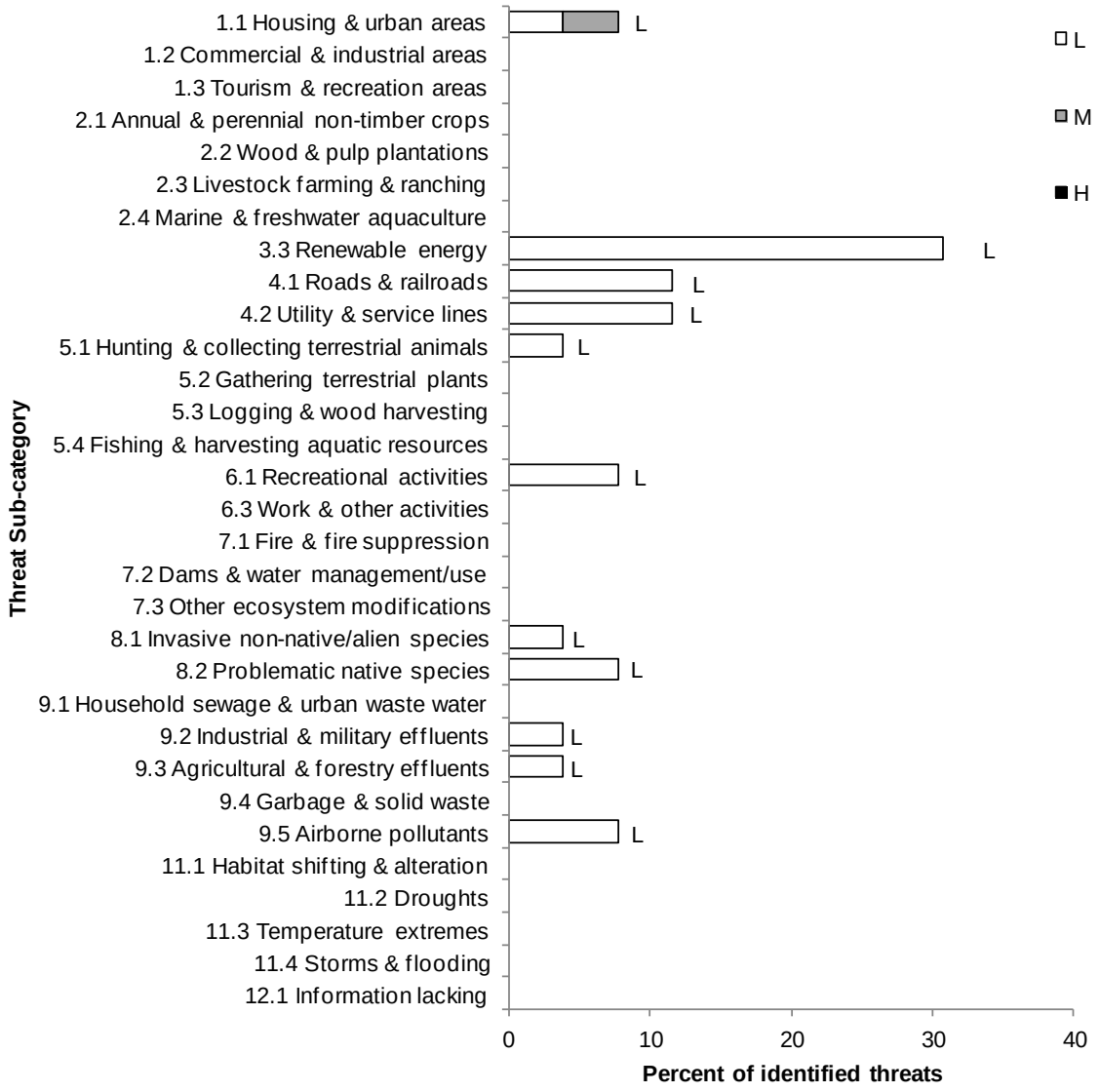

Figure 28. Percent of identified threats to priority bird species in herbaceous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in herbaceous habitat (for example, if 100 threats were identified in total for all priority 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in herbaceous habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 13. Threat addressed, conservation objectives, recommended actions and priority bird species in herbaceous habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Fragmentation or loss of herbaceous habitat to urban development	1.1 Housing & urban areas	Maintain/restore natural grasslands	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Recreate grassland-like habitats through specific site management.	2.3 Habitat and natural process restoration	Medium: American Bittern
				Secure and manage grassland 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	
				Provide incentives for landowners to protect and manage grassland habitat.	6.4 Conservation payments	

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Cultivated and Managed Areas

Cultivated and managed areas include agricultural areas and urban vegetation (or parklands). While 29% of the landmass of the province of Nova Scotia is appropriate for agriculture, only 4.3% (2 300 km^2) is actually cultivated (Fig. 29; Statistics Canada 2008).

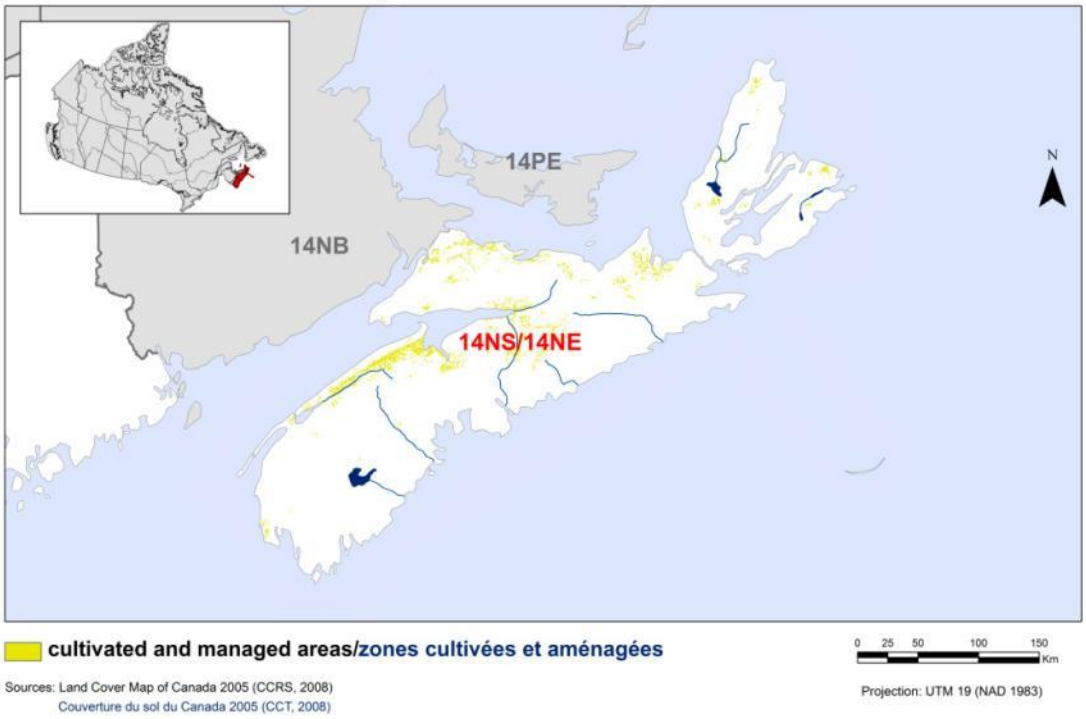

Figure 29. Map of cultivated and managed areas in BCR 14 NS.

Of the cultivated area, 174 km^2 are dykelands, created from former salt marshes. These are some of the most productive agricultural lands in the province. A further 165 km^2 are estimated to be in wild blueberry production (Nova Scotia Agricultural Land Review Committee 2010). The Atlas of Canada (Natural Resources Canada 1996) shows that in 1996, 28.6 % of agricultural land in Nova Scotia was used for crops, 0.1% was fallow and 15.6% was used for pasture. In 2006, fruit farming, beef cattle farming and nursery/tree production accounted for 23%, 19% and 11% of farms, respectively (Nova Scotia Agricultural Land Review Committee 2010). Nova Scotia's supply managed sectors (dairy, poultry and eggs) together accounted for close to half of all production in the province. Some industries have shown growth in recent years, for example the fur industry, which accounted for $64 million of the total farm cash receipts. Other industries, such as the hog sector, have experienced declines (Nova Scotia Agricultural Land Review Committee 2010). Land that is suitable for agricultural production is concentrated in the Annapolis Valley, throughout most of Hants County, and along the Northumberland Strait. There are also significant concentrations of agricultural areas in Digby and Yarmouth counties, in southern Inverness and around the Cape Breton Regional Municipality (Fig. 29).

Cultivated and managed areas, particularly those near water, are important in terms of biodiversity, and are used by a broad diversity of species. Of the 21 priority bird species that use cultivated and managed areas in BCR 14 NS, 4 are waterfowl, 1 is a waterbird, 5 are shorebirds and the remaining 11 are landbirds (Table 14).

The highest ranked threats for priority bird species in cultivated and managed areas were related to agricultural practices including mowing hayfields during the breeding season and the loss of pasture lands to cropland (2.1 Annual & perennial crops; Fig. 30). The most frequently identified threat to priority bird species in cultivated and managed areas was the contamination of food sources or direct mortality of priority birds due to chemicals used by the agriculture industry (9.3 Agricultural & forestry effluents; Fig. 30). Overall, this threat was ranked medium in this habitat. Agricultural lands in BCR 14 NS are in decline and therefore are also threatened by urban development (1.1 Housing and urban areas; Fig. 30); this threat was ranked medium for the Nelson's Sparrow and Short-eared Owl (Table 15). Only about one-third of active farmland in 1901 was still active in 2006 (Nova Scotia Agricultural Land Review Committee 2010).

Many bird species will benefit from the conservation objectives and actions presented in Table 15. Recommended conservation actions for this habitat address medium- and high-ranked threats and include increasing awareness of and providing information to farmers on how to mitigate the effects of their practices on grassland birds and encouraging bird-friendly agricultural practices through economic and other incentives. 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 14. Priority bird species that use cultivated and managed areas in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Agriculture	proximity to water	Maintain current						Y	
American Golden-Plover	Agriculture; Urban Vegetation	open areas such as golf courses, airports	Assess/Maintain		Y					
American Redstart	Agriculture	abundant shrubs and saplings	Maintain current					Y		
Barn Swallow	Agriculture; Urban Vegetation	structure with horizontal surface and shelter for nesting, nearby source of mud for nest construction	Increase 100%	Y						Y
Bobolink	Agriculture	large fields, high grasses	Increase 100%	Y	Y		Y			
Canada Goose (North Atlantic)	Agriculture		Maintain current						Y	
Canada Goose (Temperate-breeding in Eastern Canada)	Agriculture; Urban Vegetation	parks, lawns, golf courses	Decrease						Y	
Common Nighthawk	Agriculture		Increase 100%	Y						
Eastern Kingbird	Agriculture		Increase 100%				Y			
Gray Catbird	Urban Vegetation		Increase 100%							Y
Killdeer	Agriculture		Maintain current		Y					
Mallard	Agriculture	proximity to water	Maintain current						Y	
Nelson's Sparrow	Agriculture	dykeland drainage ditches	Assess/Maintain		Y		Y	Y		
Rusty Blackbird	Agriculture		Increase 100%	Y			Y			

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 14 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Short-eared Owl	Agriculture	dykeland, abundant prey	Increase 50%	Y						
Sora	Agriculture	uplands near marshes, pastures	Maintain current		Y					
Spotted Sandpiper	Agriculture	near open shoreline for foraging, displaying, etc., and denser habitat for brood cover	Increase 100%		Y					
Tree Swallow	Agriculture; Urban Vegetation	cavities or nest boxes within 1.5 km of water or open areas for foraging	Maintain current					Y		
Whimbrel	Agriculture		Assess/Maintain		Y					
White-throated Sparrow	Urban Vegetation		Maintain current			Y				
Wilson's Snipe	Agriculture	organic soil, wet, open water nearby	Increase 100%		Y					

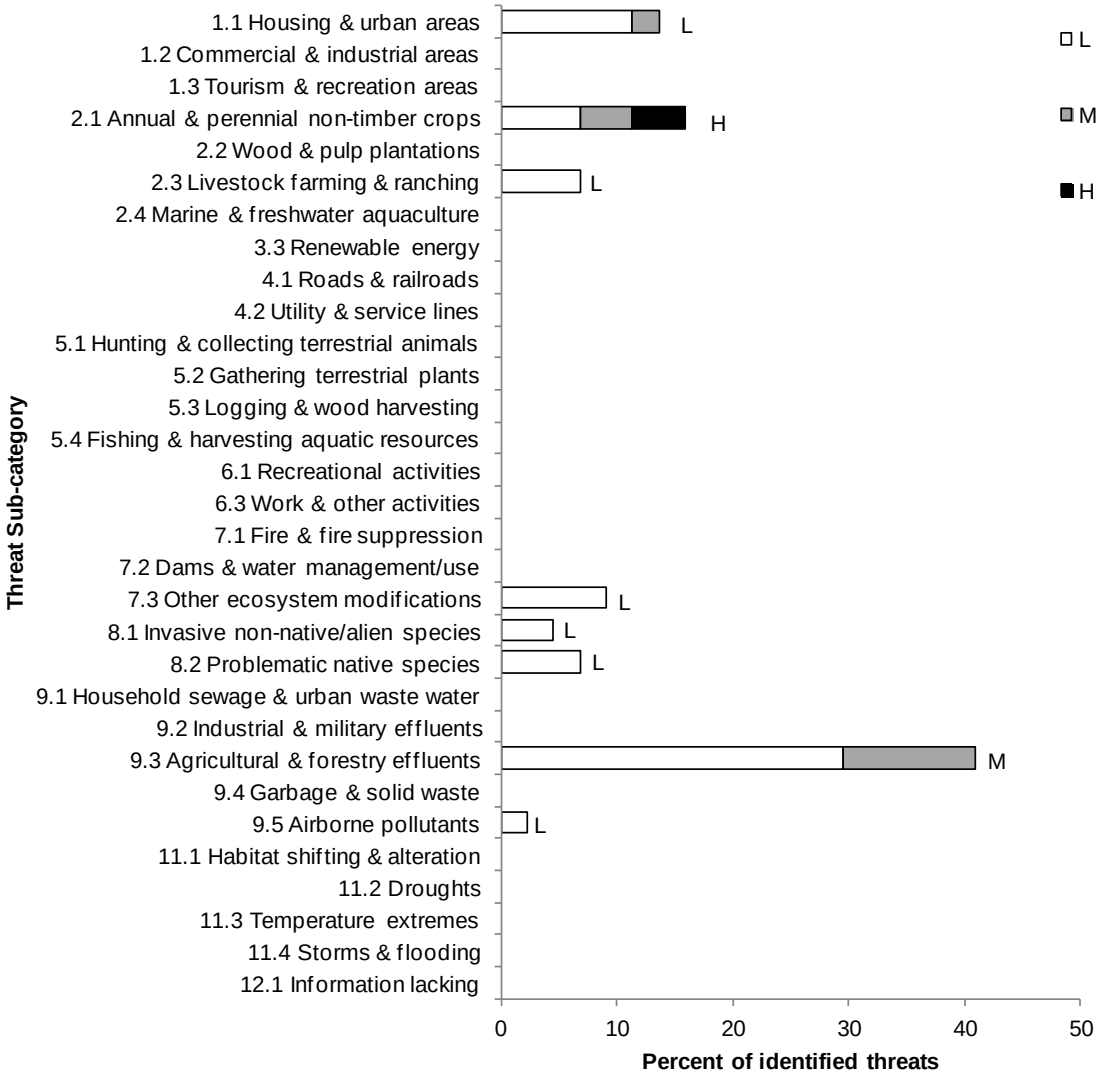

Figure 30. Percent of identified threats to priority bird species in cultivated and managed areas in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in cultivated and managed areas (for example, if 100 threats were identified in total for all priority species in cultivated and managed areas, 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in cultivated and managed areas is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 15. Threats addressed, conservation objectives, recommended actions and priority bird species affected in cultivated and managed areas in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Fragmentation or loss of managed grasslands to urban development	1.1 Housing & urban areas	Maintain/restore managed grassland habitat	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage grassland 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: Nelson's Sparrow
				Provide incentives for landowners to protect and manage grassland habitat.	6.4 Conservation payments	
				Include guidelines for the protection of priority species in beneficial management practices for municipalities and industry.	5.3 Private sector standards and codes	
Destruction of nests due to 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	
Loss of pasture lands 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 and manage grassland habitat.	6.4 Conservation payments	
Decrease of diet quality and of health of birds due to the consumption of	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	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, Tree 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 in this habitat are of low magnitude.

Table 15 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
contaminated food by biocides such as pesticide, herbicide, or fungicide		used by the agriculture industry		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: Common Nighthawk, Barn Swallow, Eastern Kingbird
				Promote pesticide-free products.	6.2 Substitution	

Urban (Artificial Surfaces and Bare Areas)

Urban habitat consists of areas where developments such as buildings, roads, parking lots and other impervious surfaces dominate (FAO 2000). In BCR 14 NS, there are approximately 2 022 km^2 of urban habitat, which accounts for 2.6% of the planning unit area (Dettmers 2006; Fig. 31). Major urban centres include the provincial capital of Halifax Regional Municipality (population of 372 679) and the Cape Breton Regional Municipality (population of 105 968; Statistics Canada 2010a).

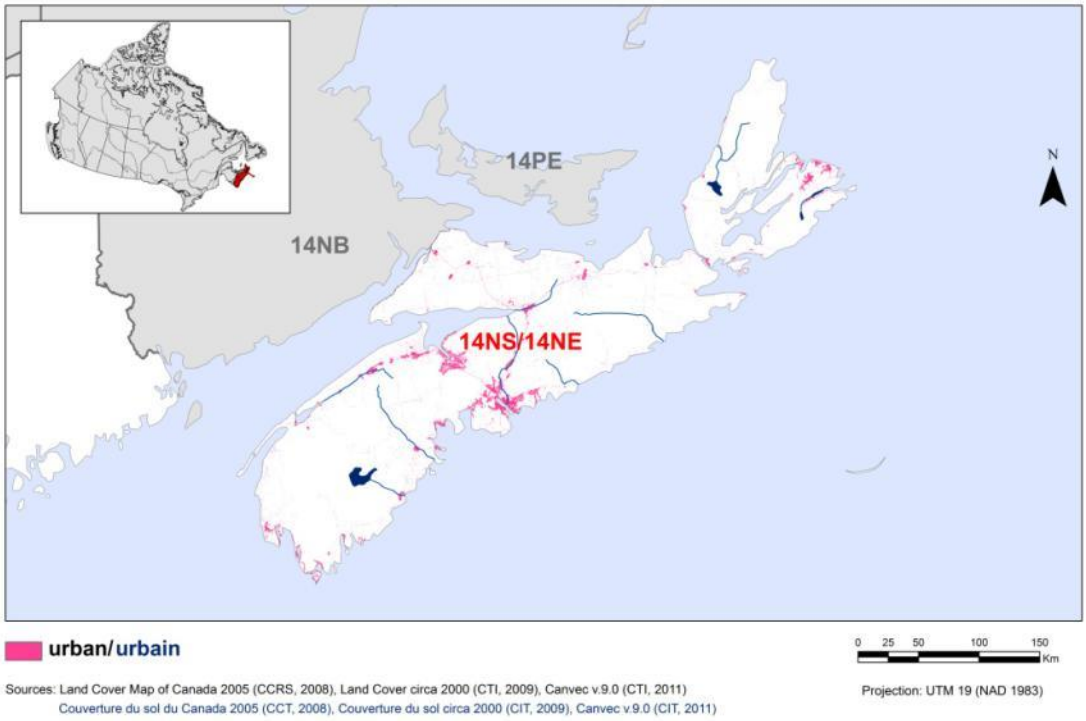

Figure 31. Map of urban areas in BCR 14 NS.

Six priority bird species are found in urban habitat in BCR 14 NS, five of which are landbirds, and one is a shorebird. Three out of the six are species at risk (Table 16).

Within urban habitats, the highest ranked and most often identified threats are loss of nesting sites on commercial or industrial structures and to a lesser extent on private dwellings (1.2 Commercial & industrial areas and 1.1 Housing & urban areas, respectively). Disturbance at nest sites due to building and bridge maintenance activities (6.3 Work & other activities) has also been identified as a threat for several priority species, though the threat was ranked low overall (Fig. 32). Decreasing prey availability to birds due to the chemical or heavy metal contamination (9.2 Industrial & military effluents; Fig. 32) was a medium-ranked threat for Chimney Swifts and Bank Swallows (Table 17).

Many bird species will benefit from the conservation objectives and actions presented in Table 17. The conservation actions recommended to address high- or medium-ranked threats in

urban habitat include raising awareness of the importance of old chimneys as nesting habitat for Chimney Swifts and encouraging stewardship organizations to promote the use of appropriate habitat management guidelines by private landowners and developers. It is also important to develop and implement beneficial management practices for bridge maintenance and building renovations and to maintain or restore gravel rooftops to benefit priority bird species such as the Common Nighthawk.

Table 16. Priority bird species in urban habitats in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Bank Swallow	Mines and Quarries	cut banks/cliffs with soft sandy soil	Increase 100%							Y
Barn Swallow	Buildings and Bridges	open habitats for foraging, nearby source of mud for nest construction	Increase 100%	Y						Y
Chimney Swift	Chimneys	chimneys or other vertical structures	Increase 100%	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	Maintain current		Y					
Peregrine Falcon (*anatum/tundrius*)	Buildings and Bridges		Assess/Maintain	Y						

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
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[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

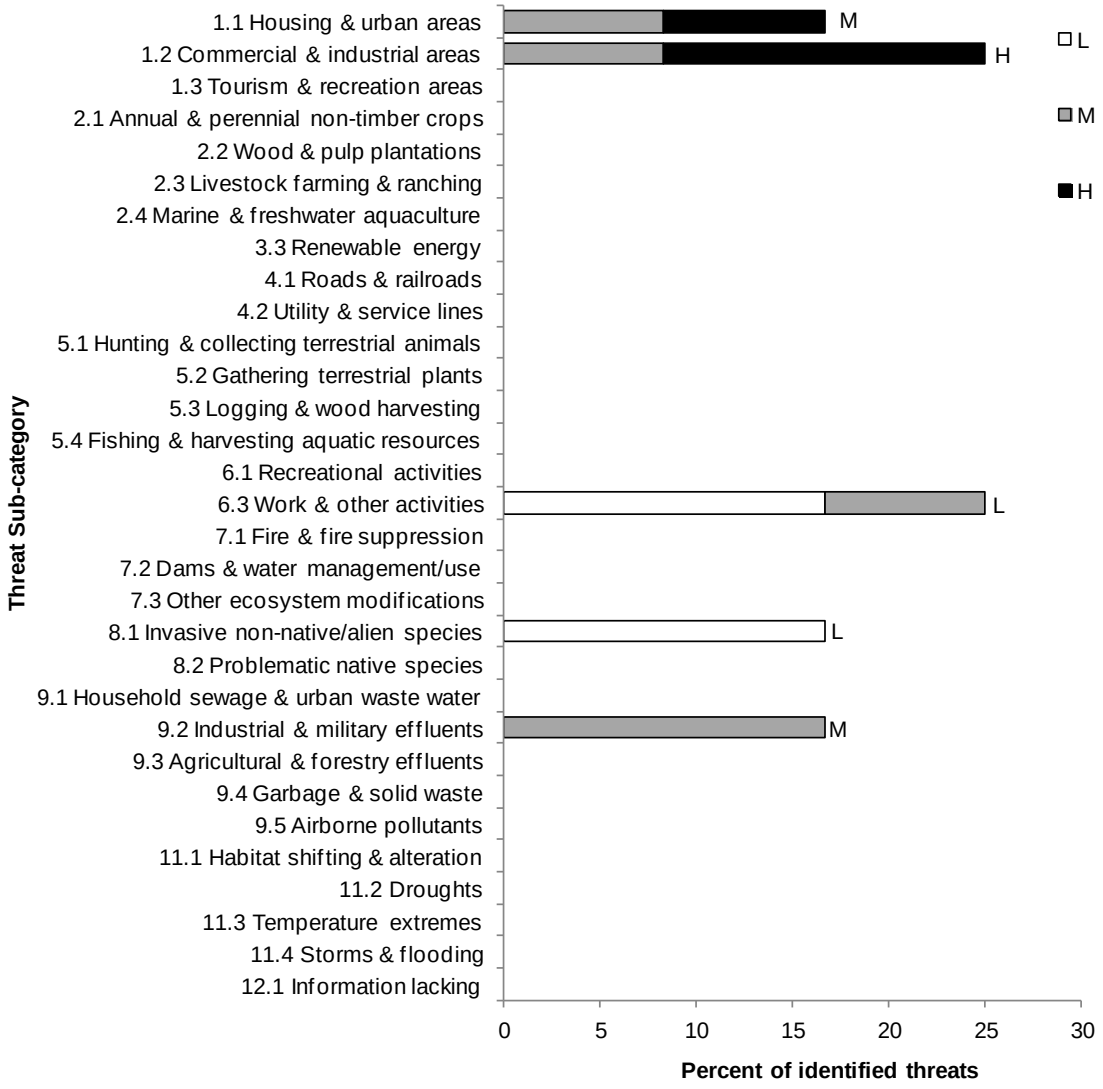

Figure 32. Percent of identified threats to priority bird species in urban habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in urban habitat (for example, if 100 threats were identified in total for all priority species in urban 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in urban habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 17. Threats addressed, conservation objectives, recommended actions and priority bird species affected in urban habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Loss of gravel roofs on private, industrial or commercial buildings as nesting sites	1.1 Housing & urban 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.	5.3 Private sector standards and codes	Medium: Common Nighthawk
	1.2 Commercial & industrial areas			Educate groups working on urban revitalization and urban wildlife about the issue of the nighthawk decline, and encourage changes in roof construction where feasible.	4.3 Awareness and communications	
Loss of old chimneys on private, industrial or commercial buildings as nesting sites	1.1 Housing & urban areas	Maintain/restore old chimneys	1.4 Maintain important habitat features on the landscape	Raise awareness of the importance of old chimneys as nesting habitat for Chimney Swift.	4.3 Awareness and communications	High: Chimney Swift
	1.2 Commercial & industrial areas			Encourage stewardship organizations to promote the use of appropriate habitat management guidelines by private landowners and developers.	7.2 Alliance and partnership development	
Loss of old wooden barns and covered bridges as nesting sites	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.	5.3 Private sector standards and codes	High: Barn Swallow
				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.	3.2 Species recovery	
				Raise awareness of the importance of old buildings to Barn Swallows and the value of Barn Swallows in the ecosystem.	4.3 Awareness and communications	
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 in this habitat are of low magnitude.

Table 17 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
Decrease of prey availability to birds due to the chemical or heavy metal contamination	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: Chimney Swift, 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 surface, but <2 m of water; Fig. 33). Over 7% (3 933 km^2) of Nova Scotia's land base is classified as wetlands (Dettmers 2006). Of these, 2 495 km^2 are freshwater emergent marshes, 1 278 km^2 are freshwater forested wetlands and 160 km^2 are saltmarshes (Nova Scotia Government 2000).

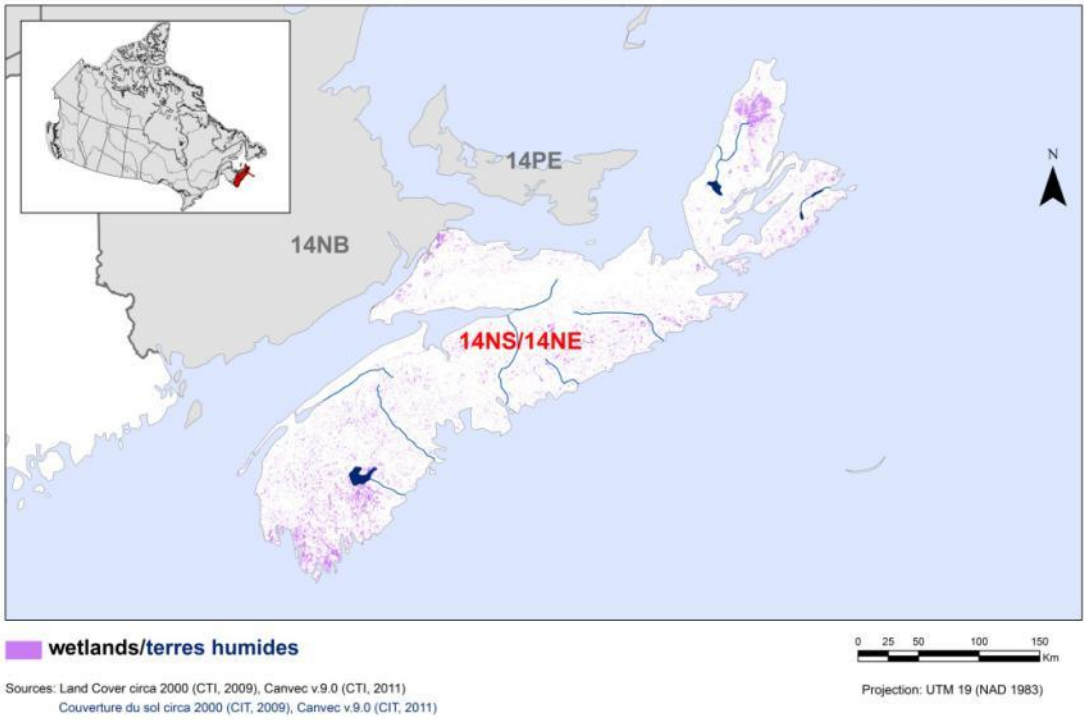

Figure 33. Map of wetlands in BCR 14 NS.

Of the 69 priority bird species in BCR 14 NS, 28 species (41%) use wetland habitats (Table 18). Of these, 6 are waterfowl, 4 are waterbirds, 4 are shorebirds and the remaining 13 are landbirds. Seven of the priority birds in wetland habitat are species at risk. Seven priority species use non-specific freshwater wetlands while the others use bogs (7 species), swamps (5 species) or marshes (12 species), though many not exclusively (Table 18).

Species found in wetland habitats face a wide variety of threats (Fig. 34). Since 1800, an estimated 200 000 km^2, almost 15% of Canada's total wetland base, have been drained or lost to other functions, and in the Maritimes, 65% of coastal salt marshes have been converted to non-wetland functions (North American Wetlands Conservation Council, n.d.). Furthermore, estimates for Nova Scotia indicate that 80% of the saltmarshes along the Bay of Fundy and 65% of saltmarshes province-wide have been lost mainly to dyking and agriculture (Nova Scotia Government 2011a). Losses of freshwater wetlands are more difficult to assess due to inadequate data for a province-wide estimate. However, they are believed to be high in the province's more fertile regions like the Annapolis Valley and the Northumberland Strait, along

the floodplains of the Cornwallis, Annapolis and Shubenacadie rivers, as well as near urban centres (Nova Scotia Government 2011a). In addition to net habitat loss from conversion to agriculture or livestock grazing areas (2.1 Annual & perennial non-timber crops; 2.3 Livestock farming & ranching) and habitat loss due to residential developments (1.1 Housing & urban areas), priority bird species in wetlands are also threatened by decreased water quality from pesticides used by the agricultural and industrial sectors (9.2 Industrial & military effluents; 9.3 Agricultural & forestry effluents; Fig. 34). The highest ranked threat was from the loss or fragmentation of wetlands due to logging activities (5.3 Logging & wood harvesting).

Many bird species will benefit from the conservation objectives and actions presented in Table 19. Conservation actions to address medium and high ranked threats in this habitat include developing beneficial management practices that encourage bird-friendly agricultural practices and providing incentives for landowners to protect wetlands. Securing and managing wetlands for priority bird species through various methods such as creating protected areas, acquiring private land, conservation easements, community conservation plans and stewardship agreements and improving linkages between bird habitat needs and forestry practices are also recommended. 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 18. Priority bird species in wetlands in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Bittern	Non-specific Freshwater Wetlands	peat bogs, shrub swamps, marsh and fens with tall emergent vegetation	Increase 50%		Y		Y			
American Black Duck	Non-specific Freshwater Wetlands	freshwater wetlands with a mix of emergent and submergent vegetation	Maintain current						Y	
Barn Swallow	Non-specific Freshwater Wetlands	structure with horizontal surface and shelter for nesting, nearby source of mud for nest construction	Increase 100%	Y						Y
Bobolink	Marsh		Increase 100%	Y	Y		Y			
Canada Goose (North Atlantic)	Marsh	adjacent, accessible upland areas with grasses and forbs	Maintain current						Y	
Canada Goose (Temperate-breeding in Eastern Canada)	Marsh		Decrease						Y	
Canada Warbler	Swamp	dense understory, ground moss, moist, generally hardwood or cedar swamp, upturned roots	Increase 50%	Y	Y	Y	Y	Y		
Chimney Swift	Non-specific Freshwater Wetlands	watersheds with manmade flowages, dead trees with "chimneys"	Increase 100%	Y	Y					
Common Nighthawk	Bog; Marsh	peat bogs	Increase 100%	Y						
Eastern Kingbird	Swamp		Increase 100%				Y			
Gray Jay	Bog	black spruce	Assess/Maintain							Y

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
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[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 18 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Green-winged Teal	Marsh	freshwater wetlands with a mix of emergent and submergent vegetation	Increase 50%						Y	
Killdeer	Marsh		Maintain current		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	Maintain current						Y	
Nelson's Sparrow	Marsh		Assess/Maintain		Y		Y	Y		
Northern Parula	Swamp	forest edges where Usnea and similar lichens are found	Maintain current					Y		
Olive-sided Flycatcher	Bog	open areas (5–10 ha) with perches, nest in spindly softwood trees	Assess/Maintain	Y	Y		Y			
Pied-billed Grebe	Marsh	dense emergent vegetation with open water	Maintain current		Y					
Ring-necked Duck	Marsh	open water (1.5 m depth)	Increase 50%						Y	
Rusty Blackbird	Bog; Fen; Swamp	bog edges, forested wetlands	Increase 100%	Y			Y			
Short-eared Owl	Bog; Marsh	abundant prey	Increase 50%	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	Maintain current		Y					
Spruce Grouse	Bog	forested bogs	Increase 50%							Y
Tree Swallow	Non-specific Freshwater Wetlands	cavities within 1.5 km of water or open areas for foraging	Maintain current					Y		
Virginia Rail	Marsh	shallow water (0–15 cm), emergent cover and substrate	Assess/Maintain		Y					
Wilson's Snipe	Non-specific Freshwater Wetlands	organic soil, wet	Increase 100%		Y					

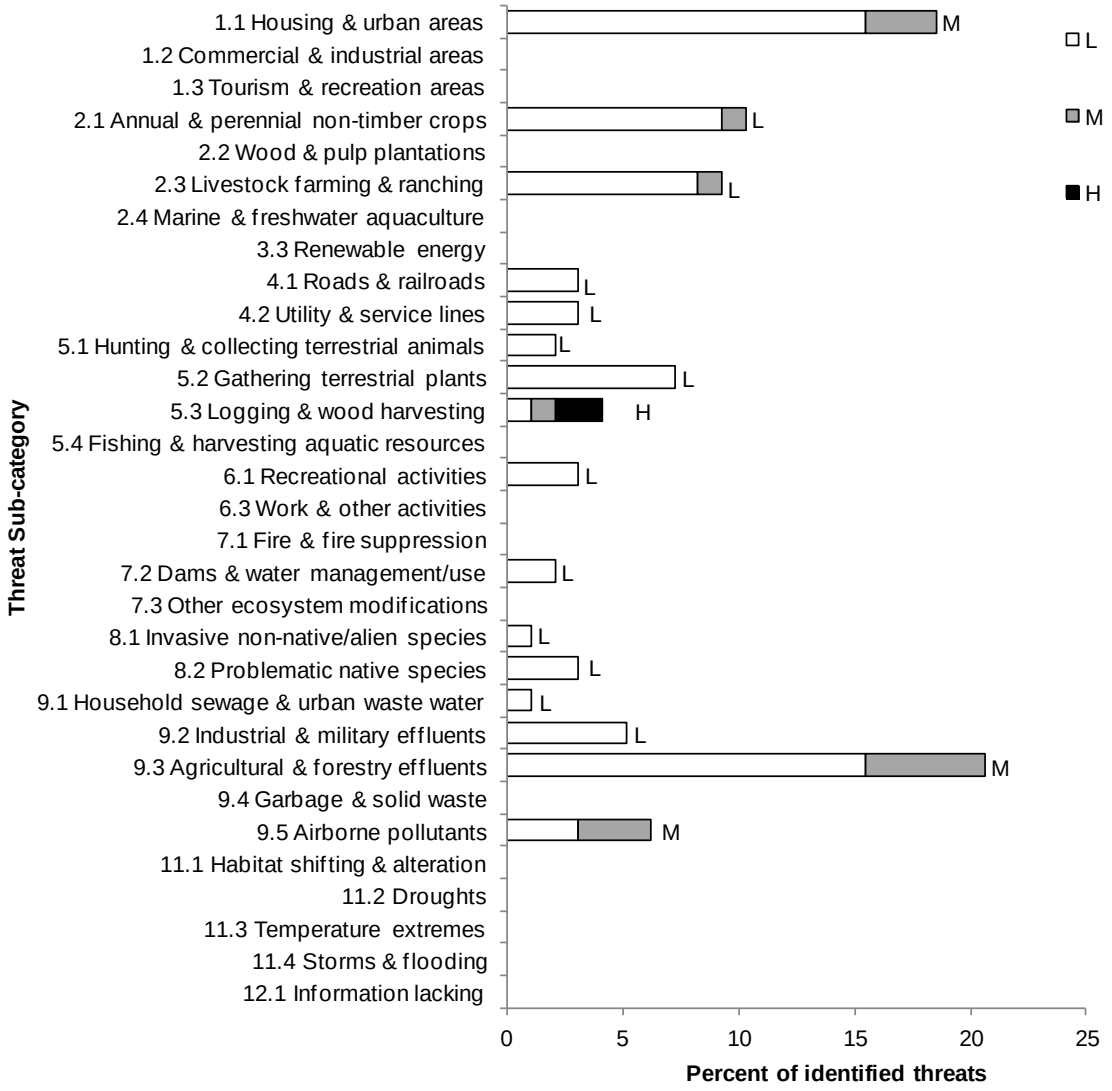

Figure 34. Percent of identified threats to priority bird species in wetlands in each threat sub-category.
Each bar represents the percent of the total number of threats identified in each threat sub-category in wetlands (for example, if 100 threats were identified in total for all priority species in 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in wetlands is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 19. Threats addressed, conservation objectives, recommended actions and priority bird species affected in wetland habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Fragmentation or loss of freshwater wetlands due 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, Nelson's Sparrow, Pied-billed Grebe
				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 their conversion 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: Pied-billed Grebe
				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	
Fragmentation or loss of freshwater wetlands due to cattle grazing	2.3 Livestock farming & ranching	Maintain/restore freshwater wetlands	1.1 Ensure land and resource-use policies and practices maintain or improve bird	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: Pied-billed Grebe

[†] 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	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
			habitat	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	
Fragmentation or loss of swamps and bogs due to logging activities	5.3 Logging & wood harvesting	Maintain/restore swamps and bogs	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage swamps and bogs 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: Gray Jay, Spruce Grouse Medium: Canada Warbler
				Define and provide the minimum number, size and condition of residual snags and living trees needed for priority species in swamps (Canada Warbler).	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, Tree Swallow
				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: Chimney Swift, Common Nighthawk, Barn Swallow
				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 (Fig. 35). 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 northeastern North America, natural riparian areas are usually forested. Riparian zones play a vital role in the ecosystem as they filter the water, provide habitat for animals and plants, and control flooding (Taylor 2002). While there are no estimates of total area of riparian habitat in Nova Scotia, the major rivers in Nova Scotia are the Annapolis, St. Mary's, Medway, Mersey, Shubenacadie and Margaree (Nova Scotia Government 2006).

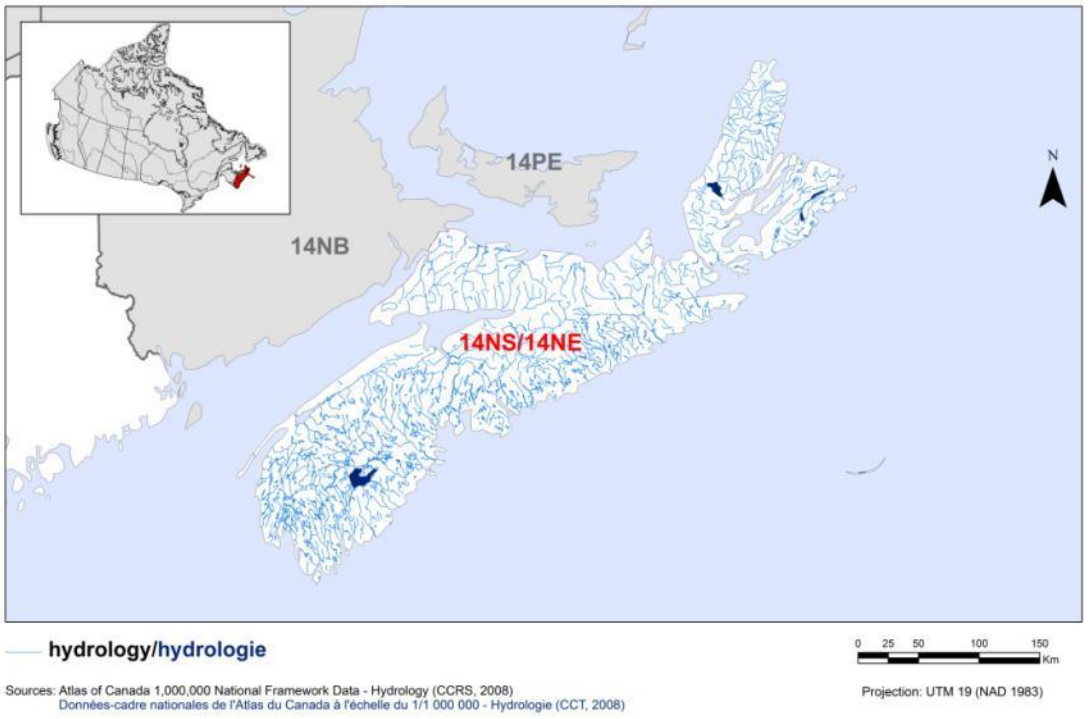

Figure 35. Map of hydrologic network approximating riparian habitat in BCR 14 NS.

Of the 14 priority species found in riparian habitats in BCR 14 NS, 3 are waterfowl, 1 is a shorebird and the remaining 10 are landbirds. Of these, 2 are species at risk (Table 20). Eleven priority birds use either forested or shrubby riparian areas. The Bank Swallow uses banks and bluffs, and the Belted Kingfisher and Peregrine Falcon (*anatum/tundrius*) use bare riparian areas (Table 20).

Riparian areas, and consequently the birds that use them, face a wide variety of threats (Fig. 36). Because of the proximity of these habitats to water and their related soil characteristics, priority species in riparian areas are threatened by urban development

(1.1 Housing & urban development) and forestry activities (5.3 Logging & wood harvesting), which in turn makes them vulnerable to contamination from agricultural and forestry based pesticides and other biocides (9.3 Agricultural & forestry effluents; Fig. 36).

Many bird species will benefit from the conservation objectives and actions presented in Table 21. Conservation actions to address medium- and high-ranked threats for this habitat include managing recreational activities in waterbodies and waterways to minimize disturbance to priority bird species and improving linkages between bird conservation needs and forest management guidelines. 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. It is also important to 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.

Table 20. Priority bird species that use riparian habitats in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Non-specific Forest		Maintain current						Y	
Bald Eagle	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 100%							Y
Bay-breasted Warbler	Mature Forest		Increase 50%				Y			
Belted Kingfisher	Bare Areas	vertical earth exposure for nest burrow	Increase 50%				Y			
Black-and-white Warbler	Non-specific Forest	young, immature	Maintain current					Y		
Eastern Kingbird	Non-specific Forest		Increase 100%				Y			
Gray Catbird	Non-specific Shrub		Increase 100%							Y
Mallard	Non-specific Forest		Maintain current						Y	
Northern Parula	Coniferous Forest; Deciduous Forest; Mixed Forest	forest edges where Usnea and similar lichens are found	Maintain current					Y		
Peregrine Falcon (*anatum/tundrius*)	Bare Areas	crevices/cliffs for nesting	Assess/Maintain	Y						
Rusty Blackbird	Coniferous Forest		Increase 100%	Y			Y			

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 20 continued

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Spotted Sandpiper	Non-specific Forest	near open shoreline for foraging, displaying, etc., and semi-open habitat for nesting	Increase 100%		Y					
Tree Swallow	Non-specific Forest; Non-specific Shrub	cavities within 1.5 km of water or open areas for foraging	Maintain current					Y		

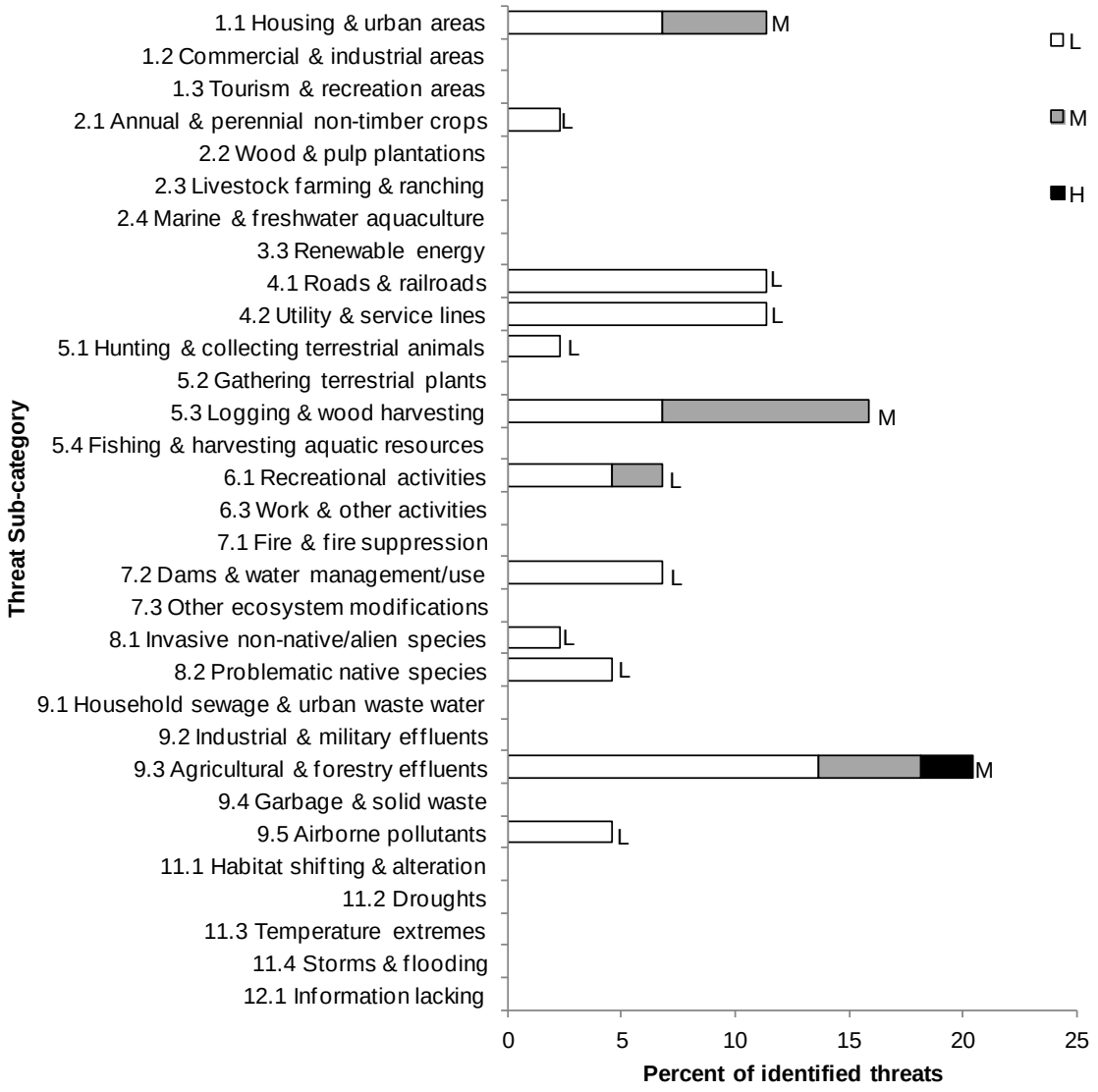

Figure 36. Percent of identified threats to priority bird species in riparian habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in riparian habitat (for example, if 100 threats were identified in total for all priority species in riparian 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in riparian habitat is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 21. Threats addressed, conservation objectives, recommended actions and priority bird species affected in riparian habitat in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
Fragmentation or loss of riparian forest due 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 Habitat sub-class 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, Black-and-white Warbler, Tree Swallow
				Maintain/restore riparian buffers of suitable width depending on riparian Habitat sub-class 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	
				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	5.2 Policies and	

† Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 21 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
				forest management guidelines.	regulations	
Disturbance at roosting sites by recreational activities in waterbodies and waterways	6.1 Recreational activities	Reduce/ eliminate disturbance from recreational activities in riparian habitats	4.1 Reduce disturbance from human recreation	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
				Raise public awareness of priority species and their habitat needs, and the impacts of disturbance from recreational activities in waterbodies and waterways.	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 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: Tree Swallow
				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	High: Bay-breasted Warbler Medium: Bank Swallow
				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 (FAO 2000). For the purposes of this document, the following discussion focuses only on lakes, ponds, streams and rivers because there are no areas within BCR 14 NS where snow and/or ice covers the ground for the majority of the year and because BCR 14 NS does not extend into marine waters (see MBU 12 NS and MBU 11 NS for coverage of marine waters). Inland waterbodies cover a total of 3 274 km^2 (less than 6%) of BCR 14 NS (Dettmers 2006; Fig. 37).

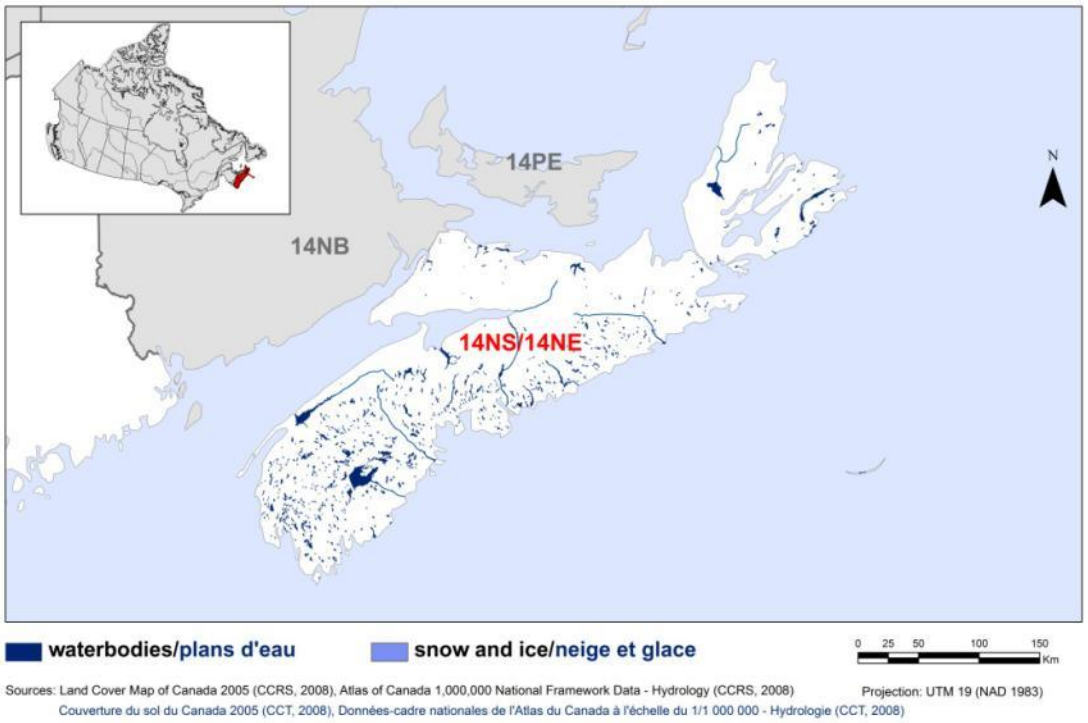

Figure 37. Map of inland waterbodies in BCR 14 NS; there is no area covered by snow or ice for the majority of the year, and BCR 14 NS does not extend into the marine waters.

There are 6 674 lakes in the province that are greater than 0.01 km^2 in surface area, with a mean surface area of 0.34 km^2 (Nova Scotia Museum of Natural History 2009). The southwestern portion of the province has many more lakes than the northern portion (Fig. 37). In some watersheds, freshwater coverage has been substantially increased by the construction of dams (Nova Scotia Museum of Natural History 2009). The largest lake is the Bras d'Or Lake in Cape Breton (Nova Scotia Government 2006).

Of the 13 priority bird species that use this habitat, 7 are waterfowl, 3 are waterbirds, 2 are shorebirds and 1 is a landbird. There is only 1 species at risk (Table 22).

The highest ranked threat (medium) to priority bird species in these habitats is habitat degradation due to acid precipitation which affects the availability and quality of food

(9.5 Airborne pollutants). The most frequently identified threats (all ranked “low” magnitude) were also related to pollution (9.2 Industrial & military effluents and 9.3 Agricultural & forestry effluents) and include a decrease in diet quality and in the health of birds due to chemical or heavy metal contamination of food sources or due to the consumption of food that is contaminated from biocides such as pesticides, herbicides or fungicides, decreases in prey availability due to chemical contamination from biocides such as pesticides, herbicides, or fungicides, and loss of food sources due to eutrophication from fertilisers (Fig. 38).

Many bird species will benefit from the conservation objectives and actions presented in Table 23. Conservation actions to address the medium-ranked threats in this habitat include the securement and management of key inland waterbodies and waterways for priority bird species (such as the Common Loon) through various methods such as creation of protected areas, private land acquisitions, conservation easements, community conservation plans and stewardship agreements. It is also important to raise public awareness about waterbirds and their habitat needs and of the impacts of disturbance from recreational activities in lakes and ponds. 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 22. Priority bird species that use inland waterbodies in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Lakes/Ponds; Rivers/Streams	lake and pond margins, slow moving rivers and streams, wooded ponds, riparian areas, beaver ponds	Maintain current						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	Increase 50%				Y			
Canada Goose (North Atlantic)	Lakes/Ponds	lake and pond margins, slow moving rivers and streams	Maintain current						Y	
Canada Goose (Temperate-breeding in Eastern Canada)	Lakes/Ponds	islands	Decrease						Y	
Common Loon	Lakes/Ponds; Rivers/Streams	with small island and sheltered coves	Maintain current		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	Increase 50%						Y	
Mallard	Lakes/Ponds; Rivers/Streams	lake and pond margins, slow moving rivers and streams, wooded ponds, riparian areas, beaver ponds	Maintain current						Y	
Pied-billed Grebe	Lakes/Ponds	dense emergent vegetation on the edges	Maintain current		Y					

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 22 continued

Priority Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Ring-necked Duck	Lakes/Ponds	open water (1.5 m depth)	Increase 50%						Y	
Solitary Sandpiper	Lakes/Ponds; Rivers/Streams	lake and stream margins, shallow water (0–10 cm)	Assess/Maintain		Y					
Wilson's Snipe	Lakes/Ponds; Rivers/Streams	organic soil, wet	Increase 100%		Y					

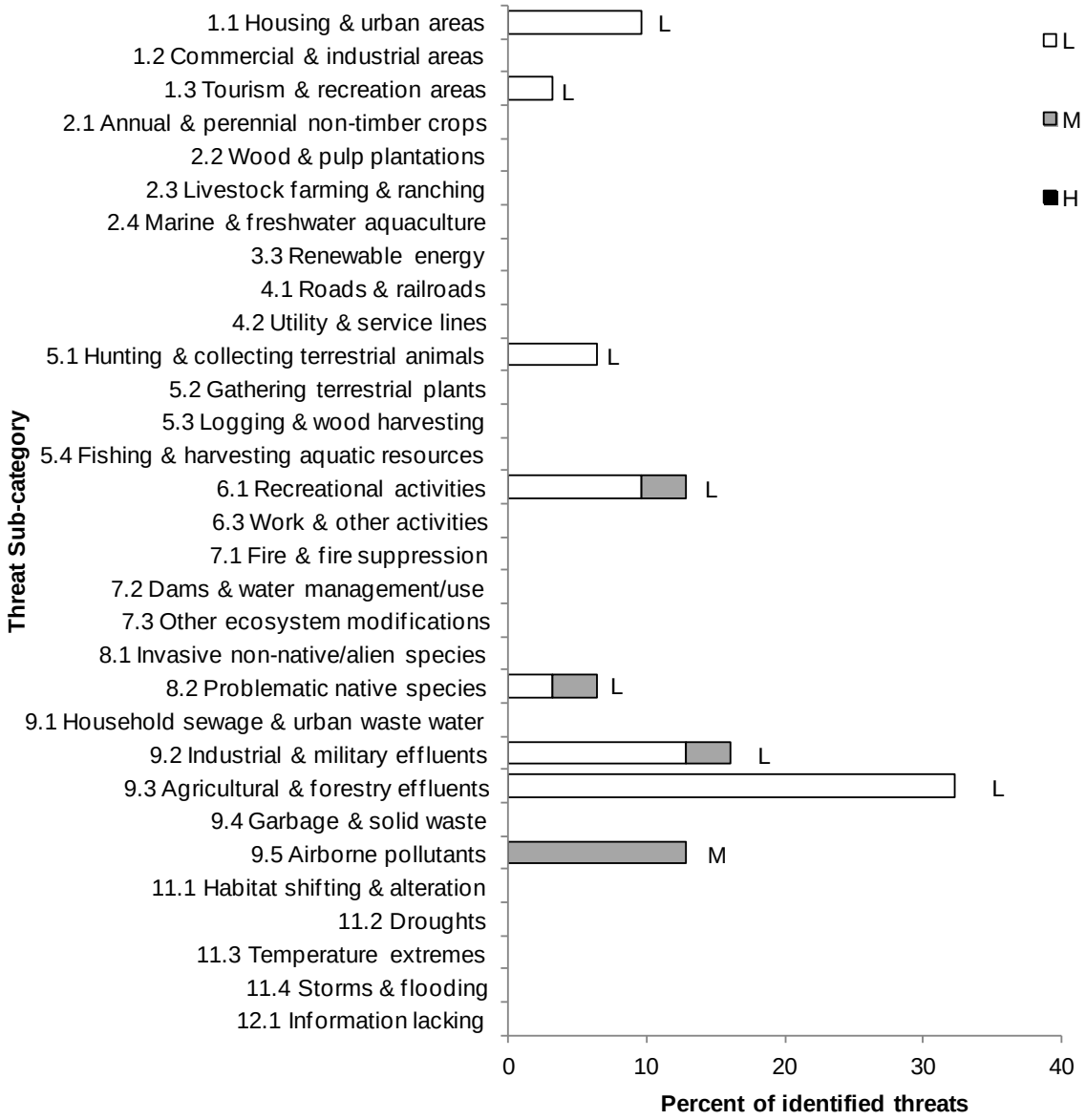

Figure 38. Percent of identified threats to priority bird species in inland waterbodies in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in inland waterbodies (for example, if 100 threats were identified in total for all priority 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in inland waterbodies is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 23. Threats addressed, conservation objectives, recommended actions and priority bird species affected in inland waterbodies in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
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, Common Tern
				Manage recreational activities to minimize 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 (Common Loon).	4.3 Awareness and communications	
				Raise environmental awareness of issues surrounding human disturbance at seabird colonies (Common Tern).	4.3 Awareness and communications	
				Assess the impacts of recreational activities in waterbodies and waterways on priority species.	8.1 Research	
Competition 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	
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	Medium: Common Loon
				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.

Marine Waters: Scotian Shelf and Bay of Fundy

The waterbodies, snow and ice habitat class includes standing and flowing water such as oceans, reservoirs, lakes, ponds, rivers and streams (FAO 2000). There are no areas within MBU 11 NS where snow and/or ice cover the sea for the majority of the year, and MBU 11 NS does not extend onto land (see BCR 14 NS for coverage of inland waters). Therefore, the following discussion focuses only on the marine waters of the southern half of the Bay of Fundy, along the province of Nova Scotia, up to the international boundary with the United States of America in the south and to the southern edge of the Laurentian Channel on the northeast. Its total area is approximately 408 000 km^2 (Fig. 39).

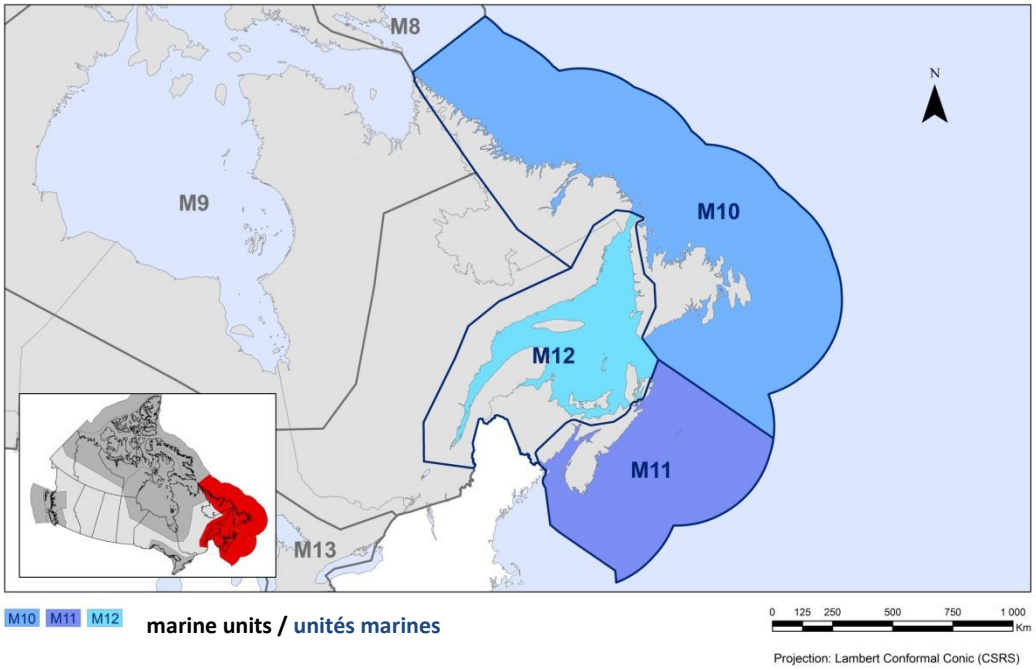

Figure 39. Map of the Scotian Shelf and Bay of Fundy (M11), which includes the marine waters of the Scotian Shelf and Bay of Fundy (MBU 11 NS).
Note: These marine waters surround the province of Nova Scotia but, unlike this illustration, do not include the portion of the Bay of Fundy off the shores of the province of New Brunswick**.**

Of the 31 priority species that are found in the marine waters of MBU 11 NS, 8 are waterfowl, 21 are waterbirds, and 2 are shorebirds. Five are species at risk (Table 24). Twenty-six priority species from MBU 11 NS are found primarily in nearshore waters, 17 are found in the continental shelf area and 7 use oceanic habitat beyond the continental shelf (Table 24).

The highest ranked threats to priority bird species in the marine waters of MBU 11 NS are oil spills and discharges from shipping activities (9.2 Industrial & military effluents), ingestion of and entanglement in garbage and solid wastes (9.4 Garbage & solid waste), fisheries bycatch, and competition for resources with the fisheries (5.4 Fishing & harvesting of aquatic resources)

and aquaculture industries (2.4 Marine & freshwater aquaculture; Fig. 40). Threats related to oil spills and discharges from shipping activities are ranked either medium or high for 18 priority bird species (Table 24) and low for all other priority bird species in the marine waters of MBU 11 NS.

Many bird species will benefit from the conservation objectives and actions presented in Table 25. Recommended conservation actions to address medium- or high-ranked threats the marine waters of MBU 11 NS in include managing the aquaculture industry to minimize habitat degradation, promoting and monitoring 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 accidental oil discharges.

Table 24. Priority bird species that use the marine waters of MBU 11 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Nearshore Waters	shallow sheltered areas	Maintain current						Y	
Barrow's Goldeneye (Eastern)	Nearshore Waters	rocky coasts, rockweed, sheltered bays	Assess/Maintain	Y						
Black-legged Kittiwake	Continental Shelf; Nearshore Waters	upwellings/fronts	Maintain current			Y				
Bonaparte's Gull	Nearshore Waters		Assess/Maintain		Y					
Common Eider	Nearshore Waters		Maintain current						Y	
Common Goldeneye	Nearshore Waters	sandy, cobble, rocky, or boulder substrate with abundant prey	Assess/Maintain						Y	
Common Loon	Nearshore Waters	bays and nearshore coastal areas	Assess/Maintain		Y		Y			
Common Murre	Continental Shelf; Nearshore Waters	upwellings/fronts	Assess/Maintain		Y					
Common Tern	Nearshore Waters	shallow areas, clear water for foraging	Assess/Maintain				Y			
Cory's Shearwater	Continental Shelf; Oceanic Waters	warmer waters	Assess/Maintain		Y					
Dovekie	Nearshore Waters; Continental Shelf; Oceanic Waters	upwellings/fronts, continental shelf edge, offshore pack ice, cold water	Assess/Maintain		Y					
Great Cormorant	Nearshore Waters	sheltered bays with nearby perching sites	Assess/Maintain		Y					

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 24 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Great Shearwater	Continental Shelf; Nearshore Waters; Oceanic Waters	upwellings/fronts	Assess/Maintain		Y	Y		Y		
Great Skua	Continental Shelf; Oceanic Waters	upwellings	Assess/Maintain		Y					
Harlequin Duck (Eastern)	Nearshore Waters	rocky coastline, exposed headlands, and subtidal ledges; often associated with offshore islands	Assess/Maintain	Y						
Horned Grebe (Magdalen Islands and Western)	Nearshore Waters	sheltered areas between islands far from land (10–20 m depth)	Assess/Maintain	Y						
Ivory Gull	Continental Shelf	pack ice	Recovery Objective	Y	Y		Y			
Leach's Storm-Petrel	Continental Shelf; Oceanic Waters	upwellings/fronts	Assess/Maintain			Y	Y	Y		
Long-tailed Duck	Continental Shelf; Nearshore Waters	protected bays with steep slopes and shorelines with gradual shelves	Assess/Maintain						Y	
Manx Shearwater	Continental Shelf; Nearshore Waters; Oceanic Waters	fronts/upwellings	Assess/Maintain		Y		Y			
Razorbill	Continental Shelf; Nearshore Waters	upwellings/fronts	Assess/Maintain		Y					
Red Phalarope	Continental Shelf; Nearshore Waters	near upwellings, where Euphausiids are present	Assess/Maintain		Y					
Red-necked Grebe	Nearshore Waters		Assess/Maintain		Y		Y			
Red-necked Phalarope	Continental Shelf; Nearshore Waters	shelfbreaks, upwellings, fronts	Assess/Maintain		Y					
Red-throated Loon	Continental Shelf; Nearshore Waters	sheltered, shallow, sandy substrate	Assess/Maintain		Y					
Roseate Tern	Nearshore Waters	shallow water, sandy substrate	Recovery objective	Y						
Sooty Shearwater	Continental Shelf; Nearshore Waters; Oceanic Waters	upwellings/fronts	Assess/Maintain		Y					
South Polar Skua	Continental Shelf; Oceanic Waters		Assess/Maintain		Y					
Surf Scoter	Nearshore Waters	sandy, cobble or rocky substrate (<10 m depth)	Assess/Maintain						Y	

Table 24 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Thick-billed Murre	Continental Shelf; Nearshore Waters	ice, upwellings/fronts	Assess/Maintain		Y		Y			
White-winged Scoter	Nearshore Waters		Assess/Maintain		Y				Y	

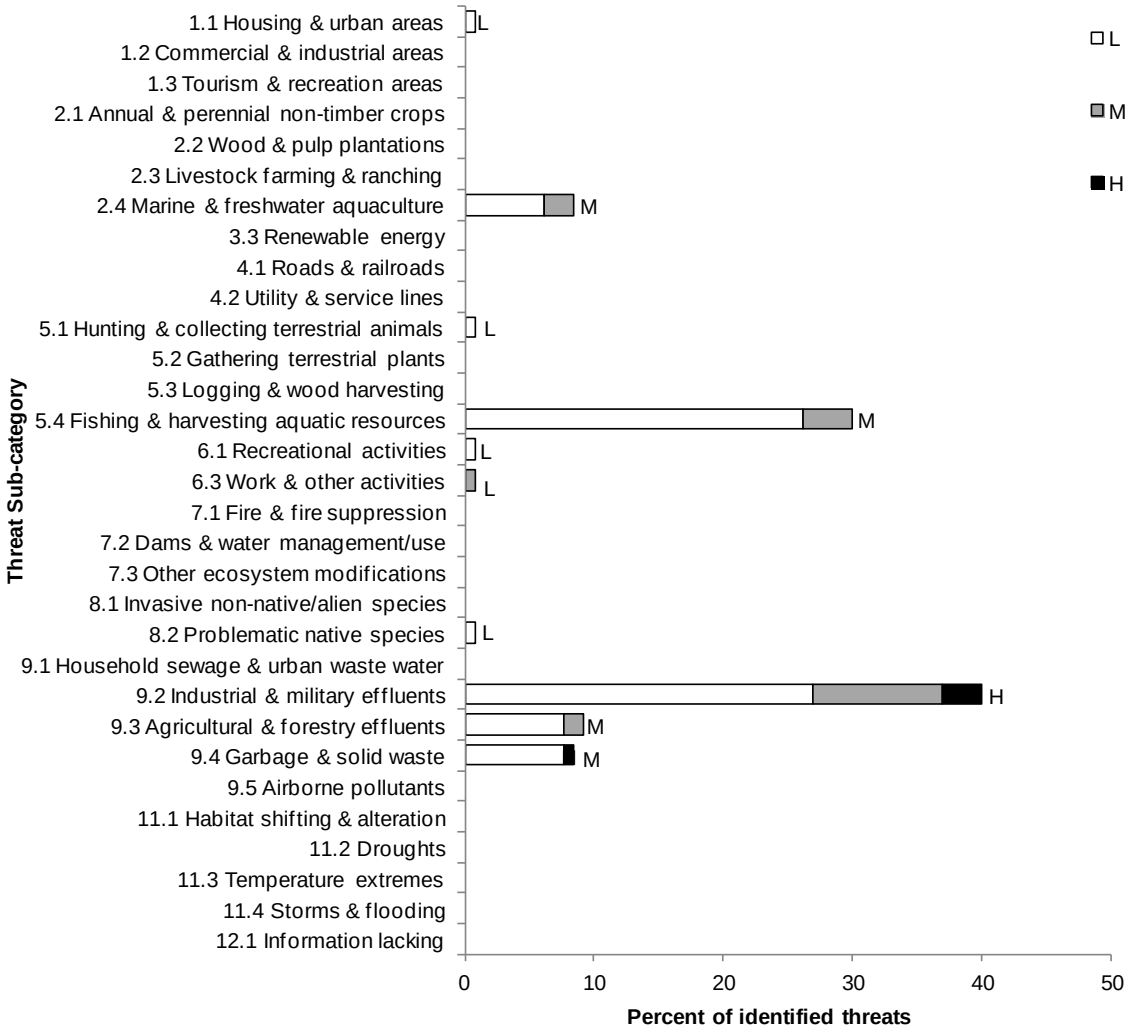

Figure 40. Percent of identified threats to priority bird species in the marine waters of MBU 11 NS in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the marine waters (MBU 11 NS) (for example, if 100 threats were identified in total for all priority species in the marine waters (MBU 11 NS), 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in the marine waters (MBU 11 NS) is shown in Table 4, Relative magnitude of identified threats to priority species within MBU 11 NS 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 the marine waters of MBU 11 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: 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 in nearshore waters	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: Surf Scoter, White-winged Scoter
				Raise public awareness of waterbirds and waterfowl, their habitat needs, and the impacts of aquaculture.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Competition for nesting/brood rearing areas with aquaculture farms	2.4 Marine & freshwater aquaculture	Reduce/ eliminate competition for brooding/chick rearing areas with the aquaculture industry in nearshore waters	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: Common Eider
				Raise awareness in the industry on the impacts of activities on waterfowl.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Competition for prey or resources with the industrial or commercial fisheries operations	5.4 Fishing & harvesting aquatic resources	Reduce/eliminate competition for resources (food) with the fishing industry	5.3 Reduce human competition for food sources or foraging sites	Provide input into laws, regulations, and beneficial management practices for fishing activities that directly impact the quality of seabird foraging habitat.	5.2 Policies and regulations	Medium: Black-legged Kittiwake
				Establish/maintain protected areas to restrict access/activity at key foraging sites.	1.1 Site/area protection	
Fisheries bycatch or drowning as a result of entanglement in fishing gear	5.4 Fishing & harvesting aquatic resources	Reduce mortality from fisheries bycatch	2.4 Reduce incidental mortality	Develop policies, regulations and beneficial management practices that minimize seabird bycatch, such as the modification of fishing gear.	5.2 Policies and regulations	Medium: Common Murre, Manx Shearwater, Razorbill, Thick-billed Murre
				Continue to monitor and enforce compliance with laws, policies and regulations to minimize seabird bycatch.	5.4 Compliance and enforcement	
				Establish/maintain protected areas to restrict fishing activity at key foraging sites.	1.1 Site/area protection	
Decrease of diet quality and of health	9.2 Industrial & military	Reduce mortality from exposure to	2.2 Reduce mortality and/or	Develop beneficial management practices to manage the discharge of chemical/heavy metal contaminants	5.3 Private sector standards and	Medium: Ivory Gull, Leach's

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 25 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
of birds due to the chemical or heavy metal contamination of food source	effluents	chemical/heavy metal contaminants from industry	sub-lethal effects from exposure to contaminants	into the environment.	codes	Storm-Petrel
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
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, Razorbill, Red Phalarope, Red-necked Phalarope Medium: Barrow's Goldeneye (Eastern), Common Loon, Common Murre, Dovekie, Harlequin Duck (Eastern), Horned Grebe, Ivory Gull, Sooty Shearwater, South Polar Skua, Thick-billed Murre, White-winged Scoter
				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	
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: Ivory Gull, Leach's Storm-Petrel
				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	
Mortality from consumption of plastics or garbage	9.4 Garbage & solid waste	Reduce mortality from ingestion and entanglement in	2.4 Reduce incidental mortality	Develop beneficial management practices to manage garbage and other solid wastes, and eliminate dumping into the marine environment.	5.3 Private sector standards and codes	High: Manx Shearwater

Table 25 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
		garbage and other solid wastes		Continue to monitor and enforce compliance with laws, policies and regulations that reduce garbage and other waste disposal into the marine environment.	5.4 Compliance and enforcement	

Marine Waters: Gulf of St. Lawrence

The waterbodies, snow and ice habitat class includes standing and flowing water such as oceans, reservoirs, lakes, ponds, rivers and streams (FAO 2000). There are no areas within MBU 12 NS where snow and/or ice cover the sea for the majority of the year, and MBU 12 NS does not extend onto land (see BCR 14 NS for coverage of inland waters). Therefore, the following discussion focuses on the marine waters of the Northumberland Strait (Fig. 41). The total area is approximately 27 223 km^2.

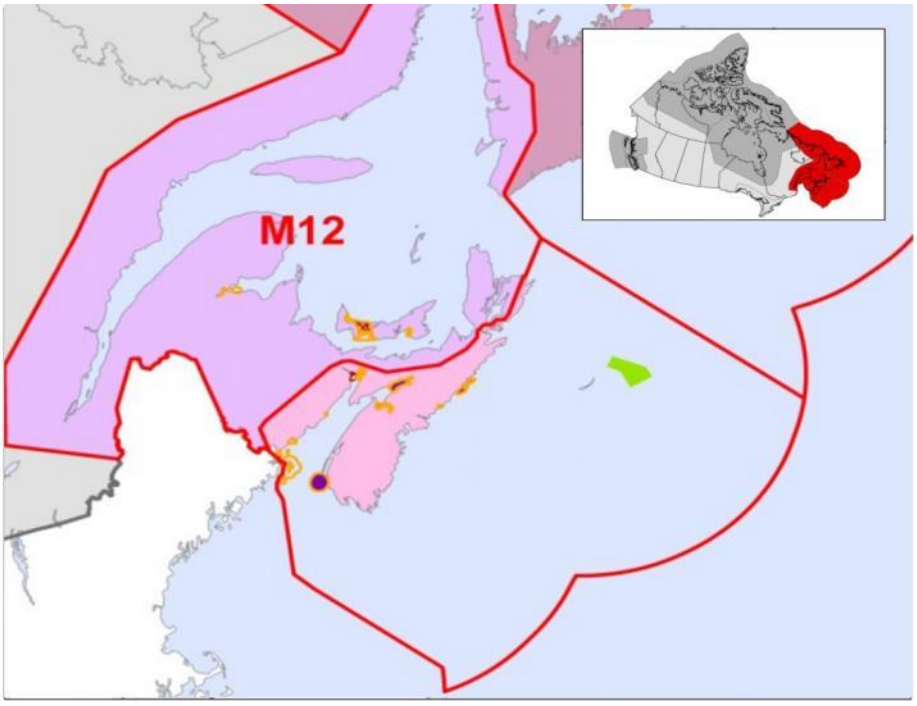

Figure 41. Map of the Gulf of St. Lawrence (M12), which includes the marine waters of the Gulf of St. Lawrence in Nova Scotia (MBU 12 NS).
Note: In this strategy, the marine waters of MBU 12 NS start at the M11 boundary, surround Cape Breton and follow the Northumberland Strait off the shores of Nova Scotia, but do not include the waters off Prince Edward Island or off the island of Newfoundland.

Of the 20 priority bird species found in this habitat, 7 are waterfowl and 13 are waterbirds. Three are species at risk (Table 26). All priority bird species use nearshore waters either exclusively or in combination with areas around the continental shelf (Table 26).

The highest ranked threats to priority bird species in the marine waters of MBU 12 NS are oil spills and discharges from shipping activities (9.2 Industrial & military effluents), pollution from pesticides used by the agricultural and forestry industries (9.3 Agricultural & forestry effluents), pollution from heavy metal contamination (9.2 Industrial & military effluents), fisheries bycatch, and competition for resources with the fisheries (5.4 Fishing & harvesting of aquatic resources) and aquaculture industries (2.4 Marine & freshwater aquaculture; Fig. 42). As was the case in

the marine waters (MBU 11 NS) (Section 2: Marine Waters: Scotian Shelf and Bay of Fundy), the threats from oil spills and discharges from shipping activities were ranked as medium or high for eight priority species in the Gulf marine waters (MBU 12 NS) (Table 27) and were ranked low for all other remaining priority bird species in MBU 12 NS.

Many bird species will benefit from the conservation objectives and actions presented in Table 27. Recommended conservation actions to address medium- or high-ranked threats include managing the aquaculture industry to minimize habitat degradation, promoting and monitoring the 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 accidental oil discharges. 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 bird species that use the marine waters of MBU 12 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Nearshore Waters	shallow sheltered areas	Maintain current						Y	
Barrow's Goldeneye (Eastern)	Nearshore Waters	rocky coasts, rockweed, sheltered bays	Assess/Maintain	Y						
Black Scoter	Nearshore Waters	sandy, cobble, or boulder substrate, 5–6 m depth, mollusc beds	Assess/Maintain							
Bonaparte's Gull	Nearshore Waters		Assess/Maintain		Y					
Common Eider	Nearshore Waters		Maintain current						Y	
Common Goldeneye	Nearshore Waters	sandy, cobble, rocky, or boulder substrate with abundant prey	Assess/Maintain						Y	
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			
Dovekie	Continental Shelf; Nearshore Waters	upwellings/fronts, continental shelf edge, offshore pack ice, cold water	Assess/Maintain		Y					
Great Cormorant	Nearshore Waters	sheltered bays with nearby perching sites	Assess/Maintain		Y					
Great Shearwater	Continental Shelf; Nearshore Waters	upwellings/fronts	Assess/Maintain		Y	Y		Y		
Horned Grebe (Magdalen Islands and Western)	Nearshore Waters	sheltered areas between islands far from land (10–20 m depth)	Assess/Maintain	Y						
Ivory Gull	Continental Shelf	pack ice	Recovery Objective	Y	Y		Y			

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 26 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Leach's Storm-Petrel	Continental Shelf	upwellings/fronts	Assess/Maintain			Y	Y	Y		
Long-tailed Duck	Continental Shelf; Nearshore Waters	protected bays with steep slopes and shorelines with gradual shelves	Assess/Maintain						Y	
Razorbill	Continental Shelf; Nearshore Waters		Assess/Maintain		Y					
Red-necked Grebe	Nearshore Waters		Assess/Maintain		Y		Y			
Red-throated Loon	Continental Shelf; Nearshore Waters	sheltered, shallow, sandy substrate	Assess/Maintain		Y					
Sooty Shearwater	Continental Shelf; Nearshore Waters	upwellings/fronts	Assess/Maintain		Y					
Surf Scoter	Nearshore Waters	sandy, cobble or rocky substrate (<10 m depth)	Assess/Maintain						Y	

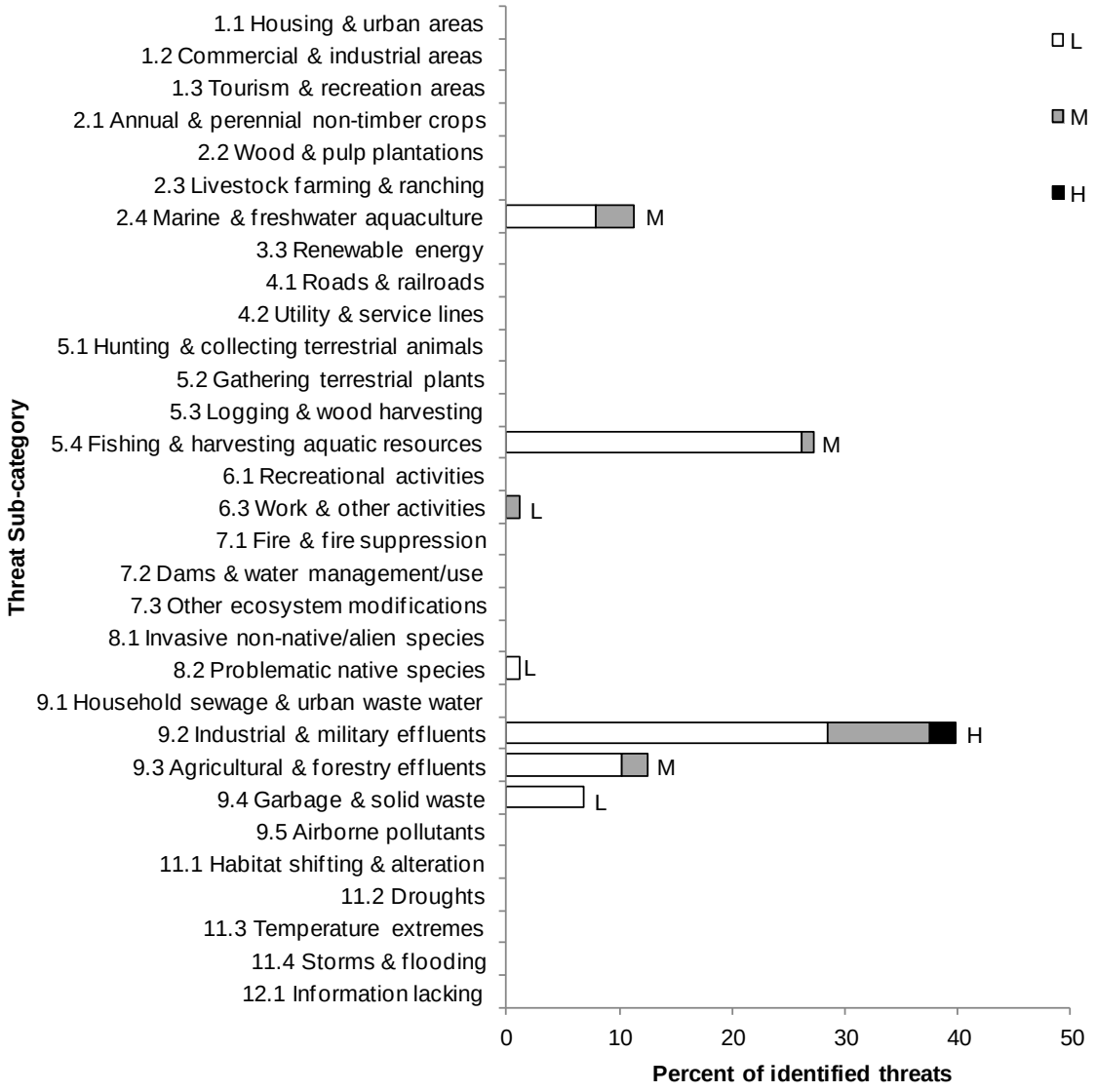

Figure 42. Percent of identified threats to priority bird species in the marine waters of MBU 12 NS in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in the marine waters (MBU 12 NS) (for example, if 100 threats were identified in total for all priority species in the Gulf marine waters (MBU 12 NS), 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in the Gulf marine waters (MBU 12 NS) is shown in Table 4, Relative magnitude of identified threats to priority species within MBU 12 NS 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 27. Threats addressed, conservation objectives, recommended actions and priority bird species affected for threats ranked medium or high in the marine waters of MBU 12 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: 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 in nearshore waters	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: Surf Scoter, Black Scoter
				Raise public awareness of waterbirds and waterfowl and their habitat needs, and the impacts of aquaculture.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Competition for nesting/brood rearing areas with aquaculture farms	2.4 Marine & freshwater aquaculture	Reduce/eliminate competition for brooding/chick rearing areas with the aquaculture industry in nearshore waters	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: Common Eider
				Raise awareness in the industry on the impacts of activities on waterfowl.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Fisheries bycatch or drowning as a result of entanglement in fishing gear	5.4 Fishing & harvesting aquatic resources	Reduce mortality from fisheries bycatch	2.4 Reduce incidental mortality	Develop policies, regulations and beneficial management practices that minimize seabird/waterbird/waterfowl bycatch, such as the modification of fishing gear.	5.2 Policies and regulations	Medium: Razorbill
				Continue to monitor and enforce compliance with laws, policies and regulations to minimize seabird bycatch.	5.4 Compliance and enforcement	
				Establish/maintain protected areas to restrict fishing activity at key foraging sites.	1.1 Site/area protection	
Disturbance at moulting sites due to operational activities of oyster and mussel aquaculture leases	6.3 Work & other activities	Reduce/eliminate disturbance from boat traffic	4.2 Reduce disturbance from industrial or work activity	Identify, secure and manage key areas used by moulting eiders through various methods such as creation of protected areas, private land acquisitions, conservation easements, or community conservation plans.	1.1 Site/area protection	Medium: Common Eider

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 27 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
				Manage industrial activities (such as rockweed and shellfish harvest, aquaculture activities, commercial fisheries, and ecotourism) to minimize disturbance to eiders during the moulting period.	5.2 Policies and regulations	
				Raise public awareness of the importance of moulting areas to eiders, and the impacts of disturbance during moult.	4.3 Awareness and communications	
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	Medium: Ivory Gull, Leach's Storm-Petrel
				Continue to monitor and enforce compliance with laws, policies and regulations at all levels.	5.4 Compliance and enforcement	
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, Razorbill Medium: Barrow's Goldeneye (Eastern), Common Loon, Dovekie, Horned Grebe, Ivory Gull, Sooty Shearwater
				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	
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: Ivory Gull, Leach's Storm-Petrel
				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	

Coastal – Above High Tide

Coastal habitat includes 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 NS has 5 934 km of coastline along three main marine water bodies: the Gulf of St. Lawrence, the Atlantic Ocean (Scotian Shelf) and the Bay of Fundy (Fig. 43). Priority bird species using marine coastal habitats (intertidal areas) in the province of Nova Scotia are included in the next two sections: Coastal (Intertidal): Scotian Shelf and Bay of Fundy and Coastal (Intertidal): Gulf of St. Lawrence.

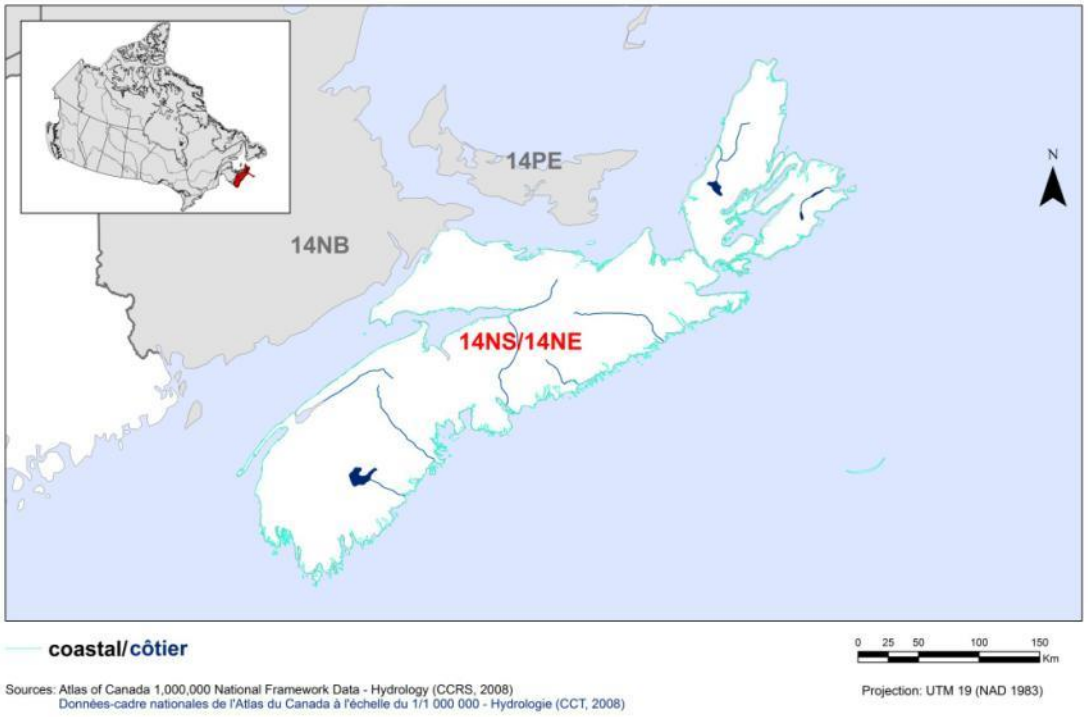

Figure 43. Map of coastal habitat (above high tide) in BCR 14 NS.

Of the 17 priority species that are found in coastal habitat in BCR 14 NS, there is 1 species of waterfowl, 3 waterbirds, 5 shorebirds and 6 landbirds. Five are species at risk (Table 28).

The highest ranked threats for priority bird species in coastal habitat (above high tide) in BCR 14 NS include disturbances due to ATV traffic, dogs walking off-leash and other human uses of beaches (6.1 Recreational activities), loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap (7.3 Other ecosystem modification), habitat loss from residential developments (1.1 Housing and urban areas), mortality from ocean oil spill events (9.2 Industrial & military effluents), and contamination from agricultural runoff (9.3 Agricultural & forestry effluents; Fig. 44).

Many bird species will benefit from the conservation objectives and actions presented in Table 29. Recommended actions to address medium- and high-ranked threats for coastal habitat (above high tide) in BCR 14 NS include managing coastal recreational activities to minimize disturbance to priority species and securing and managing 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. 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. It is also important to raise public awareness of priority birds and their habitat needs and the impacts of disturbance in coastal areas. Managing coastal off-bottom oyster aquaculture activities to minimize disturbance is also recommended.

Table 28. Priority bird species that use coastal habitats (above high tide) in BCR 14 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Bittern	Saltmarsh	tall emergent vegetation with aquatic bed vegetation	Increase 50%		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 100%							Y
Belted Kingfisher	Estuaries	clear water with aquatic animals, near nest burrow, overhanging perches beneficial	Increase 50%				Y			
Bobolink	Saltmarsh		Increase 100%	Y	Y		Y			
Common Nighthawk	Beaches		Increase 100%	Y						
Common Tern	Beaches	sand and gravel, scattered vegetation (cover for for chicks)	Assess/Maintain				Y			
Killdeer	Beaches		Maintain current		Y					
Mallard	Estuaries; Saltmarsh		Maintain current						Y	
Nelson's Sparrow	Saltmarsh		Assess/Maintain		Y		Y	Y		
Peregrine Falcon (*anatum/tundrius*)	Beaches	shorebirds	Assess/Maintain	Y						
Piping Plover (melodus)	Beaches	sparse vegetation and wrack, sand or medium cobble beach but not rocky	Recovery objective	Y	Y					

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 28 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Short-eared Owl	Saltmarsh	abundant prey	Increase 50%	Y						
Sora	Saltmarsh		Maintain current		Y					
Spotted Sandpiper	Beaches	beaches and barrier beaches	Increase 100%		Y					
Whimbrel	Heathlands	coastal heathlands	Assess/Maintain		Y					

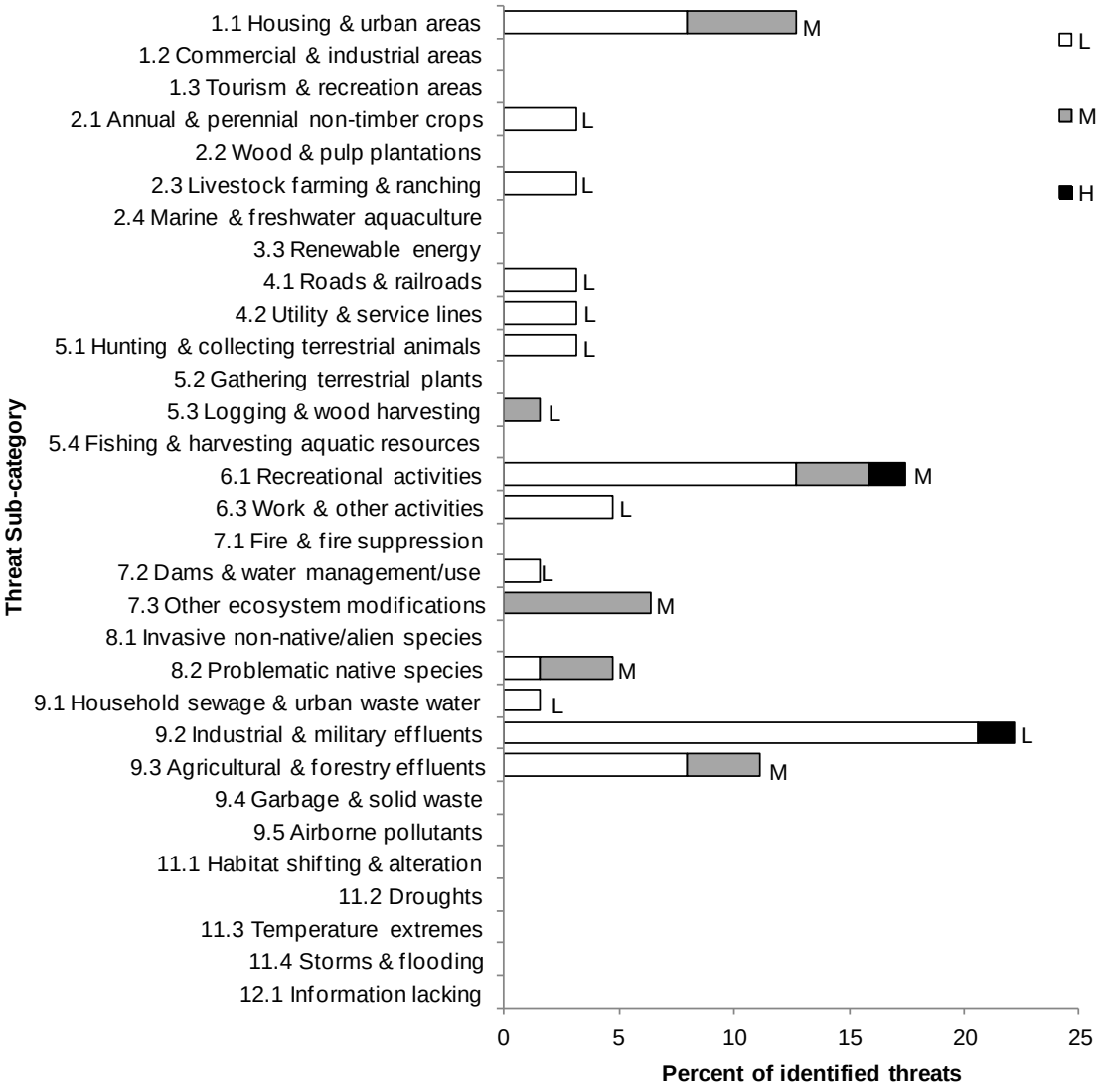

Figure 44. Percent of identified threats to priority bird species in coastal habitat (above high tide) in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal habitat (above high tide) (for example, if 100 threats were identified in total for all priority species in coastal habitat (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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in coastal habitat (above high tide) is shown in Table 4, Relative magnitude of identified threats to priority species within BCR 14 NS 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 for threats ranked medium or high in coastal habitats (above high tide) in BCR 14 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
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	
				Develop beneficial management practices and avoidance guidelines to manage developments and minimize priority species habitat degradation.	5.3 Private sector standards and codes	
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, or community conservation plans.	1.2 Resource and habitat protection	Medium: American Bittern, Nelson's Sparrow
				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	
				Enhance and restore saltmarshes from abandoned dykelands.	2.3 Habitat and natural process restoration	
				Assess the impacts of coastal development on saltmarshes	8.1 Research	

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 29 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
				and priority species.		
				Establish long-term monitoring programs for Nelson's Sparrow (Nelson's Sparrow).	8.2 Monitoring	
Loss of nesting, 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 (beaches, intertidal mudflats, saltmarshes, etc.) for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, or community conservation plans.	1.2 Resource and habitat protection	High: Piping Plover (*melodus*) Medium: American Golden-Plover
				Raise public awareness of priority species 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 coastal areas	6.1 Recreational activities	Reduce/ eliminate disturbance from recreational activities in mature coastal forest	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 communications	
				Manage recreational activities to minimize disturbance during key periods for priority species.	5.2 Policies and regulations	

Table 29 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected[†]
Loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap	7.3 Other ecosystem modifications	Maintain/ restore natural shorelines and beaches	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage 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	Medium: Bank Swallow, Common Tern, Piping Plover (*melodus*), Spotted Sandpiper
				Manage coastal development activities to minimize habitat degradation.	5.2 Policies and regulations	
				Raise public awareness of shorebirds, seabirds and bank-nesting birds, their habitat needs, and the impacts of installing riprap in coastal areas.	4.3 Awareness and communications	
				Enhance/restore degraded habitat.	2.3 Habitat and natural process restoration	
Competition 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 due to an increasing populations of predators (foxes and raccoons) as a results of land use practices	8.2 Problematic native species	Reduce predation by foxes and raccoons	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. raccoons, foxes).	2.2 Invasive/ problematic species control	Medium: Piping Plover (*melodus*)
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 (*melodus*)
				Continue to monitor and enforce compliance with laws, policies and regulations regarding the release of oil and oily	5.4 Compliance and enforcement	

Table 29 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat: Priority Species Affected†
				waste into waterbodies.		
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
				Promote pesticide-free products.	6.2 Substitution	

Coastal – Intertidal – Scotian Shelf and Bay of Fundy

Coastal habitat of MBU 11 NS includes all intertidal habitat types below the high-tide line along ocean shorelines including estuaries, mudflats, sand flats, barrier islands, rocky shorelines, eelgrass and saltmarshes. The Province of Nova Scotia has 5 934 km of coastline along three main marine waterbodies: the Gulf of St. Lawrence, the Atlantic Ocean (Scotian Shelf) and the Bay of Fundy (Fig. 45). Priority bird species using coastal habitat above the high tide line (BCR 14 NS) and coastal intertidal habitat of the Gulf of St. Lawrence (MBU 12 NS) are included in the two sections: Coastal (above high tide) and the Coastal (intertidal) – Gulf of St.Lawrence, respectively.

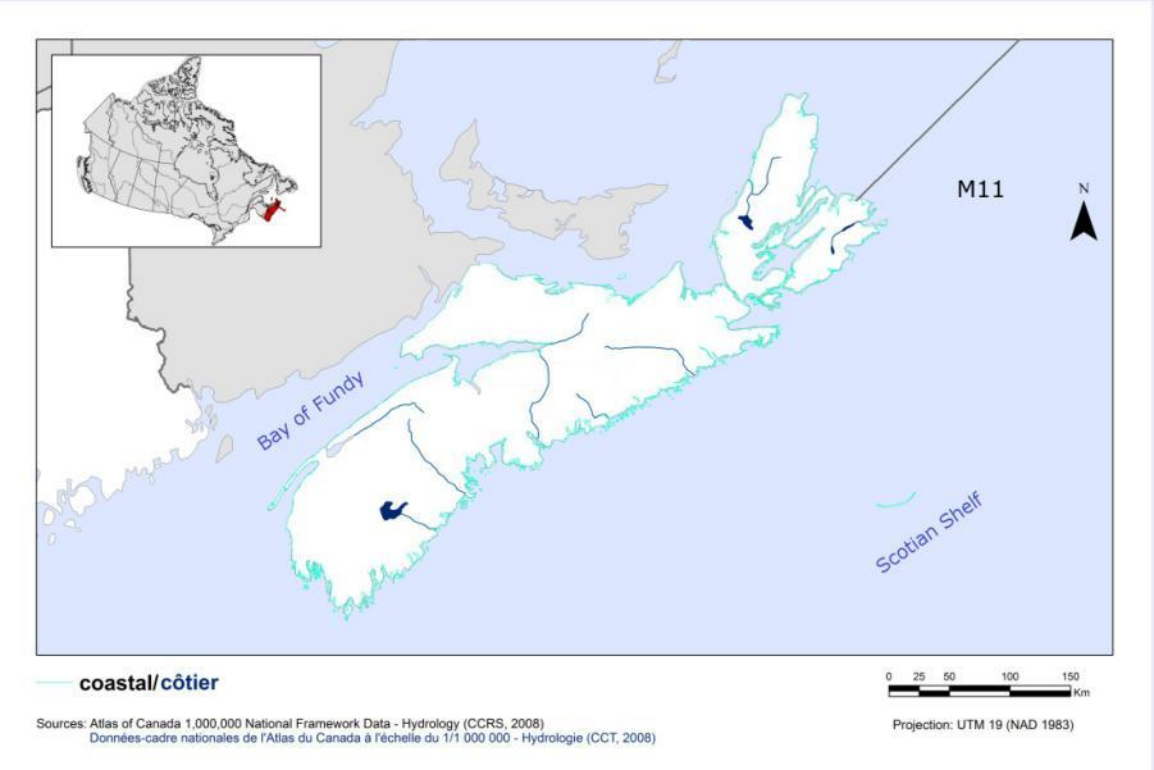

Figure 45. Map of coastal habitats in Nova Scotia. The Scotian Shelf and Bay of Fundy coastal (intertidal) habitats (MBU 11 NS) are approximately delineated from the Gulf of St. Lawrence (MBU 12NS) by the black line.

Of the 32 priority species that use coastal (intertidal) habitats in MUB 11 NS, 6 are waterfowl, 12 are waterbirds and 14 are shorebirds. Five are species at risk (Table 30). Eleven priority species use saltmarshes, 9 use mudflats, 8 use islands and 22 use estuaries (Table 30).

The highest ranked and most frequently identified threats to priority bird species in coastal (intertidal) habitats of MBU 11 NS are related to oil spills and discharges from shipping activities (9.2 Industrial & military effluents). Threats related to human disturbances from recreational activities at nesting and foraging sites (6.1 Recreational activities) were also ranked high. The

threat from losses of specific habitat features due to changes in sedimentation patterns caused by installation of riprap (7.3 Other ecosystem modifications) was ranked medium (Fig. 46).

Many bird species will benefit from the conservation objectives and actions presented in Table 31. Recommended conservation actions to address medium- or high-ranked threats to priority species in the coastal (intertidal) habitats of MBU 11 NS include managing coastal recreational and commercial activities to minimize disturbance to priority species and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.

Table 30. Priority bird species that use coastal (intertidal) habitat of MBU 11 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Estuaries; Saltmarsh	shallow sheltered areas	Maintain current						Y	
Barrow's Goldeneye (Eastern)	Estuaries		Assess/Maintain	Y						
Black-bellied Plover	Estuaries; Mudflats; Saltmarsh; Sandflats		Assess/Maintain		Y					
Black-legged Kittiwake	Islands	predator-free islands	Maintain current			Y				
Bonaparte's Gull	Estuaries		Assess/Maintain		Y					
Canada Goose (North Atlantic)	Estuaries; Mudflats; Saltmarsh		Maintain current						Y	
Canada Goose (Temperate-breeding in Eastern Canada)	Estuaries; Mudflats; Saltmarsh		Decrease						Y	
Common Eider	Islands; Rocky Shoreline	vegetated or rocky, livestock-free and predator-free islands with abundant seaweed and access to fresh water; abundant prey	Maintain current						Y	
Common Goldeneye	Estuaries	adequate prey	Assess/Maintain						Y	
Common Loon	Estuaries		Assess/Maintain		Y		Y			
Common Murre	Islands	islands or cliffs for nesting	Assess/Maintain		Y					
Common Tern	Estuaries; Saltmarsh; Islands	sand and gravel, scattered vegetation (cover for for chicks)	Assess/Maintain				Y			
Dunlin	Estuaries; Mudlfats; Sandflats		Assess/Maintain		Y					

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 30 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Great Cormorant	Islands	cliffs or rocky islands free from predators	Assess/Maintain		Y					
Horned Grebe	Estuaries	sheltered/protected areas	Assess/Maintain	Y						
Hudsonian Godwit	Estuaries; Mudflats; Saltmarsh; Sandflats		Assess/Maintain		Y					
Leach's Storm-Petrel	Islands	vegetated islands with soft soil for digging burrows or rock crevices for nest sites, livestock-free	Assess/Maintain			Y	Y	Y		
Least Sandpiper	Estuaries; Mudflats; Saltmarsh		Assess/Maintain		Y					
Lesser Yellowlegs	Estuaries; Mudflats; Saltmarsh		Assess/Maintain		Y					
Piping Plover (melodus)	Sandflats		Recovery objective	Y	Y					
Purple Sandpiper	Rocky Shoreline	rocky shoreline exposed to wave action	Assess/Maintain		Y					
Razorbill	Islands	predator-free islands or cliffs for nesting	Assess/Maintain		Y					
Red Knot (rufa)	Mudflats; Saltmarsh; Sandflats		Assess/Maintain	Y	Y					
Red-necked Grebe	Estuaries		Assess/Maintain		Y		Y			
Red-necked Phalarope	Estuaries		Assess/Maintain		Y					
Red-throated Loon	Estuaries	sheltered, shallow, sandy substrate	Assess/Maintain		Y					
Roseate Tern	Islands	cover for nests and chicks	Recovery objective	Y						
Sanderling	Estuaries; Sandflats		Assess/Maintain		Y					
Semipalmated Sandpiper	Beaches; Estuaries; Mudflats; Sandflats	sand/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		Increase 50%		Y					

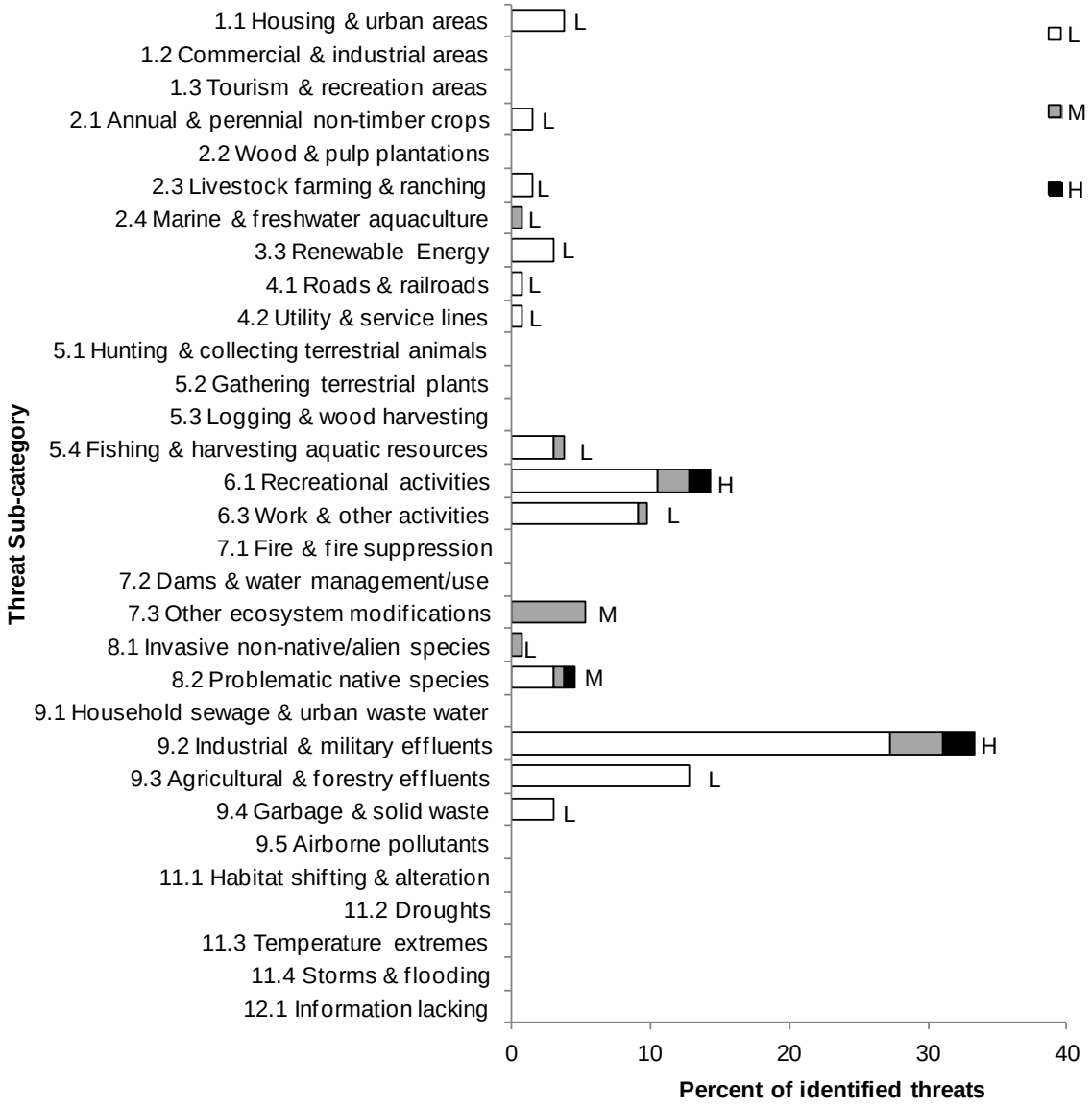

Figure 46. Percent of identified threats to priority bird species in coastal (intertidal) habitat of MBU 11 NS in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal (intertidal) habitat of MBU 11 NS (for example, if 100 threats were identified in total for all priority species in coastal (intertidal) habitat of MBU 11 NS, 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat in coastal (intertidal) habitat of MBU 11 NS is shown in Table 4, Relative magnitude of identified threats to priority species within MBU 11 NS 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 31. Threats addressed, conservation objectives, recommended actions and priority bird species affected for threats ranked medium or high in the coastal (intertidal) habitat of MBU 11 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat Priority Species Affected[†]
Competition for nesting/brood rearing areas with aquaculture farms	2.4 Marine & freshwater aquaculture	Reduce/eliminate competition for brooding/chick rearing areas with the aquaculture industry in nearshore waters	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: Common Eider
				Raise awareness in the industry on the impacts of activities on waterfowl.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
Competition for prey or resources with industrial or commercial operations harvesting marine worms	5.4 Fishing & harvesting aquatic resources	Reduce/eliminate competition for resources (food) with marine worm harvesters on mudflats	5.3 Reduce human competition for food sources or foraging sites	Manage bloodworm harvesting to minimize priority species habitat degradation.	5.3 Private sector standards and codes	Medium: Black-bellied Plover
				Raise public awareness of shorebirds and their habitat needs, and on the impacts of harvesting bloodworms.	4.3 Awareness and communications	
				Assess the impact of bloodworm harvesting on priority species.	8.1 Research	
Disturbance at foraging sites by recreational activities in coastal areas	6.1 Recreational activities	Reduce/eliminate disturbance from recreational activities in estuaries	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, or community conservation plans.	1.2 Resource and habitat protection	High: Piping Plover (*melodus*), Semipalmated Sandpiper Medium: Black-bellied Plover, Red Knot (*rufa*), Sanderling
				Raise public awareness of shorebirds 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 in this habitat are of low magnitude.

Table 31 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat Priority Species Affected[†]
Loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap	7.3 Other ecosystem modifications	Maintain/restore beaches	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage 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	Medium: Black-bellied Plover, Lesser Yellowlegs, Piping Plover (*melodus*), Red Knot (*rufa*), Sanderling, Semipalmated Sandpiper, Whimbrel
				Manage coastal development activities to minimize habitat degradation.	5.2 Policies and regulations	
				Raise public awareness of shorebirds and seabirds and their habitat needs, and the impacts of installing riprap in coastal areas.	4.3 Awareness and communications	
				Enhance/restore degraded habitat.	2.3 Habitat and natural process restoration	
Competition from introduced mammalian predators on coastal islands	8.1 Invasive non-native/alien species	Reduce/eliminate mortality from introduced predators on coastal islands	2.5 Reduce parasitism/ predation	Control predator activity at breeding sites.	2.2 Invasive/ problematic species control	Medium: Leach's Storm-Petrel
Competition 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.	8.2 Monitoring	
Competition from mammalian and avian predators	8.2 Problematic native species	Reduce loss of productivity from nest predation on coastal islands	2.5 Reduce parasitism/ predation	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	High: Roseate Tern
				Discourage gulls at managed colonies and at islands selected for restoration.	2.2 Invasive/ problematic species control	
				Establish at least one additional predator-free colony.	3.2 Species recovery	

Table 31 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat Priority Species Affected[†]
				Near key Roseate Tern colonies, collect information on gull resource use, home range, and determinants of reproductive success.	8.1 Research	
				Monitor gull population and distribution.	8.2 Monitoring	
Decrease of availability of food to birds due to oil spills and oil discharges	9.2 Industrial & military effluents	Reduce oil contamination in the habitat	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	Medium: Semipalmated Sandpiper
				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	
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 (*melodus*), Red Knot (*rufa*), Semipalmated Sandpiper Medium: Common Loon, Horned Grebe, Purple Sandpiper, 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	

Coastal – Intertidal – Gulf of St.Lawrence

Coastal habitat of MBU 12 NS includes all intertidal habitat types below the high-tide line along ocean shorelines including estuaries, mudflats, sand flats, barrier islands, rocky shorelines, eelgrass, saltmarshes. The Province of Nova Scotia has 5 934 km of coastline along three main marine water bodies: the Gulf of St. Lawrence, the Atlantic Ocean (Scotian Shelf) and the Bay of Fundy (Fig. 47). Priority bird species using coastal habitats (above high tide; BCR 14 NS) and coastal (intertidal) habitats of the Scotian Shelf and Bay of Fundy (MBU 11 NS) are included in the two sections: Coastal (Above High Tide) and the Coastal (Intertidal) – Scotian Shelf and Bay of Fundy, respectively.

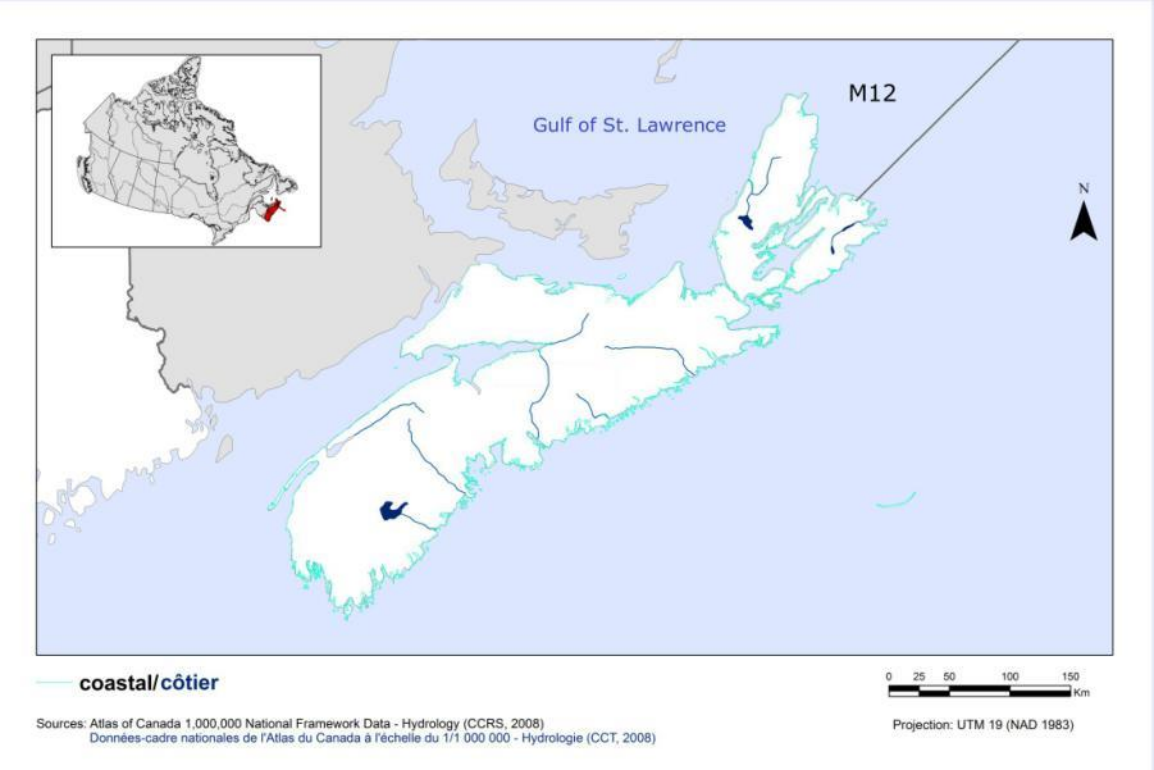

Figure 47. Map of coastal habitats in Nova Scotia. The Gulf of St. Lawrence coastal (intertidal) habitats (MBU 12 NS) is approximately delineated from the Scotian Shelf and Bay of Fundy coastal habitats (MBU 11 NS) by the black line.

Of the 28 priority species that use the coastal (intertidal) habitats of MBU 12 NS, 6 are waterfowl, 8 are waterbirds and 13 are shorebirds. Of these, 4 are species at risk (Table 32). Eleven priority species use saltmarshes, 9 use mudflats, 5 use islands and 18 use estuaries (Table 32).

The highest ranked and most frequently identified threats to priority bird species in the coastal (intertidal) habitats of MBU 12 NS are related to oil spills and discharges from shipping activities (9.2 Industrial & military effluents). Other medium-ranked threats include human disturbances from recreational activities at nesting and foraging sites (6.1 Recreational activities) and losses

of specific habitat features due to changes in sedimentation patterns caused by installation of riprap (7.3 Other ecosystem modifications; Fig. 48).

Many bird species will benefit from the conservation objectives and actions presented in Table 33. Recommended conservation actions to address medium- or high-ranked threats for this habitat include managing coastal recreational and commercial activities to minimize disturbance to priority species and developing beneficial management practices and avoidance guidelines to manage shipping activities and minimize accidental oil discharges.

Table 32. Priority bird species that use coastal (intertidal) habitat of MBU 12 NS, regional habitat sub-class, habitat features important to birds, population objectives and reason for priority status.

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
American Black Duck	Estuaries; Saltmarsh	shallow sheltered areas	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		Maintain current						Y	
Canada Goose (Temperate-breeding in Eastern Canada)	Estuaries; Mudflats; Saltmarsh		Decrease						Y	
Common Eider	Islands; Rocky Shoreline	vegetated or rocky, livestock-free and predator-free islands with abundant seaweed and access to fresh water; abundant prey	Maintain current						Y	
Common Goldeneye	Estuaries	adequate prey	Assess/Maintain						Y	
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					

[1] SAR, species listed under SARA (Species at Risk Public Registry 2012), assessed by (COSEWIC 2012), or listed under Nova Scotia's Endangered Species Legislation (Nova Scotia Government 2007a) as Endangered, Threatened, Special Concern (SARA/COSEWIC only) or Vulnerable (NS only).
[2] N/CC, National/Continental Concern.
[3] N/CS, National/Continental Stewardship.
[4] R/SC, Regional/Sub-regional Concern.
[5] R/SS, Regional/Sub-regional Stewardship.
[6] NAWMP/EHJV, waterfowl that are priority species under the NS EHJV implementation plan (Nova Scotia Eastern Habitat Joint Venture 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).
[7] 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 in Appendix 2: Element 1: Species Assessment to Identify Priority Species.

Table 32 continued

Priority Bird Species	Habitat Sub-class	Important Habitat Features	Population Objective	Reason for Priority Status						
				SAR[1]	N/CC[2]	N/CS[3]	R/SC[4]	R/SS[5]	NAWMP/ EHJV[6]	Review[7]
Great Cormorant	Islands	cliffs or rocky islands free from predators	Assess/Maintain		Y					
Horned Grebe (Magdalen Islands and Western)	Estuaries	sheltered/protected areas	Assess/Maintain	Y						
Hudsonian Godwit	Estuaries; Mudflats; Saltmarsh; Sandflats		Assess/Maintain		Y					
Leach's Storm-Petrel	Islands	vegetated islands with soft soil for digging burrows or rock crevices for nest sites, livestock-free	Assess/Maintain			Y	Y	Y		
Least Sandpiper	Estuaries; mudflats; Saltmarsh		Assess/Maintain		Y					
Lesser Yellowlegs	Estuaries; Mudflats; Saltmarsh		Assess/Maintain		Y					
Piping Plover (melodus)	Sandflats		Recovery objective	Y	Y					
Purple Sandpiper	Rocky Shoreline	rocky shoreline exposed to wave action	Assess/Maintain		Y					
Razorbill	Islands	islands or cliffs for nesting	Assess/Maintain		Y					
Red Knot (rufa)	Mudflats; Saltmarsh; Sandflats		Assess/Maintain	Y	Y					
Red-necked Grebe	Estuaries		Assess/Maintain		Y		Y			
Red-throated Loon	Estuaries	sheltered, shallow, sandy substrate	Assess/Maintain		Y					
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		Increase 50%		Y					

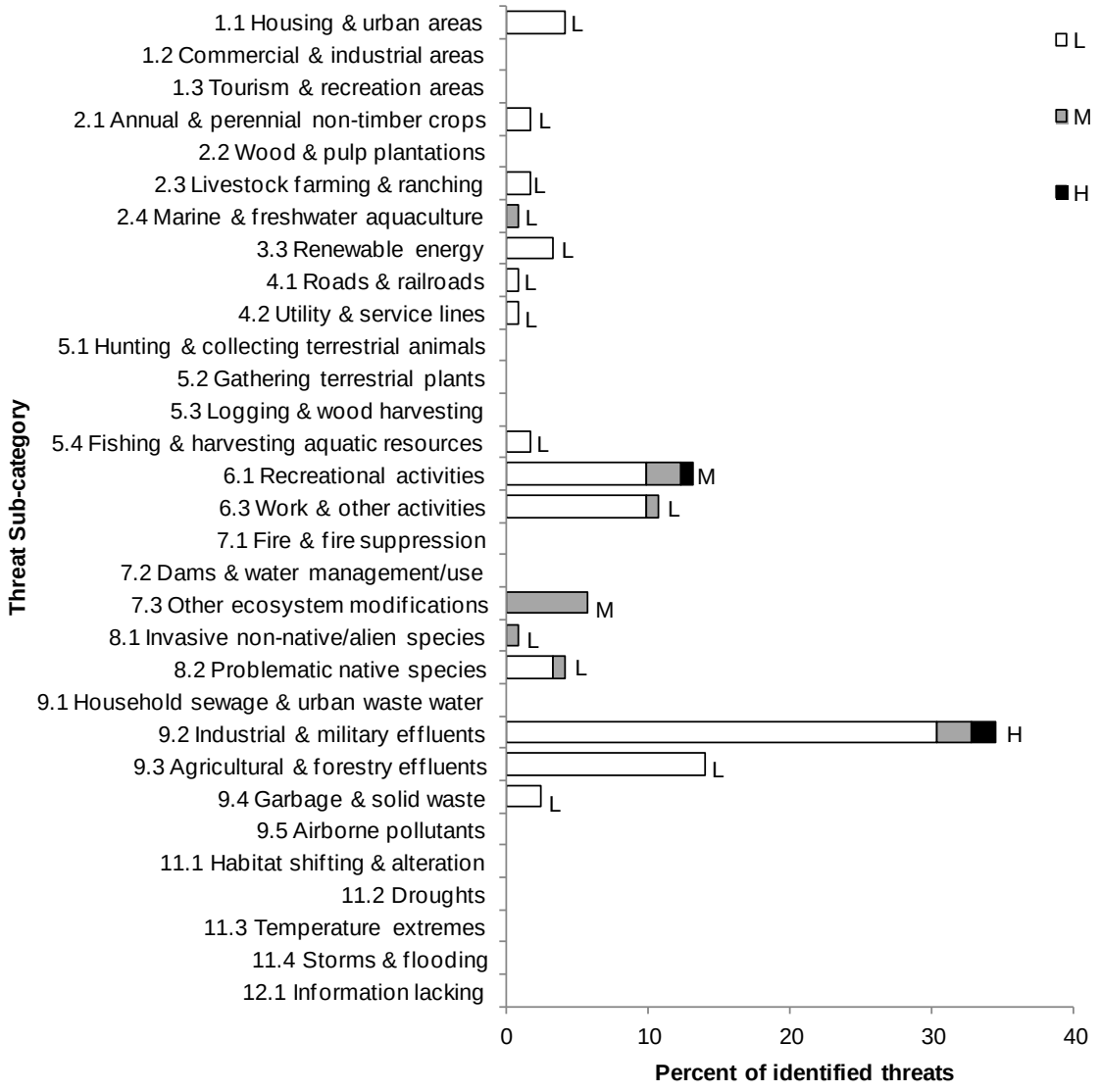

Figure 48. Percent of identified threats to priority bird species on coastal (intertidal) habitat of MBU 12 NS in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in coastal (intertidal) habitat of MBU 12 NS (for example, if 100 threats were identified in total for all priority species in coastal (intertidal) habitat of MBU 12 NS, 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, Medium and High rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked High for one species and Low for another; the shading illustrates the proportion of the various rankings in the sub-category. The overall magnitude of the sub-threat the coastal (intertidal) habitat of MBU 12 NS is shown in Table 4, Relative magnitude of identified threats to priority species within MBU 12 NS 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 33. Threats addressed, conservation objectives, recommended actions and priority bird species affected for threats ranked medium or high in the coastal (intertidal) habitat of MBU 12 NS.

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat Priority Species Affected[†]
Competition for nesting/brood rearing areas with aquaculture farms	2.4 Marine & freshwater aquaculture	Reduce/eliminate competition for brooding/chick rearing areas with the aquaculture industry in nearshore waters	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: Common Eider
				Raise awareness in the industry on the impacts of activities on waterfowl.	4.3 Awareness and communications	
				Assess the impact of aquaculture on priority species.	8.1 Research	
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 (beaches, intertidal mudflats, saltmarshes, etc.) for priority species through various methods such as creation of protected areas, private land acquisitions, conservation easements, or community conservation plans.	1.2 Resource and habitat protection	High: Piping Plover (melodus) Medium: Black-bellied Plover, Red Knot (rufa), Sanderling
				Raise public awareness of shorebirds 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 moulting sites by recreational and industrial boat traffic	6.3 Work & other activities	Reduce/eliminate disturbance from boat traffic	4.2 Reduce disturbance from industrial or work activity	Identify, secure and manage key areas used by moulting eiders through various methods such as creation of protected areas, private land acquisitions, conservation easements, or community conservation plans.	1.1 Site/area protection	Medium: Common Eider
				Manage industrial activities (such as rockweed and shellfish harvest, aquaculture activities, commercial fisheries, and ecotourism) to minimize disturbance to eiders during the moulting period.	5.2 Policies and regulations	
				Raise public awareness of the importance of moulting	4.3 Awareness and	

[†] Priority species not mentioned in this table are absent because identified threats in this habitat are of low magnitude.

Table 33 continued

Threat Addressed	Threat Category	Conservation Objective	Objective Category	Conservation Action	Action Category	Rank of Threat Priority Species Affected†
				areas to eiders, and the impacts of disturbance during moult.	communications	
Loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap	7.3 Other ecosystem modifications	Maintain/restore beaches	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Secure and manage 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	Medium: Black-bellied Plover, Lesser Yellowlegs, Piping Plover (melodus), Red Knot (rufa), Sanderling, Semipalmated Sandpiper, Whimbrel
				Manage coastal development activities to minimize habitat degradation.	5.2 Policies and regulations	
				Raise public awareness of shorebirds and seabirds and their habitat needs, and the impacts of installing riprap in coastal areas.	4.3 Awareness and communications	
				Enhance/restore degraded habitat.	2.3 Habitat and natural process restoration	
Competition from introduced mammalian predators	8.1 Invasive non-native/alien species	Reduce/eliminate mortality from introduced predators on coastal islands	2.5 Reduce parasitism/ predation	Control predator activity at breeding sites.	2.2 Invasive/ problematic species control	Medium: Leach's Storm-Petrel
Competition 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	8.2 Monitoring	
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 (melodus), Red Knot (rufa) Medium: Common Loon, Horned Grebe, 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 Nova Scotia has not yet been determined.

Collisions

Buildings

Collisions with glass windows or reflective panels on buildings are 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 and 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 (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 34 for conservation objectives and actions.

Wind Turbines

The 2 955 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, approximately 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. In fact, wind turbines have a minor effect on bird populations compared to other human-made impacts. 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 3 635 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 5 700 (Zimmerling et al. 2013). See Table 34 for conservation objectives and actions.

Nova Scotia's first wind turbine was installed at Grand Etang in 2002, and the first wind farms were completed at Digby Neck and Nuttby Mountain in 2010. Currently, Nova Scotia produces about 316 MW from wind energy (Nova Scotia Power 2012). In Fall 2010, the government of Nova Scotia pledged to increase the proportion of energy generated by renewable electricity to 40% by 2020; as of 2011, renewable energy was at 17.5% (Nova Scotia Government 2011b). In order to achieve the renewable energy goal, provincial experts estimate that the number of wind turbines will increase from the current 41 (as of 2008) to over 300 (Hatch 2008). Existing wind turbines are found throughout N.S., but the majority is found along the Gulf coast (Nova Scotia Power 2012).

Communication Towers

There are currently almost 8 000 communication towers in Canada >60 m 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 each 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 communication towers may negatively affect the population trends of some birds. See Table 34 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). For instance, MacKinnon and Kennedy (2011) recently recorded mortality and injury of Common Eiders from collisions with local power transmission lines and shortwave communication towers during their fall migration through the New Brunswick and Nova Scotia border area. 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). Nova Scotia Power owns and manages 5 300 km of transmission lines and 31 800 km of distribution lines across the province (Nova Scotia Power 2013). See Table 34 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), which are often bordered by fences and vegetation that provide convenient places for birds to perch, forage and nest. In Nova Scotia, the department of transportation manages more than 23 000 km of roads (Nova Scotia Government 2012b). This does not include roads in towns, cities or owned by municipalities or roads in National Parks. 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. 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 that 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 34 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.

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 many species of birds are potentially vulnerable to population effects at the local scale in southern Canada. In BCR 14 NS, the Gray Catbird in cultivated and managed areas and the Common Nighthawk in urban areas have been identified as priority species affected by cat predation. See Table 34 for 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).

The 2006 Agriculture Census (Statistics Canada 2006) reported that in Nova Scotia in 2006, commercial fertilizer was applied on 819 km^2; herbicides were applied on 285 km^2; insecticides on 121 km^2; and fungicides on 108 km^2. 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 total value of agricultural production in Nova Scotia was near $6 million in 2010 (Statistics Canada 2011a) while the aquaculture industry gross outputs for 2010 were near $38 million (Statistics Canada 2011b), though N.S. government reports a value of $41 million for 2010, 80% of which is from finfish cultures (Nova Scotia Government 2011c). Pesticides are used by the aquaculture industry for the control of crustacean parasites such as sea lice; however, there is no information on the amounts used by the industry.

Contamination from pesticides was identified as a threat to priority bird species in all BCR 14 NS habitats except for urban areas (and for 51 of its 62 priority bird species). It was also a threat to priority species in the coastal and marine habitats of MBU 11 NS (for 26 of its 46 priority species) and of MBU 12 NS (for 25 of its 35 priority species). See Table 34 for conservation objectives and actions.

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.

This threat was identified for herbaceous, urban, wetlands, coastal (above high tide) habitats and inland waters of BCR 14 NS for 9 of its 62 priority bird species. It was also identified for the coastal (intertidal) habitats and marine waters of MBU 11 NS for 21 of its 46 priority species, and for those of MBU 12 NS for 19 of its 35 priority species. See Table 34 for conservation objectives and actions.

Acid Deposition

Acid rain is a problem in eastern Canada because many of the water and soil systems in this region lack natural alkalinity – such as a lime base – and therefore cannot neutralize acid naturally (Environment Canada 2012). Provinces that are part of the Canadian Precambrian Shield, like Ontario, Quebec, New Brunswick and Nova Scotia, are hardest hit because the chemistry of their water and soil systems cannot fight the damaging consequences of acid rain (Environment Canada 2012).

Habitat degradation due to acid precipitation affecting prey availability and/or reductions in fecundity due to the contamination of food from acid precipitation have been identified as threats to nine priority bird species in eight habitats in BCR 14 NS (Table A-3).

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 waterproofing 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 34 for conservation objectives and actions.

The Gulf of St. Lawrence is the gateway for shipping traffic to Quebec and Ontario. In 2007, more than 65 million tonnes of domestic shipping and 161 million tonnes of international shipping passed through the Gulf, while 7 thousand tonnes of domestic shipping and 42 million tonnes of international shipping arrived in Nova Scotia (Statistics Canada 2010b). Saint John (N.B.) handles heavy traffic cargo (>25 million tonnes), mostly in the form of crude oil (Vasarhelyi and Kirk 2007), much of which would pass through marine waters in the Bay of Fundy in Nova Scotia. Halifax and Sydney are popular destinations for cruise ships; a reported 312 000 people visited in 2011 (Nova Scotia Government 2011d). Fishing is a cornerstone industry sector in Nova Scotia and produces a quarter of Canada's seafood, the largest proportion of any province (Nova Scotia Government 2007b). Given the extensive traffic through the MBU 11 NS and MBU 12 NS, the area is susceptible to oil spills both accidental and intentional. See Table 34 for conservation objectives and actions.

Table 34. Conservation objectives and actions associated with bird mortality from collisions, cats and contaminants.

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority 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.	Follow beneficial management practices for reducing bird mortality when designing and locating wind turbines. Ensure that offshore wind energy developments will not present significant migration barriers. Locate offshore wind energy developments away from seabird breeding colonies and important waterbird foraging areas. 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.	2.1 Site/area management 5.3 Private sector standards and codes 1.2 Resource and habitat protection 8.2 Monitoring	Common Tern, Leach's Storm Petrel
Collisions with communications towers cause bird mortality, particularly during migration.	1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with human-made structures	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing mortality to birds when constructing new communications towers. Switch off solid lights on existing towers and ensure that remaining lights have a synchronized, complete dark phase. 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. Retrofit existing towers to adhere to as many	2.1 Site/area management 5.3 Private sector standards and codes	All species

Table 34 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Species Affected
				guidelines as possible.		
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.	In high-risk areas, retrofit power lines so that the risk of electrocution of raptors is minimized. In new developments, locate transmission lines underground. Use markers or paint to increase visibility of power lines in high-strike areas. Avoid siting lines over or near wetlands.	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.	Erect road signs or speed bumps to lower vehicle speeds where bird activity is frequent. Remove plants that attract birds from roadsides and medians. Landscape along roads using taller trees and 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.	2.1 Site/area management 1.1 Site/area protection	Bald Eagle, Barn Swallow, Common Nighthawk, Short-eared Owl
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 (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 such as Common Nighthawk, Gray Catbird Tree Swallow Barn Swallow American Redstart Purple Finch Evening Grosbeak

Table 34 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority 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.	Evaluate which species are most vulnerable to cat predation. Investigate the population-level effects of cat predation through better monitoring of kill rates and the number of feral cats. 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. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.	8.1 Research 8.2 Monitoring	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	Reduce mortality and sub-lethal effects of pesticides on birds Reduce the effects of pesticides on prey species	2.1 Reduce mortality and/or sub-lethal effects from pesticide use. 5.1 Maintain natural food webs and prey sources.	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. Improve regulation of pesticides/rodenticides/herbicides in Canada to reduce bird mortality.	5.2 Policies and regulations 5.3 Private sector standards and codes	**Direct or indirect poisoning by pesticides:** American Golden-plover, American Redstart, American Woodcock, Bald Eagle, Belted Kingfisher, Evening Grosbeak, Killdeer, Lesser Yellowlegs, Northern Parula, Peregrine Falcon (*anatum/tundrius*), Ruffed Grouse, Short-eared Owl, Solitary Sandpiper, Spotted Sandpiper, Tree Swallow, Veery, Virginia Rail, Whimbrel, Wilson's Snipe, American Black Duck, Barrow's Goldeneye (Easter), Black-bellied Plover, Canada Goose (North Atlantic and Temperate-breeding), Common Eider, Common Goldeneye, Common Tern, Dovekie, Dunlin, Harlequin Duck (Eastern), Hudsonian Godwit, Ivory Gull, Leach's Storm-Petrel, Least Sandpiper, Long-tailed Duck, Piping Plover (melodu), Red Knot, Sanderling, Semipalmated

Table 34 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Species Affected
						Sandpiper, Surf Scoter, Willet, Black Scoter **Reductions in prey due to pesticide use:** American Bittern, Bank Swallow, Barn Swallow, Bay-breasted Warbler, Black-and-white Warbler, Black-billed Cuckoo, Blackburnian Warbler, Black-throated Green Warbler, Blue-headed Vireo, Bobolink, Canada Warbler, Cape May Warbler, Chimney Swift, Common Loon, Common Nighthawk, Eastern Whip-poor-will, Eastern Wood-pewee, Magnolia Warbler, Mourning Warbler, Olive-sided Flycatcher, Pied-billed Grebe, Rusty Blackbird, Sora, White-throated Sparrow
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
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	American Bittern, American Black Duck, Canada Goose (North Atlantic and Temperate Breeding), Common Loon, Mallard, Ring-necked Duck, Black-legged Kittiwake, Bonaparte's Gull, Common Murre, Common Tern, Dovekie, Ivory Gull, Leach's Storm-Petrel, Razorbill, Red-necked Grebe, Red-throated Loon, Thick-billed Murre
Mortality of waterbirds from oil pollution.	9. Pollution	Reduce mortality from oil pollution	2.3 Reduce mortality and/or sublethal effects of oil	Improve monitoring and enforcement capacity to reduce chronic oil pollution from illegal dumping of bilge waste and cleaning of oil tanks.	5.4 Compliance and enforcement	**Lethal and sublethal effect of oil exposure:** American Black Duck, Barrow's Goldeneye, Black-bellied Plover, Blacklegged Kittiwake, Bonaparte's

Table 34 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Species Affected
			pollution. 5.1 Maintain natural food webs and prey sources.	Improve education/outreach to make 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	Gull, Canada Goose (North Atlantic and Temperate Breeding), Common Eider, Common Goldeneye, Common Loon, Common Murre, Common Tern, Cory's Shearwater, Dovekie, Dunlin, Great Cormorant, Great Shearwater, Great skua, Harlequin Duck (Eastern), Horned Grebe, Hudsonian Godwit, Ivory Gull, Leach's Storm-Petrel, Least Sandpiper, Lesser Yellowlegs, Manx Shearwater, Piping Plover (melodus), Purple Sandpiper, Razorbill, Red Knot (rufa), Red Phalarope, Red-necked Grebe, Red-necked Phalarope, Red-throated Loon, Sanderling, Semipalmated Sandpiper, Sooty Shearwater, South Polar Skua, Surf Scoter, Thick-billed Murre, Whimbrel, White-winged Scoter,Willet, Black Scoter, Long-tailed Duck
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.	Evaluate the affects of PBDEs and other chemicals on vital rates in birds. Evaluate the extent to which pesticides are reducing prey availability for aerial insectivores. Improve the ability to monitor and understand the effects of contaminant concentrations in birds. Continue to acquire information on oiling of waterbirds through programs like Birds Oiled at Sea.	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 that alter habitat structure and community composition (North American Bird Conservation Initiative 2009; Faaborg et al. 2010). See Tables 35 and 36 for a summary of impacts of climate change and conservation objectives.

A recent exercise used bioclimatic modelling 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 priority 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. In BCR 14 NS, the model predicts a gain of 30 species, a loss of 30 species for a total turnover (species gains + species losses) of 38%.

Some of the predicted impacts of climate change in the 21st century in Nova Scotia include increases in both mean annual temperature (with the highest predicted temperatures in interior areas) and precipitation (although inland areas may experience drier summers; Lemmen, et al. 2008), a rise in sea level, more intense coastal storms, and more extreme weather, including more frequent droughts and more intense rainfall (Warren et al. 2010).

Throughout the Scotian Shelf and Bay of Fundy, some of the impacts of climate change include changes in frequency and intensity of storms, sea-level rise (Shaw et al. 2003) and a decrease in salinity (Greene et al. 2008). Along the Atlantic coast of Nova Scotia, an additional expected impact is a reduction of shorefast ice, which protects the coast against significant storm waves (Shaw et al. 2003). Additional predicted impacts for the Gulf of Maine include an increase in sea surface temperature (Fogarty et al. 2007) and acidification (Nye 2010).

In the Gulf of St. Lawrence, some of the impacts of climate change are expected to include changes in surface and intermediate waters and ice cover (Galbraith et al. 2010), changes in storm frequency and intensity, and sea-level rise (Shaw et al. 2003), as well as a decrease in freshwater from the St. Lawrence River, which could affect water circulation and stratification in the Gulf (Saucier et al. 2009). There may also be a decrease in salinity due to an increase in 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 become even lower as water warms; this is a concern along the Gulf's coastal areas and harbours (Gilbert et al. 2005).

In BCR 14 NS, 60 priority species are expected to be affected by climate change through habitat alterations resulting in loss of suitable habitat and reductions in survival or fecundity. For 4 of those priority species, climate change has been given a high threat magnitude (Bank Swallow, Barn Swallow, Bobolink and Common Tern). In MBU 11 NS, 33 priority species and in MBU 12 NS, 23 priority species are expected to be affected by climate change through habitat loss or reductions in productivity. Climate change has been given a high threat magnitude for the Common Tern in both MBUs as they are expected to be highly affected by reductions in fecundity. See Table 35 for a more thorough list of priority species that will be affected by climate change and Table 36 for conservation objectives and actions to address the threats due to climate change.

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 35. Examples of the current and anticipated effects of climate change on bird populations in Canada and examples of priority bird species impacted by each climate change effect.
Note: the species shown here do not represent an exhaustive list; rather, they provide examples of species for which the effects of climate change have been suggested or documented.

Potential and Realized Effects of Climate Change	Priority Species Affected in BCR 14 NS, MBU 11 NS and MBU 12 NS
Mismatch between peak hatch and peak food abundance	American Bitter, American Black Duck, American Golden-Plover, American Redstart, Blad Eagle, Bank Swallow, Barn Swallow, Bay-breasted Warbler, Belted Kingfisher, Black-and-white Warbler, Black-billed Cuckoo, Blackburnian Warbler, Black-bellied Plover, Black-throated Green Warbler, Blue-headed Vireo, Bobolink, Boreal Chickadee, Canada Goose (temperate breeding in Eastern Canada), Canada Warbler, Cape May Warbler, Chimney Swift, Common Nighthawk, Eastern Kingbird, Eastern Whip-poor-will, Eastern Wood-Pewee, Evening Grosbeak, Gray Catbird, Gray Jay, Green-winged Teal, Hudsonian Godwit, Killdeer, Least Sandpiper, Lesser Yellowlegs, Magnolia Warbler, Mallard, Mourning Warbler, Nelson's Sparrow, Northern Parula, Olive-sided Flycatcher, Peregrine Falcon (*anatum/tundrius*), Pied-billed Grebe, Piping Plover (melodus), Purple Finch, Red Knot (rufa), Ring-necked Duck, Ruffed Grouse, Rusty Blackbird, Sanderling, Savannah Sparrow (princeps), Semipalmater Sandpiper, Short-eared Owl, Solitary Sandpiper, Sora, Spotted Sandpiper, Spruce Grouse, Tree Swallow, Veery, Virginia Rail, Whimbrel, White-throated Sparrow, Willet, Wilson's Snipe
Extended breeding season	Canada Goose, Lincoln's Sparrow

Table 35 continued

Potential and Realized Effects of Climate Change	Priority Species Affected in BCR 14 NS, MBU 11 NS and MBU 12 NS
Habitat loss as a result of ecosystem changes	American Bitter, American Black Duck, American Woodcock, Bank Swallow, Bicknell's Thrush, Black-bellied Plover, Black-legged Kittiwake, Canada Goose (Temperate breeding in Eastern Canada), Canada Warbler, Common Eider, Common Tern, Dovekie, Dunlin, Great Cormorant, Ivory Gull, Leach's Storm-Petrel, Pied-billed Cuckoo, Pine Grosbeak, Rusty Blackbird, Savannah Sparrow (princeps), Solitary Sandpiper, Sora, Roseate Tern, Virginia Rail, Willet
Increase in severe weather events	Tree Swallow, Barn Swallow, Chimney Swift, Common Nighthawk, Tree Swallow
Introduction of new predators and competitors	Red-necked Grebe
Range shifts to the north and from coastal to inland sites	Tennessee Warbler, Spruce Grouse
Changes in ocean temperature and currents impact marine productivity and food webs	Great Cormorant, Great Shearwater, Leach's Storm-Petrel, Razorbill, Sooty Shearwater, Black-legged Kittiwake, Black Scoter, Common Eider, Common Murre, Common Tern, Cory's Shearwater, Dovekie, Dunlin, Great Skua, Manx Shearwater, Red Phalarope, Red-necked Phalarope, Roseate Tern, South Polar Skua, Surf Scoter, Thick-billed Murre

Table 36. Proposed conservation objectives and actions to address climate change.

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Species Affected
Climate change impacts habitat and negatively affects survival and productivity of birds	11.1 Habitat shifting and alteration	Reduce greenhouse gas emissions Mitigate the effects of climate change on bird habitat	6.1 Support efforts to reduce greenhouse gas emissions 6.2 Manage for habitat resilience as climate changes	Support efforts to reduce greenhouse gas emissions. 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. Manage buffer areas and the matrix between protected areas to enhance movement of species across the landscape. Manage ecosystems to maximize carbon storage and sequestration while simultaneously enhancing bird habitat. 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).	5.2 Policies and regulations 1.1 Site/area protection 2.1 Site/area management 5.2 Policies and regulations	In BCR 14 NS: American Woodcock, Bicknell's Thrush, Pine Grosbeeak, Eastern Whip-poor-will, nelson's Sparrow, Savannah Sparrow (princeps) In MBU 11 NS: Common Tern, Dovekie, Great Skua, Great Shearwater, Ivory Gull, Razorbill, Red Knot (rufa), Sooty Shearwater, South Polar Skua, Thick-billed Murre In MBU 12 NS: Common Tern, Dovekie, Great Shearwater, Ivory Gull, Razorbill, Red Knot (rufa), Sooty Shearwater
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	Evaluate which species are most vulnerable to climate change. Investigate the cumulative effects of climate change. 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	8.1 Research	All

Table 36 continued

Threats Addressed	Threat Category	Objective	Objective Category	Recommended Actions	Action Category	Priority Species Affected
				studies. Continue to monitor bird populations so changes in numbers and distributions can be identified. Undertake monitoring to evaluate the effectiveness of mitigation activities.	8.2 Monitoring	

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." The 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 39 priority species in BCR 14 NS, 36 priority species in MBU 11 NS and 28 priority species in MBU 12 NS. The list of species and recommendations for improving population monitoring appear in Table 37.

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;
- review the information needs and expenditures for duck banding programs; and
- realign resources for eider and scoter monitoring to a more efficient suite of surveys.

With the Avian Monitoring Review recommendations (Avian Monitoring Review Steering Committee 2012), there is a need for further discussions with other government officials and key bird and habitat conservation players about bird population monitoring needs and priorities not only for BCR 14 NS and its associated marine units but also for all priority birds within Atlantic Region.

Table 37. Monitoring objectives for priority species in BCR 14 NS, MBU 11 NS and MBU 12 NS for which we do not have good monitoring data.

Objective	Priority Species Affected
1. Develop/improve population monitoring techniques for priority birds wintering in BCR 14 NS, NS MBUs 11, 12 (trend direction and magnitude) not effectively monitored using existing techniques.	BCR 14 NS: Ruffed Grouse, Northern Goshawk, Bald Eagle, Short-eared Owl, American Three-toed Woodpecker, Black-backed Woodpecker, Purple Finch, Evening Grosbeak, Common Golden-eye. MBU 11 NS: Purple Sandpiper, Red-throated Loon, Common Loon, Red-necked Grebe, Horned Grebe, Ivory Gull, Bonaparte's Gull, Long-tailed duck, Common Goldeneye, Common Eider MBU 12 NS: 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 NS, MBU 11 NS, MBU 12 NS (trend direction and magnitude) not effectively monitored using existing techniques.	In BCR 14 NS: American Golden-Plover, Solitary Sandpiper, Whimbrel, Belted Kingfisher, Bay-breasted warbler and other landbird priority species In MBU 11 NS, MBU 12 NS: All priority species
3. Develop/improve monitoring techniques for priority birds breeding in BCR 14 NS (trend direction and magnitude) not effectively monitored using existing techniques.	Pied-billed Grebe, Least Bittern, Green Heron, Yellow Rail, Virginia Rail, Sora, Black Tern, Common Tern, Nelson's Sparrow, Rusty Blackbird, Willet, Green-winged Teal, Ring-necked Duck, Solitary Sandpiper, Wilson's Snipe, Red-shouldered Hawk, Ruffed Grouse, American Three-toed Woodpecker, Whip-poor Will, Bay-breasted Warbler, Bicknell's Thrush White-throated Sparrow, Boreal Chickadee, Bank Swallow, Peregrine Falcon, Short-eared Owl

Table 37 continued

Objective	Priority Species Affected
4. Develop appropriate habitat monitoring techniques across spatial scales (associations, trend direction and magnitude).	All priority species of BCR 14 NS, MBU 11 NS, MBU 12 NS
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) and offshore habitat (boating, fishing, offshore wind farm development, resource extraction energy, etc.)	Priority waterbirds, waterfowl and shorebirds in BCR 14 NS and all priority birds species of MBU 11 NS, MBU 12 NS
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 species in BCR 14 NS, MBU 11 NS, MBU 12 NS

Research

The focus of this section is to outline the main areas where a lack of information hindered the 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 38). 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.

Table 38 provides a preliminary list of research needs for BCR 14 NS. This list will be used as a starting point for further discussions with other government officials, key bird and habitat conservation players and scientists about research needs and priorities for BCR 14 NS and its associated marine units along with all priority birds within Atlantic Region.

Table 38. General research objectives for BCR 14 NS, MBU 11 NS and MBU 12 NS.

Objective	Examples of 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 and Bicknell's Thrush (in BCR 14 NS) and shorebirds (in MBU 11 NS, MBU 12 NS)
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 species of BCR 14 NS, MBU 11 NS, MBU 12 NS
3. Develop a spatially explicit habitat/threat framework for identifying spatial priorities for bird conservation.	All priority species of BCR 14 NS, MBU 11 NS, MBU 12 NS
4. Determine the degree of genetic isolation of priority birds at risk and determine effective population size.	Bicknell's Thrush, other priority species of BCR 14 NS
5. Determine whether physiological stress as determined by H-L ratio can be used as productivity measure in hard-to-study species.	Bicknell's Thrush and other priority species of BCR 14 NS
6. Conduct research, using stable isotopes, geolocators and/or other approaches as appropriate for each priority species, in order to identify: 1) foraging areas, migratory routes, staging areas, and wintering grounds; 2) assess threats throughout their range; and 3) target conservation efforts.	All priority species of BCR 14 NS, MBU 11 NS, MBU 12 NS
7. Continue to engage in interdisciplinary climate change research with respect to understand environmental changes, impact on habitat requirements for priority birds, changes in the ecosystem and food web, and identify species most vulnerable	All priority species of BCR 14 NS, MBU 11 NS, MBU 12 NS
8. 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); identify species most vulnerable.	All priority species of BCR 14 NS, MBU 11 NS, MBU 12 NS

Table 38 continued

Objective	Examples of Species Affected
9. Determine the population-level significance of mortality from predation by domestic and feral cats. Identify particularly vulnerable priority birds.	All priority species of BCR 14 NS
10. 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 species of BCR 14 NS, MBU 11 NS, MBU 12 NS
11. 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.	In BCR 14 NS: Pied-billed Grebe, Least Bittern, Green Heron, Yellow Rail, Virginia Rail, Sora, Black Tern, Common Tern, American Golden-Plover, Piping Plover, Spotted Sandpipier, Solitary Sandpiper, Whimbrel, Bank Swallow, Nelson's Sparrow In MBU 11 NS, MBU 12 NS: All priority species using the intertidal zone
12. 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.	In BCR 14 NS: Pied-billed Grebe, Least Bittern, Green Heron, Yellow Rail, Virginia Rail, Sora, Black Tern, Common Tern, American Golden-Plover, Piping Plover, Spotted Sandpipier, Solitary Sandpiper, Whimbrel, Bank Swallow, Nelson's Sparrow In MBU 12 NS: All priority species using the intertidal zone
13. Participate in national assessments, including cost/benefit analysis, of the possibilities for demographic monitoring of landbirds in Canada to determine value of demographic monitoring.	Priority landbirds of BCR 14 NS
14. Assess impacts of offshore development on priority bird habitats (existing and anticipated resource extraction projects, offshore wind development, etc.) and cumulative effects.	All priority species using offshore habitats of MBU 11 NS, MBU 12 NS

Threats Outside Canada

Many bird species found in Canada spend a large portion of their lifecycle outside the country (Fig. 49). 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 62 priority species in BCR 14 NS, 42 (68%) are migratory and spend part of their annual cycle—up to half the year or more—outside Canada. Of the 46 priority species in MBU 11 NS and 35 priority species in MBU 12 NS, 43 (93%) and 33 (94%) are migratory, respectively.

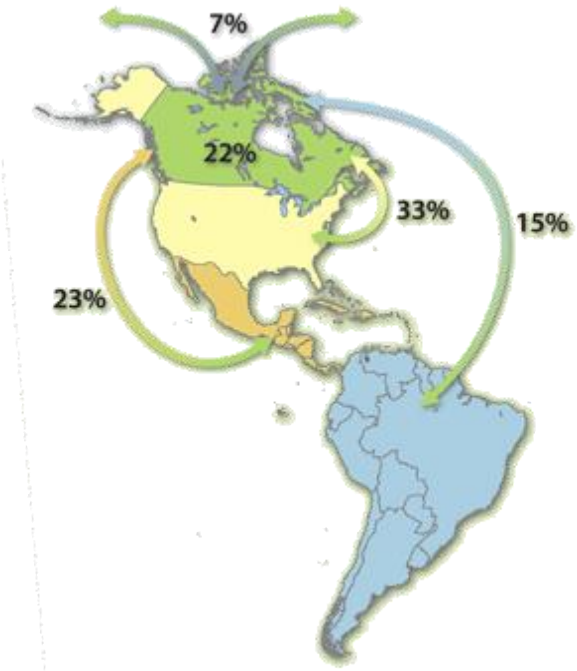

Figure 49. Percent of Canadian breeding birds that migrate to regions outside Canada for part of their life cycle (North American Bird Conservation Initiative 2012).

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 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 Canada.

Despite this, some information is available to inform conservation work outside Canada (Figures 50, 51, 52). Priority birds from BCR 14, MBU 11 and MBU 12 in Nova Scotia face the loss or degradation of key migration and wintering habitats. The primary sources of habitat loss and degradation include residential development (1.1 Housing & urban areas), the conversion of grasslands, wetlands and forests for agricultural use (2.1 Annual & perennial non-timber crops), and deforestation (for BCR 14 NS; 5.3 Logging & 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 NS, MBU 11 NS and MBU 12 NS are the lethal and sub-lethal impacts of exposure to industrial and agricultural contaminants (9.2 Industrial & military effluents and 9.3 Agricultural & forestry effluents), particularly for species found in the marine biogeographic units. 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 Canada are related to legal and illegal hunting activities and poisoning from lead shot (5.1 Hunting & collecting terrestrial animals) and collisions with buildings and towers (1.2 Commercial & industrial areas). Priority species from MBU 11 NS and MBU 12 NS are also susceptible to impacts from fishing and harvesting aquatic resources (5.4 Fishing & harvesting aquatic resources); these include incidental fisheries bycatch and habitat alteration from rockweed harvesting and aquaculture.

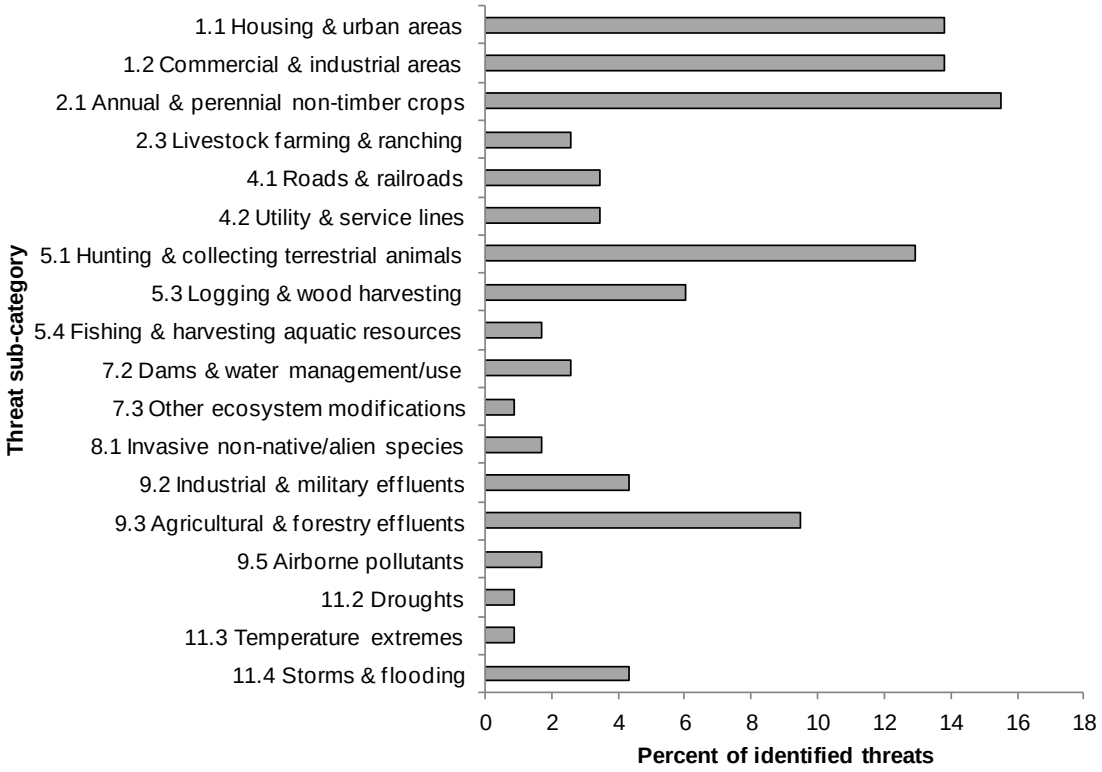

Figure 50. Percent of identified threats to priority species (by threat sub-category) in BCR 14 NS when they are outside Canada.

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

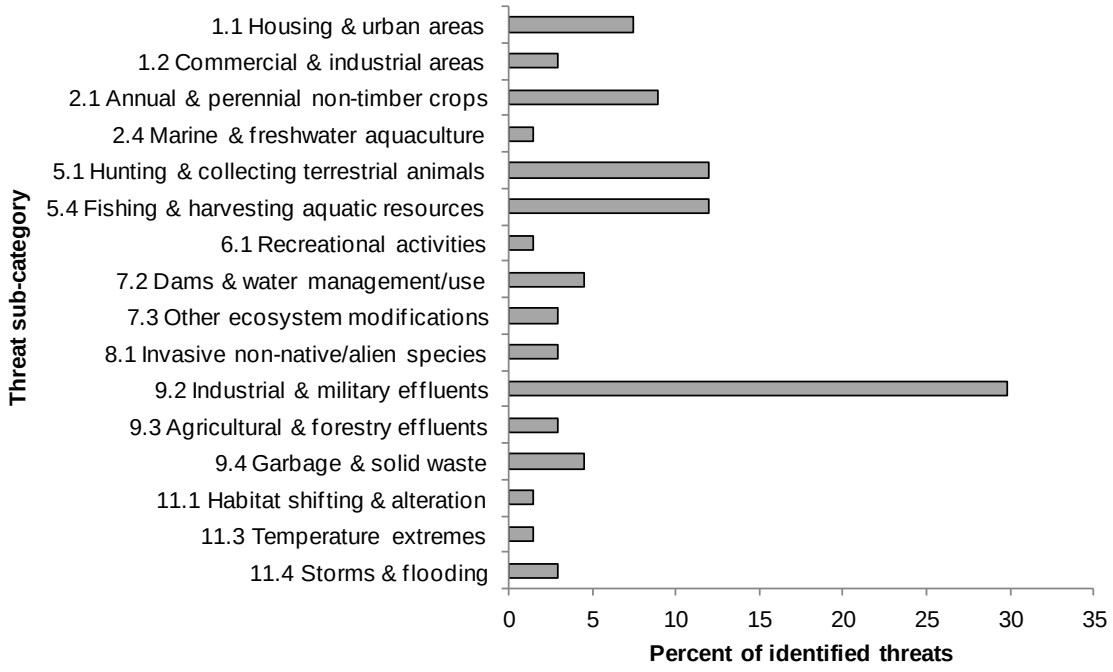

Figure 51. Percent of identified threats to priority species (by threat sub-category) in MBU 11 NS when they are outside Canada.

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

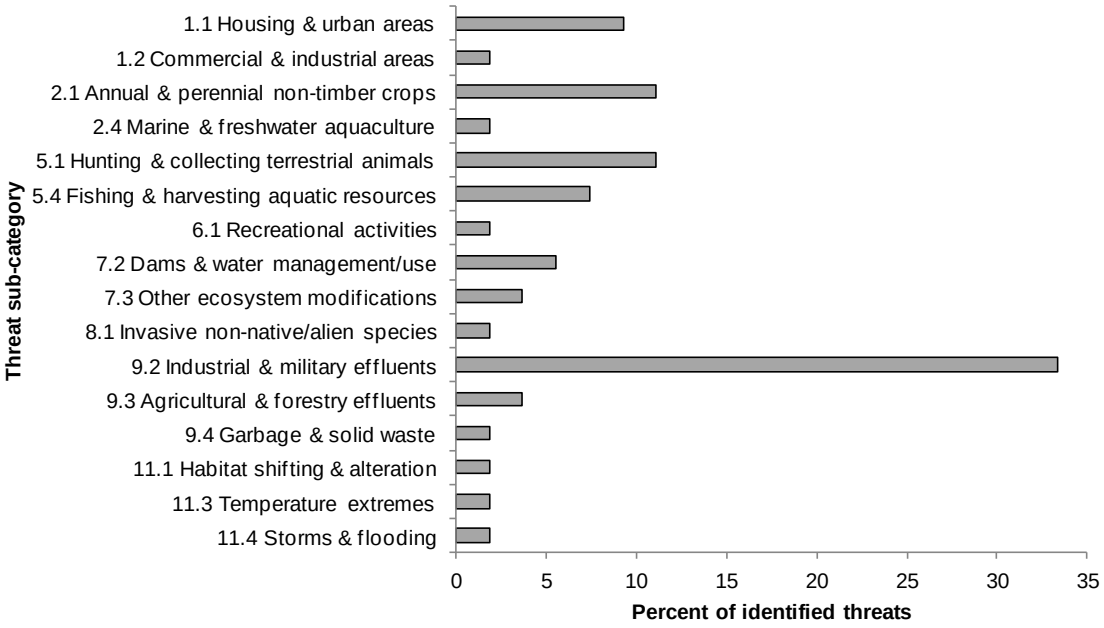

Figure 52. Percent of identified threats to priority species (by threat sub-category) in MBU 12 NS when they are outside Canada.

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, non-governmental organizations 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 (oiseauxmigrateurs_migratorybirds@ec.gc.ca).

References

Aboriginal Affairs and Northern Development Canada. Aboriginal and Treaty Rights Information System (ATRIS). Accessed Jan 23 2013. www.aadnc-aandc.gc.ca/eng/1100100014686/1100100014687

American Bird Conservancy. 2012. *Bird Collisions at Communication Towers.* www.abcbirds.org/abcprograms/policy/collisions/towers.html Accessed March 19, 2012.

Andres, B.A. 2009. *Analysis of Shorebird Population Trend Datasets.* Unpublished document for the North American Bird Conservation Initiative, U.S. Committee. 2009. State of the Birds. U.S. Department of Interior, Washington, D.C., 36 pp.

Andres, B.A., P.A. Smith, C.L. Gratto-Trevor and R.I.G. Morrison. 2012. *Population estimates of North American shorebirds, 2012*. Unpublished.

Atlantic Flyway Technical Section of the Canada Goose Committee. 2008. *Management Plan for the North Atlantic Population of Canada Geese.*, July 2008, 37 pp.

Avian Monitoring Review Steering Committee. 2012. *Environment Canada Avian Monitoring Review – Final Report*. Environment Canada, Ottawa ON, xii + 170 pp. + 3 appendices.

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.

Betts, M. G., J. C. Hagar, J. W. Rivers, J. D. Alexander, K. McGarigal and B. C. McComb. 2012. *Thresholds in forest bird occurrence as a function of the amount or early-seral broadleaf forest at landscape scales.* Ecological Applications 20(8): 2116-2130.

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 – Écologie et conservation des oiseaux 8(2):2. www.ace-eco.org/vol8/iss2/art2/.

Blancher, P.J. 2013. *Estimated number of birds killed by house cats* (Felis catus) *in Canada*. Avian Conservation and Ecology – Écologie et conservation des oiseaux 8(2):3. www.ace-eco.org/vol8/iss2/art3/.

Boates, J.S., J. Chardine, R. Curley, R. Elliot, M. Gloutney, J. Goulet, A. Hanson, P. Hicklin, R. Melanson, J. Paquet, S. Richard and 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 April 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 – Écologie et conservation des oiseaux 8(2):11. www.ace-eco.org/vol8/iss2/art11/.

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 Biodiversity Website (Redpath Museum, McGill University). 2012. *Atlantic Maritime Ecozone.* http://canadianbiodiversity.mcgill.ca/english/ecozones/atlanticmaritime/atlanticmaritime.htm. Accessed: October 2012.

COSEWIC. 2012. *Committee on the Status of Endangered Wildlife in Canada*. www.cosewic.gc.ca Accessed: April 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. 27pp.

eBird Canada. 2009. http://ebird.org/content/canada Accessed : December 2009.

Eeva, T., and E. Lehikoinen. 2000. *Recovery of breeding success in wild birds*. Nature 403: 851-852.

Environment Canada. 2013. Province-Territory Weather Winners. http://climat.meteo.gc.ca/archivedmessages_e.html?startRow=31&selRowPerPage=5&ShortText=&Sort=expiry_date&Direction=&Month=&Year= > Accessed: March 2013.

Environment Canada. 2012. *Acid Rain FAQ.* www.ec.gc.ca/air/default.asp?lang=En&n=7E5E9F00-1#wsD5D8B879 Accessed October 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-B3AEBEAE2342%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. 2010. *Canadian Marine Ecosystem Status and Trends Report*. Vers. revised. Science Advisory Report. October 2010. www.dfo-mpo.gc.ca/csas-sccs/publications/sar-as/2010/2010_030-eng.htm Accessed June 2012.

Fogarty, M., L. Incze, L., R. Wahle, D. Mountain, A. Robinson, A. Pershing, K. Hayhoe, A. Richards, and J. Manning. 2007. *Potential climate change impacts on marine resources of the northeastern United States*. Northeast Climate Impacts Assessment. 32 pp. http://www.northeastclimateimpacts.org/pdf/miti/fogarty_et_al.pdf

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., C.M. Custer, T.W. Custer, J.M. Reed and L.M. Romero. 2008. *Corticosterone stress response in tree swallows nesting near polychlorinated biphenyl- and dioxin-contaminated rivers*. Environmental Toxicology and Chemistry 27: 2326–2331.

Frisk, J. 2011. *Guidance for the preparation of ESTR products - land classification scheme.* Technical Thematic Report No.3, Ottawa, ON: Canadian Biodiversity: Ecosystem Status and Trends 2010 for Canadian Council of Resource Ministers. 34 pp. www.speciesatrisk.ca/resource/DOCUMENT/499No.3_Land_classification_scheme_Feb_2012_E.pdf.

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: April 2011.

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. Ceci. 2008. *Arctic climate change and its impacts on the ecology of the North Atlantic*. Ecology 89: S24-S38 (suppl.)

Gulf of Maine Council on the Marine Environment. 2010. *State of the Gulf of Maine.* www.gulfofmaine.org/2/resources/state-of-the-gulf-of-maine-report. Accessed: June 2012.

Hatch. 2008. *Final Report Nova Scotia Wind Integration Study for NS Department of Energy.* Nova Scotia Government. www.gov.ns.ca/energy/resources/EM/Wind/NS-Wind-Integration-Study-FINAL.pdf Accessed: June 2012.

Kennedy, J.A., E.A. Krebs and A.F. Camfield. 2012. *A Manual for Completing All-bird Conservation Plans in Canada*, April 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.

Lemmen, D.S., F.J. Warren, J. Lacrois and E. Bush. 2008. *From Impacts to Adaptation: Canada in a Changing Climate 2007.* Ottawa, ON: Government of Canada. 448 pp.

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 and D. Drake. 2012. *An Estimate of Avian Mortality at Communication Towers in the United States and Canada*. PLoS ONE 7(4): e34025. http://www.plosone.org/article/info:doi/10.1371/journal.pone.0034025.

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 – Écologie et conservation des oiseaux 8(2):6. http://www.ace-eco.org/vol8/iss2/art6/.

MacKinnon, C.M. and A.C. Kennedy. 2011. *Migrant Common Eider, Somateria mollissima, Collisions with Power Transmission Lines and Shortwave Communication Towers on the Tantramar Marsh in Southeastern New Brunswick.* Canadian Field-Naturalist 125(1): 41-46.

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.

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.

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. 2010. *Christmas Bird Count*. www.audubon.org/bird/cbc/index.html Accessed: May 2010.

National Audubon Society. 2009. *Birds and climate change - Ecological disruption in motion.* 16 pp. www.audubon.org/sites/default/files/documents/bacc-ecologicaldisruptioninmotion_feb2009.pdf

Natural Resources Canada. 2010. *The Atlas of Canada - Coastline and Shoreline.* http://atlas.nrcan.gc.ca/site/english/index.html. Accessed: June 2012.

Natural Resources Canada. 1996. *Agriculture at a glance 1996.* http://atlas.nrcan.gc.ca/site/english/index.html. Accessed: June 2012.

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, U.S. Committee. 2010. *The State of the Birds 2010 Report on Climate Change, United States of America.* US Department of Interior: Washington, DC. 32 pp.

North American Bird Conservation Initiative, U.S. Committee. 2009. *The State of the Birds, United States of America,* US Department of Interior: Washington, DC. 36 pp.

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, 106pp. www.nawmp.ca/pdf/impfr-en-k.pdf

North American Wetlands Conservation Council. No date. *A Wetland Conservation Vision for Canada*. Wetlands Canada: www.wetlandscanada.org/pubs.html. Accessed: September 2012.

Nova Scotia Agricultural Land Review Committee. 2010. *Appendix F: Agricultural Profiles-NS.* Government of Nova Scotia. www.gov.ns.ca/agri/elibrary/nsalrc/AppendixF-AgriculturalProfiles-NS.pdf Accessed: July 2012.

Nova Scotia Eastern Habitat Joint Venture. 2008. *Eastern Habitat Joint Venture Five Year (2007-2012) Plan for the Implementation of the North American Waterfowl Management Plan in Nova Scotia.* North American Waterfowl Management Plan.

Nova Scotia Government. 2012a. *Our Wild Spaces: Protected Areas: 12 Percent.* April 2012. www.gov.ns.ca/nse/12percent/ Accessed: August 2012.

Nova Scotia Government. 2012b. *Highway Construction FAQ.* July 13, 2012. http://novascotia.ca/tran/highways/faq.asp Accessed: July 2012.

Nova Scotia Government. 2011a. *Nova Scotia Wetland Conservation Policy.* October 14, 2011. www.gov.ns.ca/nse/wetland/conservation.policy.asp Accessed: June 2012.

Nova Scotia Government. 2011b. *Nova Scotia Renewables Current Activity in Wind Energy.* www.gov.ns.ca/energy/renewables/current-activity/wind.asp Accessed: June 2012.

Nova Scotia Government. 2011c. *Aquaculture Statistics.* August 24, 2011. www.gov.ns.ca/fish/aquaculture/stats/ Accessed: June 2012.

Nova Scotia Government. 2011d. *Research: Facts and Figures - Key Tourism Indicators.* www.gov.ns.ca/econ/tourism/research/facts-figures/key-tourism-indicators.asp Accessed: June 2012.

Nova Scotia Government. 2007a. *Species at Risk List.* www.gov.ns.ca/natr/wildlife/biodiversity/species-list.asp Accessed: June 2012.

Nova Scotia Government. 2007b. *Fisheries and Aquaculture.* ttns.gov.ns.ca/en/home/doingbusiness/gettingtoknowus/sectorsnapshots/fisheriesaquaculture.aspx Accessed: June 2012.

Nova Scotia Government. 2006. *The Playground: Geography and Climate.* www.gov.ns.ca/playground/geography.asp Accessed: January 2013.

Nova Scotia Government. 2000. *Nova Scotia's Wetland Inventory.* www.gov.ns.ca/natr/wildlife/habitats/wetlands.asp Accessed: August 2012.

Nova Scotia Museum of Natural History. 2009. *Natural History of Nova Scotia, Volume 1: Topics: Fresh Water and Resources. Nova Scotia Surface Water.* November 23, 2009. www.gov.ns.ca/nse/surface.water/docs/NSMuseum_FreshWaterAndResources.pdf Accessed: August 2012.

Nova Scotia Power. 2012. *Interactive Map of Nova Scotia's Wind Energy.* www.nspower.ca/en/home/environment/renewableenergy/wind/map.aspx Accessed: June 2012.

Nova Scotia Power. 2013. *How we deliver electricity.* www.nspower.ca/en/home/aboutnspi/bringingelectricitytoyou/transmissionlinemap.aspx Accessed: October 2013.

Nye, J. 2010. *Climate Change and its effects on Ecosystems, Habitats and Biota: State of the Gulf of Maine Report.* Gulf of Maine Council on the marine environment. June 2010. www.gulfofmaine.org/state-of-the-gulf/climate-change.html Accessed: April 2011.

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

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 and T.C. Will. 2004. *Partners in Flight North American Landbird Conservation Plan.* Cornell Lab of Ornithology. Ithaca, NY. 85 pp + appendices.

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. Lefaivre, 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: April 2011.

Simpson, J. 2008. *Restoring the Acadian Forest: A Guide to Forest Stewardship for Woodlot Owners in the Maritimes.* Kentville, NS. 155pp.

Species at Risk Public Registry. Accessed 4 April 2012. *Schedule 1: List of Wildlife Species at Risk*. www.sararegistry.gc.ca/species/schedules_e.cfm?id=1

Statistics Canada. 2011a. *2011 Census of Agriculture.* www29.statcan.gc.ca/ceag-web/eng/index-index Accessed: October 2012.

Statistics Canada. 2011b. *Aquaculture industry – summary tables.* www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/prim56e-eng.htm Accessed: October 2012.

Statistics Canada. 2010a. *Canada's Population estimate – Table 2. Quarterly demographic estimate.* www.statcan.gc.ca/daily-quotidien/100628/t100628a2-eng.htm. Accessed: June 2012.

Statistics Canada. 2010b. *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. 2008. *Total farm area, land tenure and land in crops, by province.* www40.statcan.gc.ca/l01/cst01/agrc25d-eng.htm Accessed: June 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.

Statistics Canada. 2001. *2001 Census of Agriculture. Canadian Farm Operations in the 21st Century.* www.statcan.gc.ca/ca-ra2001/first-premier/farmop-explagri/01farm-ferme-eng.htm. Accessed: June 2012.

Stewart, R.L.M., K.A. Bredin, A.R. Couturier, A.G. Horn, D. Lepage, S. Makepeace, P. Taylor, R.M. Whittam and P.D. Taylor (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.

Taylor, P. H. 2002. *The Space Between: Lying at the edge of land and water, riparian habitats play a crucial role in the ecosystem.* Gulf of Maine Times 6(3): Fall 2002. www.gulofmaine.org/times/fall2002/science_insights.html. Accessed: October 2012.

Therriault, J.C. 1991. *The Gulf of St.Lawrence: small ocean or big estuary?* Can. Spec. Publ. Fish. Aquat. Sci. 113: 359pp.

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.

Villard, M.-A. 2000. *Reducing long-term effects of forest harvesting on indicator species of closed-canopy mature forests.* Project report 2000-20, Edmonton: Sustainable Forest Management Network = Réseau sur la gestion durable des forêts.

Warren, F. J., T. Kulkarni and D. S. Lemmen (Eds.). 2010. *Canada in a Changing Climate.* Government of Canada, Ottawa, ON. 18 pp.

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: April 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 – Écologie et conservation des oiseaux 8(2): 10. http://www.ace-eco.org/vol8/iss2/art10/

Appendix 1

List of All Bird Species in BCR 14 NS, MBU 11 NS and MBU 12 NS

Table A-1. Complete list of species in BCR 14 NS, MBU 11 NS and MBU 12 NS, when they are in the planning unit (breeding, migrant, winter) and their priority status.

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

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Coccyzus erythropthalmus	Black-billed Cuckoo	Coulicou à bec noir	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Setophaga fusca	Blackburnian Warbler	Paruline à gorge orangée	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Poecile atricapillus	Black-capped Chickadee	Mésange à tête noire	Landbird	BCR 14 NS		BCR 14 NS		
Setophaga striata	Blackpoll Warbler	Paruline rayée	Landbird	BCR 14 NS	BCR 14 NS			
Setophaga caerulescens	Black-throated Blue Warbler	Paruline bleue	Landbird	BCR 14 NS	BCR 14 NS			
Setophaga virens	Black-throated Green Warbler	Paruline à gorge noire	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Guiraca caerulea	Blue Grosbeak	Guiraca bleu	Landbird		BCR 14 NS			
Cyanocitta cristata	Blue Jay	Geai bleu	Landbird	BCR 14 NS		BCR 14 NS		
Polioptila caerulea	Blue-gray Gnatcatcher	Gobemoucheron gris-bleu	Landbird		BCR 14 NS			
Vireo solitarius	Blue-headed Vireo	Viréo à tête bleue	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Vermivora pinus	Blue-winged Warbler	Paruline à ailes bleues	Landbird		BCR 14 NS			
Dolichonyx oryzivorus	Bobolink	Goglu des prés	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Bombycilla garrulus	Bohemian Waxwing	Jaseur boréal	Landbird			BCR 14 NS		
Poecile hudsonicus	Boreal Chickadee	Mésange à tête brune	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Aegolius funereus	Boreal Owl	Nyctale de Tengmalm	Landbird	BCR 14 NS	BCR 14 NS			
Buteo platypterus	Broad-winged Hawk	Petite Buse	Landbird	BCR 14 NS	BCR 14 NS			
Certhia americana	Brown Creeper	Grimpereau brun	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Toxostoma rufum	Brown Thrasher	Moqueur roux	Landbird		BCR 14 NS			
Molothrus ater	Brown-headed Cowbird	Vacher à tête brune	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Cardellina canadensis	Canada Warbler	Paruline du Canada	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Setophaga tigrina	Cape May Warbler	Paruline tigrée	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Bombycilla cedrorum	Cedar Waxwing	Jaseur d'Amérique	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Setophaga pensylvanica	Chestnut-sided Warbler	Paruline à flancs marron	Landbird	BCR 14 NS	BCR 14 NS			
Chaetura pelagica	Chimney Swift	Martinet ramoneur	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Spizella passerina	Chipping Sparrow	Bruant familier	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Spizella pallida	Clay-colored Sparrow	Bruant des plaines	Landbird		BCR 14 NS			
Petrochelidon pyrrhonota	Cliff Swallow	Hirondelle à front blanc	Landbird	BCR 14 NS	BCR 14 NS			
Quiscalus quiscula	Common Grackle	Quiscale bronzé	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Chordeiles minor	Common Nighthawk	Engoulevent d'Amérique	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Corvus corax	Common Raven	Grand Corbeau	Landbird	BCR 14 NS		BCR 14 NS		
Carduelis flammea	Common Redpoll	Sizerin flammé	Landbird		BCR 14 NS	BCR 14 NS		
Geothlypis trichas	Common Yellowthroat	Paruline masquée	Landbird	BCR 14 NS	BCR 14 NS			
Accipiter cooperii	Cooper's Hawk	Épervier de Cooper	Landbird		BCR 14 NS			
Junco hyemalis	Dark-eyed Junco	Junco ardoisé	Landbird	BCR 14 NS		BCR 14 NS		
Spiza americana	Dickcissel	Dickcissel d'Amérique	Landbird		BCR 14 NS	BCR 14 NS		
Picoides pubescens	Downy Woodpecker	Pic mineur	Landbird	BCR 14 NS		BCR 14 NS		
Sialia sialis	Eastern Bluebird	Merlebleu de l'Est	Landbird	BCR 14 NS	BCR 14 NS			
Tyrannus tyrannus	Eastern Kingbird	Tyran tritri	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Sturnella magna	Eastern Meadowlark	Sturnelle des prés	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Sayornis phoebe	Eastern Phoebe	Moucherolle phébi	Landbird	BCR 14 NS	BCR 14 NS			
Pipilo erythrophthalmus	Eastern Towhee	Tohi à flancs roux	Landbird		BCR 14 NS	BCR 14 NS		
Contopus virens	Eastern Wood-Pewee	Pioui de l'Est	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Coccothraustes vespertinus	Evening Grosbeak	Gros-bec errant	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Spizella pusilla	Field Sparrow	Bruant des champs	Landbird		BCR 14 NS			
Passerella iliaca	Fox Sparrow	Bruant fauve	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Regulus satrapa	Golden-crowned Kinglet	Roitelet à couronne dorée	Landbird	BCR 14 NS		BCR 14 NS		
Ammodramus savannarum	Grasshopper Sparrow	Bruant sauterelle	Landbird		BCR 14 NS			
Dumetella carolinensis	Gray Catbird	Moqueur chat	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Perisoreus canadensis	Gray Jay	Mésangeai du Canada	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Myiarchus crinitus	Great Crested Flycatcher	Tyran huppé	Landbird	BCR 14 NS	BCR 14 NS			
Bubo virginianus	Great Horned Owl	Grand-duc d'Amérique	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Falco rusticolus	Gyrfalcon	Faucon gerfaut	Landbird		BCR 14 NS			
Picoides villosus	Hairy Woodpecker	Pic chevelu	Landbird	BCR 14 NS		BCR 14 NS		
Catharus guttatus	Hermit Thrush	Grive solitaire	Landbird	BCR 14 NS	BCR 14 NS			
Setophaga citrina	Hooded Warbler	Paruline à capuchon	Landbird		BCR 14 NS			
Eremophila alpestris	Horned Lark	Alouette hausse-col	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Troglodytes aedon	House Wren	Troglodyte familier	Landbird		BCR 14 NS			
Passerina cyanea	Indigo Bunting	Passerin indigo	Landbird	BCR 14 NS	BCR 14 NS			
Calcarius lapponicus	Lapland Longspur	Bruant lapon	Landbird		BCR 14 NS	BCR 14 NS		
Chondestes grammacus	Lark Sparrow	Bruant à joues marron	Landbird		BCR 14 NS			
Empidonax minimus	Least Flycatcher	Moucherolle tchébec	Landbird	BCR 14 NS	BCR 14 NS			
Melospiza lincolnii	Lincoln's Sparrow	Bruant de Lincoln	Landbird	BCR 14 NS	BCR 14 NS			
Asio otus	Long-eared Owl	Hibou moyen-duc	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Setophaga magnolia	Magnolia Warbler	Paruline à tête cendrée	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Cistothorus palustris	Marsh Wren	Troglodyte des marais	Landbird	BCR 14 NS	BCR 14 NS			
Falco columbarius	Merlin	Faucon émerillon	Landbird	BCR 14 NS	BCR 14 NS			
Zenaida macroura	Mourning Dove	Tourterelle triste	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Oporornis philadelphia	Mourning Warbler	Paruline triste	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Vermivora ruficapilla	Nashville Warbler	Paruline à joues grises	Landbird	BCR 14 NS	BCR 14 NS			
Ammodramus nelsoni	Nelson's Sparrow	Bruant de Nelson	Landbird	BCR 14 NS MBU 12 NS	BCR 14 NS MBU 12 NS			BCR 14 NS
Cardinalis cardinalis	Northern Cardinal	Cardinal rouge	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Colaptes auratus	Northern Flicker	Pic flamboyant	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Accipiter gentilis	Northern Goshawk	Autour des palombes	Landbird	BCR 14 NS	BCR 14 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Circus cyaneus	Northern Harrier	Busard Saint-Martin	Landbird	BCR 14 NS	BCR 14 NS			
Mimus polyglottos	Northern Mockingbird	Moqueur polyglotte	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Parula americana	Northern Parula	Paruline à collier	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Stelgidopteryx serripennis	Northern Rough-winged Swallow	Hirondelle à ailes hérissées	Landbird		BCR 14 NS			
Aegolius acadicus	Northern Saw-whet Owl	Petite Nyctale	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Lanius excubitor	Northern Shrike	Pie-grièche grise	Landbird		BCR 14 NS	BCR 14 NS		
Seiurus noveboracensis	Northern Waterthrush	Paruline des ruisseaux	Landbird	BCR 14 NS	BCR 14 NS			
Contopus cooperi	Olive-sided Flycatcher	Moucherolle à côtés olive	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Vermivora celata	Orange-crowned Warbler	Paruline verdâtre	Landbird		BCR 14 NS	BCR 14 NS		
Icterus spurius	Orchard Oriole	Oriole des vergers	Landbird		BCR 14 NS			
Pandion haliaetus	Osprey	Balbuzard pêcheur	Landbird	BCR 14 NS	BCR 14 NS		MBU 12 NS	
Seiurus aurocapilla	Ovenbird	Paruline couronnée	Landbird	BCR 14 NS	BCR 14 NS			
Setophaga palmarum	Palm Warbler	Paruline à couronne rousse	Landbird	BCR 14 NS	BCR 14 NS			
Falco peregrinus	Peregrine Falcon (*anatum/tundrius*)	Faucon pèlerin	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Vireo philadelphicus	Philadelphia Vireo	Viréo de Philadelphie	Landbird		BCR 14 NS			
Dryocopus pileatus	Pileated Woodpecker	Grand Pic	Landbird	BCR 14 NS		BCR 14 NS		
Pinicola enucleator	Pine Grosbeak	Durbec des sapins	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Carduelis pinus	Pine Siskin	Tarin des pins	Landbird	BCR 14 NS		BCR 14 NS		
Setophaga pinus	Pine Warbler	Paruline des pins	Landbird		BCR 14 NS	BCR 14 NS		
Setophaga discolor	Prairie Warbler	Paruline des prés	Landbird		BCR 14 NS			
Protonotaria citrea	Prothonotary Warbler	Paruline orangée	Landbird		BCR 14 NS			
Haemorhous purpureus	Purple Finch	Roselin pourpré	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Progne subis	Purple Martin	Hirondelle noire	Landbird	BCR 14 NS	BCR 14 NS			
Loxia curvirostra	Red Crossbill	Bec-croisé des sapins	Landbird	BCR 14 NS		BCR 14 NS		

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Melanerpes carolinus	Red-bellied Woodpecker	Pic à ventre roux	Landbird		BCR 14 NS	BCR 14 NS		
Sitta canadensis	Red-breasted Nuthatch	Sittelle à poitrine rousse	Landbird	BCR 14 NS		BCR 14 NS		
Vireo olivaceus	Red-eyed Vireo	Viréo aux yeux rouges	Landbird	BCR 14 NS	BCR 14 NS			
Melanerpes erythrocephalus	Red-headed Woodpecker	Pic à tête rouge	Landbird		BCR 14 NS			
Buteo lineatus	Red-shouldered Hawk	Buse à épaulettes	Landbird		BCR 14 NS			
Buteo jamaicensis	Red-tailed Hawk	Buse à queue rousse	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Agelaius phoeniceus	Red-winged Blackbird	Carouge à épaulettes	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Pheucticus ludovicianus	Rose-breasted Grosbeak	Cardinal à poitrine rose	Landbird	BCR 14 NS	BCR 14 NS			
Buteo lagopus	Rough-legged Hawk	Buse pattue	Landbird		BCR 14 NS	BCR 14 NS		
Regulus calendula	Ruby-crowned Kinglet	Roitelet à couronne rubis	Landbird	BCR 14 NS	BCR 14 NS			
Archilochus colubris	Ruby-throated Hummingbird	Colibri à gorge rubis	Landbird	BCR 14 NS	BCR 14 NS			
Bonasa umbellus	Ruffed Grouse	Gélinotte huppée	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Euphagus carolinus	Rusty Blackbird	Quiscale rouilleux	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Passerculus sandwichensis	Savannah Sparrow	Bruant des prés	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Passerculus sandwichensis princeps	Savannah Sparrow (princeps)	Bruant des prés (princeps)	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Piranga olivacea	Scarlet Tanager	Tangara écarlate	Landbird	BCR 14 NS	BCR 14 NS			
Accipiter striatus	Sharp-shinned Hawk	Épervier brun	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Asio flammeus	Short-eared Owl	Hibou des marais	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Plectrophenax nivalis	Snow Bunting	Bruant des neiges	Landbird		BCR 14 NS	BCR 14 NS		
Bubo scandiacus	Snowy Owl	Harfang des neiges	Landbird		BCR 14 NS	BCR 14 NS		
Melospiza melodia	Song Sparrow	Bruant chanteur	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Falcipennis canadensis	Spruce Grouse	Tétras du Canada	Landbird	BCR 14 NS		BCR 14 NS		BCR 14 NS
Piranga rubra	Summer Tanager	Piranga vermillon	Landbird		BCR 14 NS			
Catharus ustulatus	Swainson's Thrush	Grive à dos olive	Landbird	BCR 14 NS	BCR 14 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Melospiza georgiana	Swamp Sparrow	Bruant des marais	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Vermivora peregrina	Tennessee Warbler	Paruline obscure	Landbird	BCR 14 NS	BCR 14 NS			
Tachycineta bicolor	Tree Swallow	Hirondelle bicolore	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Cathartes aura	Turkey Vulture	Urubu à tête rouge	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Catharus fuscescens	Veery	Grive fauve	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Pooecetes gramineus	Vesper Sparrow	Bruant vespéral	Landbird	BCR 14 NS	BCR 14 NS			
Vireo gilvus	Warbling Vireo	Viréo mélodieux	Landbird		BCR 14 NS			
Tyrannus verticalis	Western Kingbird	Tyran de l'Ouest	Landbird		BCR 14 NS			
Antrostomus vociferus	Whip-poor-will	Engoulevent bois-pourri	Landbird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Sitta carolinensis	White-breasted Nuthatch	Sittelle à poitrine blanche	Landbird	BCR 14 NS		BCR 14 NS		
Zonotrichia leucophrys	White-crowned Sparrow	Bruant à couronne blanche	Landbird		BCR 14 NS	BCR 14 NS		
Zonotrichia albicollis	White-throated Sparrow	Bruant à gorge blanche	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		BCR 14 NS
Loxia leucoptera	White-winged Crossbill	Bec-croisé bifascié	Landbird	BCR 14 NS		BCR 14 NS		
Cardellina pusilla	Wilson's Warbler	Paruline à calotte noire	Landbird	BCR 14 NS	BCR 14 NS			
Troglodytes troglodytes	Winter Wren	Troglodyte mignon	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Hylocichla mustelina	Wood Thrush	Grive des bois	Landbird	BCR 14 NS	BCR 14 NS			
Setophaga petechia	Yellow Warbler	Paruline jaune	Landbird	BCR 14 NS	BCR 14 NS			
Empidonax flaviventris	Yellow-bellied Flycatcher	Moucherolle à ventre jaune	Landbird	BCR 14 NS	BCR 14 NS			
Sphyrapicus varius	Yellow-bellied Sapsucker	Pic maculé	Landbird	BCR 14 NS	BCR 14 NS			
Coccyzus americanus	Yellow-billed Cuckoo	Coulicou à bec jaune	Landbird		BCR 14 NS			
Icteria virens	Yellow-breasted Chat	Paruline polyglotte	Landbird		BCR 14 NS	BCR 14 NS		
Xanthocephalus xanthocephalus	Yellow-headed Blackbird	Carouge à tête jaune	Landbird		BCR 14 NS			
Setophaga coronata	Yellow-rumped Warbler	Paruline à croupion jaune	Landbird	BCR 14 NS	BCR 14 NS	BCR 14 NS		
Pluvialis dominica	American Golden-Plover	Pluvier bronzé	Shorebird		BCR 14 NS MBU 11 NS			BCR 14 NS

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Haematopus palliatus	American Oystercatcher	Huîtrier d'Amérique	Shorebird	BCR 14 NS MBU 11 NS	MBU 11 NS			
Scolopax minor	American Woodcock	Bécasse d'Amérique	Shorebird	BCR 14 NS	BCR 14 NS			BCR 14 NS
Calidris bairdii	Baird's Sandpiper	Bécasseau de Baird	Shorebird		BCR 14 NS MBU 11 NS			
Pluvialis squatarola	Black-bellied Plover	Pluvier argenté	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS		MBU 11 NS MBU 12 NS
Tryngites subruficollis	Buff-breasted Sandpiper	Bécasseau roussâtre	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			
Calidris alpina	Dunlin	Bécasseau variable	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS		MBU 11 NS MBU 12 NS
Tringa melanoleuca	Greater Yellowlegs	Grand Chevalier	Shorebird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			
Limosa haemastica	Hudsonian Godwit	Barge hudsonienne	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			MBU 11 NS MBU 12 NS
Charadrius vociferus	Killdeer	Pluvier kildir	Shorebird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS		BCR 14 NS
Calidris minutilla	Least Sandpiper	Bécasseau minuscule	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			MBU 11 NS MBU 12 NS
Tringa flavipes	Lesser Yellowlegs	Petit Chevalier	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			MBU 11 NS MBU 12 NS
Limnodromus scolopaceus	Long-billed Dowitcher	Bécassin à long bec	Shorebird		MBU 11 NS			
Calidris melanotos	Pectoral Sandpiper	Bécasseau à poitrine cendrée	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Charadrius melodus	Piping Plover	Pluvier siffleur	Shorebird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS MBU 11 NS MBU 12 NS
Calidris maritima	Purple Sandpiper	Bécasseau violet	Shorebird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Calidris canutus	Red Knot	Bécasseau maubèche	Shorebird		MBU 11 NS MBU 12 NS	MBU 11 NS	MBU 12 NS	MBU 11 NS MBU 12 NS
Phalaropus fulicarius	Red Phalarope	Phalarope à bec large	Shorebird		MBU 11 NS			MBU 11 NS
Phalaropus lobatus	Red-necked Phalarope	Phalarope à bec étroit	Shorebird		BCR 14 NS MBU 11 NS			MBU 11 NS
Arenaria interpres	Ruddy Turnstone	Tournepierre à collier	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS		
Calidris alba	Sanderling	Bécasseau sanderling	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS		MBU 11 NS MBU 12 NS
Charadrius semipalmatus	Semipalmated Plover	Pluvier semipalmé	Shorebird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			
Calidris pusilla	Semipalmated Sandpiper	Bécasseau semipalmé	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			MBU 11 NS MBU 12 NS
Limnodromus griseus	Short-billed Dowitcher	Bécassin roux	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			
Tringa solitaria	Solitary Sandpiper	Chevalier solitaire	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS MBU 11 NS MBU 12 NS
Actitis macularius	Spotted Sandpiper	Chevalier grivelé	Shorebird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Calidris himantopus	Stilt Sandpiper	Bécasseau à échasses	Shorebird		BCR 14 NS MBU 11 NS			
Calidris mauri	Western Sandpiper	Bécasseau d'Alaska	Shorebird		MBU 11 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Numenius phaeopus	Whimbrel	Courlis corlieu	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS MBU 11 NS MBU 12 NS
Calidris fuscicollis	White-rumped Sandpiper	Bécasseau à croupion blanc	Shorebird		BCR 14 NS MBU 11 NS MBU 12 NS			
Tringa semipalmata	Willet	Chevalier semipalmé	Shorebird	MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			MBU 11 NS MBU 12 NS
Gallinago delicata	Wilson's Snipe	Bécassine de Wilson	Shorebird	MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Botaurus lentiginosus	American Bittern	Butor d'Amérique	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		BCR 14 NS
Fulica americana	American Coot	Foulque d'Amérique	Waterbird	BCR 14 NS MBU 11 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS		
Sterna paradisaea	Arctic Tern	Sterne arctique	Waterbird	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS			
Fratercula arctica	Atlantic Puffin	Macareux moine	Waterbird	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Cepphus grylle	Black Guillemot	Guillemot à miroir	Waterbird	MBU 11 NS	MBU 11 NS	MBU 11 NS		
Chlidonias niger	Black Tern	Guifette noire	Waterbird	BCR 14 NS	BCR 14 NS			
Nycticorax nycticorax	Black-crowned Night-Heron	Bihoreau gris	Waterbird	MBU 11 NS	BCR 14 NS MBU 11 NS			
Chroicocephalus ridibundus	Black-headed Gull	Mouette rieuse	Waterbird		MBU 11 NS	MBU 11 NS		
Rissa tridactyla	Black-legged Kittiwake	Mouette tridactyle	Waterbird	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS
Chroicocephalus philadelphia	Bonaparte's Gull	Mouette de Bonaparte	Waterbird		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Hydroprogne caspia	Caspian Tern	Sterne caspienne	Waterbird		MBU 11 NS MBU 12 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Bubulcus ibis	Cattle Egret	Héron garde-boeufs	Waterbird		BCR 14 NS MBU 11 NS			
Gavia immer	Common Loon	Plongeon huard	Waterbird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		BCR 14 NS MBU 11 NS MBU 12 NS
Gallinula chloropus	Common Moorhen	Gallinule d'Amérique	Waterbird	BCR 14 NS	BCR 14 NS			
Uria aalge	Common Murre	Guillemot marmette	Waterbird	MBU 11 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 12 NS	MBU 11 NS
Sterna hirundo	Common Tern	Sterne pierregarin	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS MBU 11 NS MBU 12 NS
Calonectris diomedea	Cory's Shearwater	Puffin cendré	Waterbird		MBU 11 NS MBU 12 NS			MBU 11 NS
Phalacrocorax auritus	Double-crested Cormorant	Cormoran à aigrettes	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Alle alle	Dovekie	Mergule nain	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Larus hyperboreus	Glaucous Gull	Goéland bourgmestre	Waterbird		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Plegadis falcinellus	Glossy Ibis	Ibis falcinelle	Waterbird		BCR 14 NS MBU 11 NS			
Larus marinus	Great Black-backed Gull	Goéland marin	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Ardea herodias	Great Blue Heron	Grand Héron	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS		
Phalacrocorax carbo	Great Cormorant	Grand Cormoran	Waterbird	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Ardea alba	Great Egret	Grande Aigrette	Waterbird		BCR 14 NS MBU 11 NS MBU 12 NS			
Stercorarius skua	Great Skua	Grand Labbe	Waterbird		MBU 11 NS	MBU 11 NS		MBU 11 NS

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Puffinus gravis	Greater Shearwater	Puffin majeur	Waterbird		MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS
Butorides virescens	Green Heron	Héron vert	Waterbird		MBU 11 NS			
Larus argentatus	Herring Gull	Goéland argenté	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Podiceps auritus	Horned Grebe	Grèbe esclavon	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Larus glaucoides	Iceland Gull	Goéland arctique	Waterbird		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Pagophila eburnea	Ivory Gull	Mouette blanche	Waterbird			MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Larus atricilla	Laughing Gull	Mouette atricille	Waterbird		MBU 11 NS MBU 12 NS			
Oceanodroma leucorhoa	Leach's Storm-Petrel	Océanite cul-blanc	Waterbird	MBU 11 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 12 NS	MBU 11 NS MBU 12 NS
Larus fuscus	Lesser Black-backed Gull	Goéland brun	Waterbird		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Egretta caerulea	Little Blue Heron	Aigrette bleue	Waterbird		BCR 14 NS MBU 11 NS		BCR 14 NS	
Hydrocoloeus minutus	Little Gull	Mouette pygmée	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Stercorarius longicaudus	Long-tailed Jaeger	Labbe à longue queue	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Puffinus puffinus	Manx Shearwater	Puffin des Anglais	Waterbird		MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS	MBU 11 NS
Fulmarus glacialis	Northern Fulmar	Fulmar boréal	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Morus bassanus	Northern Gannet	Fou de Bassan	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Stercorarius parasiticus	Parasitic Jaeger	Labbe parasite	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Podilymbus podiceps	Pied-billed Grebe	Grèbe à bec bigarré	Waterbird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Stercorarius pomarinus	Pomarine Jaeger	Labbe pomarin	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Alca torda	Razorbill	Petit Pingouin	Waterbird	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Podiceps grisegena	Red-necked Grebe	Grèbe jougris	Waterbird	MBU 11 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 12 NS		MBU 11 NS MBU 12 NS
Gavia stellata	Red-throated Loon	Plongeon catmarin	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Larus delawarensis	Ring-billed Gull	Goéland à bec cerclé	Waterbird	MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Sterna dougallii	Roseate Tern	Sterne de Dougall	Waterbird	MBU 11 NS	MBU 11 NS			MBU 11 NS
Egretta thula	Snowy Egret	Aigrette neigeuse	Waterbird		BCR 14 NS MBU 11 NS			
Puffinus griseus	Sooty Shearwater	Puffin fuligineux	Waterbird		MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS
Porzana carolina	Sora	Marouette de Caroline	Waterbird	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Stercorarius maccormicki	South Polar Skua	Labbe de McCormick	Waterbird		MBU 11 NS		MBU 11 NS	MBU 11 NS
Uria lomvia	Thick-billed Murre	Guillemot de Brünnich	Waterbird		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS
Rallus limicola	Virginia Rail	Râle de Virginie	Waterbird	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Oceanites oceanicus	Wilson's Storm-Petrel	Océanite de Wilson	Waterbird		MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS	
Nyctanassa violacea	Yellow-crowned Night-Heron	Bihoreau violacé	Waterbird	MBU 12 NS	MBU 11 NS MBU 12 NS			

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Anas rubripes	American Black Duck	Canard noir	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		BCR 14 NS MBU 11 NS MBU 12 NS
Anas americana	American Wigeon	Canard d'Amérique	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS		
Bucephala islandica	Barrow's Goldeneye (Eastern)	Garrot d'Islande (de l'Est)	Waterfowl		BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS		BCR 14 NS MBU 11 NS MBU 12 NS
Melanitta nigra	Black Scoter	Macreuse noire	Waterfowl		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Anas discors	Blue-winged Teal	Sarcelle à ailes bleues	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			
Branta bernicla	Brant	Bernache cravant	Waterfowl		BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Bucephala albeola	Bufflehead	Petit Garrot	Waterfowl		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Branta canadensis	Canada Goose	Bernache du Canada	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Branta canadensis	Canada Goose (Atlantic Flyway Resident)	Bernache du Canada (Résidente du corridor de migration de l'Atlantique)	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		BCR 14 NS MBU 11 NS MBU 12 NS
Branta canadensis	Canada Goose (North Atlantic)	Bernache du Canada (Atlantique Nord)	Waterfowl		BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		BCR 14 NS MBU 11 NS MBU 12 NS
Somateria mollissima	Common Eider	Eider à duvet	Waterfowl	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Bucephala clangula	Common Goldeneye	Garrot à oeil d'or	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Mergus merganser	Common Merganser	Grand Harle	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Anas penelope	Eurasian Wigeon	Canard siffleur	Waterfowl			BCR 14 NS		
Anas strepera	Gadwall	Canard chipeau	Waterfowl	BCR 14 NS	BCR 14 NS			
Aythya marila	Greater Scaup	Fuligule milouinan	Waterfowl		BCR 14 NS MBU 11 NS	MBU 11 NS MBU 12 NS		
Anas crecca	Green-winged Teal	Sarcelle d'hiver	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Histrionicus histrionicus	Harlequin Duck (Eastern)	Arlequin plongeur (de l'Est)	Waterfowl			MBU 11 NS		MBU 11 NS
Lophodytes cucullatus	Hooded Merganser	Harle couronné	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		
Somateria spectabilis	King Eider	Eider à tête grise	Waterfowl			MBU 11 NS MBU 12 NS		
Aythya affinis	Lesser Scaup	Petit Fuligule	Waterfowl		BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Clangula hyemalis	Long-tailed Duck	Harelde kakawi	Waterfowl		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Anas platyrhynchos	Mallard	Canard colvert	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		BCR 14 NS
Anas acuta	Northern Pintail	Canard pilet	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			
Anas clypeata	Northern Shoveler	Canard souchet	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS			
Mergus serrator	Red-breasted Merganser	Harle huppé	Waterfowl	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		
Aythya americana	Redhead	Fuligule à tête rouge	Waterfowl	BCR 14 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS	BCR 14 NS MBU 11 NS MBU 12 NS		

Table A-1 continued

Scientific Name	English Name	French Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Aythya collaris	Ring-necked Duck	Fuligule à collier	Waterfowl	BCR 14 NS	BCR 14 NS MBU 11 NS MBU 12 NS			BCR 14 NS
Oxyura jamaicensis	Ruddy Duck	Érismature rousse	Waterfowl		BCR 14 NS			
Chen caerulescens	Snow Goose	Oie des neiges	Waterfowl		BCR 14 NS MBU 11 NS MBU 12 NS			
Melanitta perspicillata	Surf Scoter	Macreuse à front blanc	Waterfowl		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS MBU 12 NS
Aythya fuligula	Tufted Duck	Fuligule morillon	Waterfowl			BCR 14 NS		
Melanitta fusca	White-winged Scoter	Macreuse brune	Waterfowl		MBU 11 NS MBU 12 NS	MBU 11 NS MBU 12 NS		MBU 11 NS
Aix sponsa	Wood Duck	Canard branchu	Waterfowl	BCR 14 NS	BCR 14 NS			

List of Priority Bird Species Associated in Each Habitat Class of BCR 14 NS, MBU 11 NS and MBU 12 NS

Table A-2. List of priority bird species associated with each habitat class in BCR 14 NS, MBU 11 NS and MBU 12 NS.
Note that if a priority bird species was not a priority in the planning unit, the box is shaded. Some species are priorites in one or moreplanning unit.

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Total priority species in each habitat:		**22**	**22**	**13**	**11**	**8**	**21**	**6**	**14**	**28**	**13**	**17**	**31**	**20**	**32**	**28**
American Redstart	Landbird	Y	Y	Y	Y		Y									
Bald Eagle	Landbird								Y			Y				
Bank Swallow	Landbird							Y	Y			Y				
Barn Swallow	Landbird						Y	Y		Y						
Bay-breasted Warbler	Landbird	Y	Y						Y							
Belted Kingfisher	Landbird								Y		Y	Y				
Bicknell's Thrush	Landbird	Y														
Black-and-white Warbler	Landbird	Y	Y	Y					Y							
Black-billed Cuckoo	Landbird		Y	Y	Y											
Blackburnian Warbler	Landbird	Y	Y	Y												
Black-throated Green Warbler	Landbird	Y	Y		Y											
Blue-headed Vireo	Landbird	Y	Y													
Bobolink	Landbird					Y	Y			Y		Y				
Boreal Chickadee	Landbird	Y														
Canada Warbler	Landbird	Y	Y	Y						Y						

Table A-2 continued

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Cape May Warbler	Landbird	Y														
Chimney Swift	Landbird	Y	Y	Y				Y		Y						
Common Nighthawk	Landbird	Y	Y			Y	Y	Y		Y		Y				
Eastern Kingbird	Landbird				Y	Y	Y		Y	Y						
Eastern Whip-poor-will	Landbird		Y	Y												
Eastern Wood-Pewee	Landbird		Y	Y												
Evening Grosbeak	Landbird	Y	Y													
Gray Catbird	Landbird				Y		Y		Y							
Gray Jay	Landbird	Y								Y						
Magnolia Warbler	Landbird	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						
Peregrine Falcon (*anatum/tundrius*)	Landbird							Y	Y			Y				
Pine Grosbeak	Landbird	Y														
Purple Finch	Landbird	Y	Y	Y												
Ruffed Grouse	Landbird	Y	Y	Y												
Rusty Blackbird	Landbird	Y	Y				Y		Y	Y						
Savannah Sparrow (princeps)	Landbird					Y										

Table A-2 continued

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Short-eared Owl	Landbird				Y	Y	Y			Y		Y				
Spruce Grouse	Landbird	Y								Y						
Tree Swallow	Landbird					Y	Y		Y	Y						
Veery	Landbird		Y	Y	Y											
White-throated Sparrow	Landbird				Y		Y									
American Golden-Plover	Shorebird					Y	Y					Y				
American Woodcock	Shorebird		Y		Y											
Black-bellied Plover	Shorebird														Y	Y
Dunlin	Shorebird														Y	Y
Hudsonian Godwit	Shorebird														Y	Y
Killdeer	Shorebird						Y	Y		Y		Y				
Least Sandpiper	Shorebird														Y	Y
Lesser Yellowlegs	Shorebird									Y					Y	Y
Piping Plover (melodus)	Shorebird											Y			Y	Y
Purple Sandpiper	Shorebird														Y	Y
Red Knot (rufa)	Shorebird														Y	Y
Red Phalarope	Shorebird												Y			
Red-necked Phalarope	Shorebird												Y		Y	
Sanderling	Shorebird														Y	Y
Semipalmated Sandpiper	Shorebird														Y	Y

Table A-2 continued

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Solitary Sandpiper	Shorebird									Y	Y				Y	Y
Spotted Sandpiper	Shorebird						Y		Y			Y				
Whimbrel	Shorebird						Y					Y			Y	Y
Willet	Shorebird														Y	Y
Wilson's Snipe	Shorebird						Y			Y	Y					
American Bittern	Waterbird					Y				Y		Y				
Black-legged Kittiwake	Waterbird												Y		Y	
Bonaparte's Gull	Waterbird												Y	Y	Y	Y
Common Loon	Waterbird										Y		Y	Y	Y	Y
Common Murre	Waterbird												Y		Y	
Common Tern	Waterbird										Y	Y	Y	Y	Y	Y
Cory's Shearwater	Waterbird												Y			
Dovekie	Waterbird												Y	Y		
Great Cormorant	Waterbird												Y	Y	Y	Y
Great Shearwater	Waterbird												Y	Y		
Great Skua	Waterbird												Y			
Horned Grebe	Waterbird												Y	Y	Y	Y
Ivory Gull	Waterbird												Y	Y		
Leach's Storm-Petrel	Waterbird												Y	Y	Y	Y
Manx Shearwater	Waterbird												Y			

Table A-2 continued

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Pied-billed Grebe	Waterbird									Y	Y					
Razorbill	Waterbird												Y	Y	Y	Y
Red-necked Grebe	Waterbird												Y	Y	Y	Y
Red-throated Loon	Waterbird												Y	Y	Y	Y
Roseate Tern	Waterbird												Y		Y	
Sooty Shearwater	Waterbird												Y	Y		
Sora	Waterbird						Y			Y		Y				
South Polar Skua	Waterbird												Y			
Thick-billed Murre	Waterbird												Y			
Virginia Rail	Waterbird									Y						
American Black Duck	Waterfowl						Y		Y	Y	Y		Y	Y	Y	Y
Barrow's Goldeneye (Eastern)	Waterfowl										Y		Y	Y	Y	Y
Black Scoter	Waterfowl													Y		
Canada Goose (North Atlantic)	Waterfowl						Y			Y	Y				Y	Y
Canada Goose (Temperate-breeding in Eastern Canada)	Waterfowl						Y			Y	Y				Y	Y
Common Eider	Waterfowl												Y	Y	Y	Y
Common Goldeneye	Waterfowl												Y	Y	Y	Y
Green-winged Teal	Waterfowl									Y	Y					
Harlequin Duck (Eastern)	Waterfowl												Y			

Table A-2 continued

Priority Bird Species	Bird Group	BCR 14											MBUs			
													11	12	11	12
		Coniferous	Mixed wood	Deciduous	Shrub/early successional	Herbaceous	Cultivated	Urban	Riparian	Wetlands	Inland Waterbodies	Coastal (above high tide)	Marine Waters		Coastal (intertidal)	
Long-tailed Duck	Waterfowl												Y	Y		
Mallard	Waterfowl						Y		Y	Y	Y	Y				
Ring-necked Duck	Waterfowl									Y	Y					
Surf Scoter	Waterfowl												Y	Y		
White-winged Scoter	Waterfowl												Y			

List of all Regional Threats in BCR 14 NS, MBU 11 NS and MBU 12 NS

Table A-3. List of all the regional threats (with rolled-up rankings at the sub-threat level) sorted by threat sub-category (sub-categories are numbered following Salafsky et al. (2008)) summarized across habitat classes in BCR 14 NS, MBU 11 NS and MBU 12 NS. "Y" means that the threat was associated within the 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.

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
1.1 Housing and urban areas	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**M**	**M**	**M**	**L**	**L**	**L**		**L**		
Fragmentation or loss of *habitat class* to urban development	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y		Y			Y		
Loss of nesting habitat on private housing structures (gravel roofs)							Y											
Loss of habitat or disturbance at nearshore foraging sites due to urban development														Y				
Collisions with windows or buildings												Y						
1.2 Commercial & industrial areas							**H**											
Loss of nesting habitat on industrial or commercial buildings (gravel roofs, chimneys, old wooden barns and covered bridges)							Y											
1.3 Tourism & recreation areas								**L**										
Loss of nesting sites due to cottage development and recreational uses of the shores of inland waterbodies								Y										
2.1 Annual & perennial non-timber crops	**L**	**L**	**L**	**L**		**H**			**L**	**L**	**L**		**L**			**L**		
Fragmentation or loss of moist habitat types within a *habitat class* due to a conversion of that habitat to cropland	Y	Y	Y	Y					Y	Y	Y		Y			Y		
Loss of pasture lands to cropland						Y												
Destruction of nests due to early haying						Y												
2.2 Wood & pulp plantations	**M**	**M**	**M**															

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Fragmentation or loss of a *habitat class* due to its conversion to managed coniferous forest	Y	Y	Y															
2.3 Livestock farming & ranching						**L**			**L**		**L**		**L**			**L**		
Destruction of nests by cattle grazing in nesting habitat						Y												
Fragmentation or loss of freshwater wetlands or saltmarshes due to a change in land use for cattle grazing habitat									Y		Y		Y			Y		
2.4 Marine & freshwater aquaculture													**L**	**M**		**L**	**M**	
Competition for foraging areas with aquaculture farms														Y			Y	
Competition for nesting/brood rearing areas with aquaculture farms													Y	Y		Y	Y	
3.3 Renewable Energy	**L**	**L**	**L**		**L**							**L**	**L**		**L**	**L**		**L**
Fragmentation or loss of *habitat class* due to the construction and operation of wind farms	Y	Y	Y		Y								Y			Y		
Mortality due to collision with wind turbines												Y			Y			Y
4.1 Roads & railroads	**M**	**L**	**L**	**L**	**L**				**L**	**L**	**L**	**L**	**L**			**L**		
Fragmentation or loss of *habitat class* due to the construction and maintenance of roads	Y	Y	Y	Y	Y				Y	Y	Y		Y			Y		
Mortality due to collisions with vehicles												Y						
4.2 Utility & service lines	**L**	**L**	**L**	**L**	**L**				**L**	**L**	**L**	**L**	**L**			**L**		
Fragmentation or loss of *habitat class* due to the construction and maintenance of right-of-ways for power lines	Y	Y	Y	Y	Y				Y	Y	Y		Y			Y		

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Mortality due to collisions with service lines and communication towers												Y						
5.1 Hunting & collecting terrestrial animals	**L**				**L**			**L**	**L**	**L**	**L**			**L**				
Accidental shooting or mistaken identity					Y			Y	Y		Y			Y				
Illegal shooting or poaching								Y		Y	Y							
Incidental take in trapping lines	Y																	
5.2 Gathering terrestrial plants									**L**									
Fragmentation or loss of bogs within *wetlands* for peat extraction									Y									
5.3 Logging & wood harvesting	**H**	**H**	**H**						**H**	**M**	**L**							
Fragmentation or loss of forests due to logging activities	Y	Y	Y						Y	Y	Y							
5.4 Fishing & harvesting aquatic resources													**L**	**M**		**L**	**M**	
Competition for prey or resources with the industrial or commercial harvesting operations of algae													Y	Y		Y	Y	
Competition for prey or resources with industrial or commercial operations harvesting marine worms													Y					
Competition for prey or resources with the industrial or commercial fisheries operations														Y			Y	
Fisheries bycatch or drowning as a result of entanglement in fishing gear														Y			Y	
6.1 Recreational activities					**L**			**L**	**L**	**L**	**M**		**H**	**L**		**M**		
Disturbance at foraging sites by recreational activities in *habitat class*					Y			Y	Y	Y	Y		Y	Y		Y		

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Disturbance at roosting sites by recreational activities in *habitat class*										Y	Y							
Disturbance at nest sites by recreational activities in waterbodies and waterways or coastal areas								Y	Y		Y		Y			Y		
Habitat loss or degradation due to the collapse of banks caused by human activity (e.g. ATVs)										Y	Y							
6.3 Work & other activities							**L**				**L**		**L**	**L**		**L**	**L**	
Disturbance at nest sites due to building and bridge maintenance activities							Y											
Disturbance at foraging or moulting sites due to operational activities of oyster and mussel aquaculture leases											Y		Y	Y		Y	Y	
7.1 Fire & fire suppression	**L**	**L**	**L**															
Fire suppression	Y	Y	Y															
7.2 Dams & water management/use									**L**	**L**	**L**							
Habitat loss or degradation due to changes to hydrology or stabilization of water regimes within *habitat class*									Y	Y	Y							
7.3 Other ecosystem modifications				**L**		**L**					**M**		**M**			**M**		
Loss of old or abandoned fields returning to forest				Y														
Reforestation of agricultural land (i.e., as a loss of cultivated and managed areas)						Y												
Loss of specific habitat features due to changes in sedimentation patterns caused by installation of riprap											Y		Y			Y		
8.1 Invasive non-native/alien species	**L**		**L**		**L**	**L**	**L**		**L**	**L**			**L**			**L**		

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Competition from introduced mammalian predators													Y			Y		
Predation by domestic cats						Y	Y											
Competition for nest sites with European Starling	Y		Y		Y	Y	Y		Y	Y								
8.2 Problematic native species	**L**	**L**	**L**	**L**	**L**	**L**		**L**	**L**	**L**	**M**		**M**	**L**		**L**	**L**	
Parasitism by Brown-headed Cowbird	Y	Y	Y	Y	Y	Y			Y		Y							
Competition with Red-winged Blackbirds									Y	Y								
Hybridization and competition with Mallards						Y		Y	Y	Y			Y	Y		Y	Y	
Competition and displacement by gulls								Y			Y		Y			Y		
Increased predation due to an increasing populations of predators (foxes, gulls and raccoons) as a results of land use practices		Y	Y								Y		Y			Y		
Nest predation from gulls/crows					Y								Y			Y		
Finch eye disease	Y	Y	Y															
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									Y		Y							
9.2 Industrial & military effluents					**L**		**M**	**L**	**L**		**L**		**H**	**H**		**H**	**H**	
Decrease of diet quality and of health of birds due to the chemical or heavy metal contamination of food source					Y			Y	Y		Y		Y	Y		Y	Y	
Decrease of prey availability to birds due to the chemical or heavy metal contamination							Y				Y		Y	Y		Y	Y	

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Decrease of availability of food to birds due to oil spills and oil discharges											Y		Y	Y		Y	Y	
Hypothermia caused by oil on plumage from oil spills and oil discharges											Y		Y	Y		Y	Y	
9.3 Agricultural & forestry effluents	**H**	**H**	**M**	**L**	**L**	**M**		**L**	**M**	**M**	**M**		**L**	**M**		**L**	**M**	
Decrease of diet quality and of health of birds due to the consumption of contaminated food by biocides such as pesticide, herbicide, or fungicide	Y	Y	Y	Y		Y		Y	Y	Y	Y		Y	Y		Y	Y	
Decrease of prey availability to birds due to chemical contamination from biocides such as pesticide, herbicide, or fungicide	Y	Y	Y	Y	Y	Y		Y	Y	Y	Y							
Loss of food source due to an eutrophication from fertilisers								Y			Y							
9.4 Garbage & solid waste													**L**	**M**		**L**	**L**	
Mortality from consumption of plastics or garbage													Y	Y		Y	Y	
9.5 Airborne pollutants	**L**	**L**	**L**		**L**	**L**		**M**	**M**	**L**								
Habitat degradation due to acid precipitation affecting availability and quality of food	Y	Y			Y	Y		Y	Y	Y								
Habitat degradation due to acid precipitation affecting loss of nesting materials	Y	Y	Y						Y	Y								
11.1 Habitat shifting & alteration												**M**			**L**			**L**
Habitat degradation due to changes to weather or sea surface temperature affecting food availability												Y			Y			Y

Table A-3 continued

Regional Threats	BCR 14 NS												MBU 11 NS			MBU12 NS		
	Coniferous	Mixed wood	Deciduous	Shrub/early Successional	Herbaceous	Cultivated and Managed Areas	Urban	Inland waterbodies	Wetlands	Riparian	Coastal (above high tide)	Widespread	Coastal (intertidal)	Marine Waters	Widespread	Coastal (intertidal)	Marine Waters	Widespread
Habitat loss due to climate change (especially, coniferous forests and shrub and early successional)												Y			Y			Y
11.2 Droughts												**M**						
Loss of moist forests and wetlands												Y						
11.3 Temperature extremes												**L**						
Reduction in survival due to spring climate fluctuations												Y						
11.4 Storms & flooding												**H**			**M**			**M**
Reduction in survival of adults or chicks or flooding of nests due to heavy rains												Y			Y			Y
Habitat loss due to increased severity or frequency of storms leading to coastal erosion												Y						
12.1 Information lacking																		
Lack of information on factors causing population declines												Y			Y			Y
Lack of reliable long-term population trend information												Y			Y			

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[6].

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

- population size,
- breeding and non-breeding distribution,

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

- 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 priorities among birds.

For Nova Scotia planning units, 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. Records were obtained from Partners in Flight, 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 (CWS–AR), ebird Canada (eBird Canada 2009), the Atlantic Coastal Blocks database (CWS–AR), and the Christmas Bird Count data (National Audubon Society 2010). Federally or provincially listed species were also considered, even if there were fewer than 10 records.

Some aspects of the methodology were different for 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. The North American Waterfowl Management Plan's (NAWMP) latest version adds regional prioritization to its continental assessment (NAWMP Plan Committee 2004) and NAWMP's Waterfowl Conservation Regions (WCRs) are similar to NABCI's 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 Nova Scotia (NS Eastern Habitat Joint Venture 2008). The "key waterfowl species" were selected from the NS-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 NS-EHJV Implementation Plan.

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 Atlantic Region, following the Partners in Flight approach for regional species assessment (Panjabi et al. 2005).

Similarly to waterbirds, shorebirds do not benefit on 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 (PIF) 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 PIF regional assessment guidelines (Blancher, personal communication based on Panjabi et al. 2005).

Element 2: Habitats 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, nor 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 (FAO 2000). Some modifications were made to the LCCS scheme to reflect habitat types that are important to birds that are 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 (e.g., provincial forest inventories), 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 the North American Bird Conservation Initiative (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 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. 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 Nova Scotia, population objectives for waterfowl were taken from the Nova Scotia EHJV Implementation Plan (NS Eastern Habitat Joint Venture 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 the entire BCR was calculated using preliminary data from the first four years of the Second Maritimes Breeding Bird Atlas (Bird Studies Canada, unpublished) following PIF protocols (Panjabi et al. 2005) because the Breeding Bird Survey (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; 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 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 threats 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 following 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 International Union for Conservation of Nature – Conservation Measures Partnership (IUCN-CMP) threat classification scheme (Salafsky et al. 2008) with the addition of categories to capture species for which we lack information. Only threats stemming from human activity were included in the threats 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 of low, medium or 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 NS, MBU 11 NS and MBU 12 NS, 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 to best 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 Nova Scotia, 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) 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 A-4. International Union for Conservation of Nature-Conservation Measures Partnership (IUCN-CMP) classification of threats to biodiversity as per Salafsky et al. (2008).
Note that not all threat categories apply to birds or occur in every BCR or MBU.

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

Table A-4 continued

Threat category/sub-category	Definition
	reasons; includes accidental mortality/bycatch
6 Human intrusions and disturbance	Threats from human activities that alter, destroy and disturb habitats and species associated with nonconsumptive uses of biological resources
6.1 Recreational activities	People spending time in nature or travelling in vehicles outside established transport corridors, usually for recreation purposes
6.2 War, civil unrest and military exercises	Actions by formal or paramilitary forces without a permanent footprint
6.3 Work and other activities	People spending time in or travelling in natural environments for reasons other than recreation or military activities
7 Natural system modifications	Threats from actions that convert or degrade habitat in service of "managing" natural or seminatural systems, often to improve human welfare
7.1 Fire and fire suppression	Suppression or increase in fire frequency and/or intensity outside of its natural range of variation
7.2 Dams and water 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, sivicultural, and aquaculture systems that include nutrients, toxic chemicals and/or sediments including the effects of these pollutants on the site where they are applied
9.4 Garbage and solid waste	Rubbish and other solid materials including those that entangle wildlife
9.5 Air-borne pollutants	Atmospheric pollutants from point and non-point sources
9.6 Excess energy	Inputs of heat, sound or light that disturb wildlife or ecosystems
10 Geological events	Threats from catastrophic geological events
10.1 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 the natural range of variation that could wipe out a vulnerable species or habitat

Table A-4 continued

Threat category/sub-category	Definition
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 A-5. International Union for Conservation of Nature-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 *ex situ* 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
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

Table A-5 continued

Action category/sub-category	Definition
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 of 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.

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