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Bird Conservation Strategy for Bird Conservation Region 8 in Quebec Region – Boreal Softwood Shield

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Preface

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

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

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

Acknowledgements

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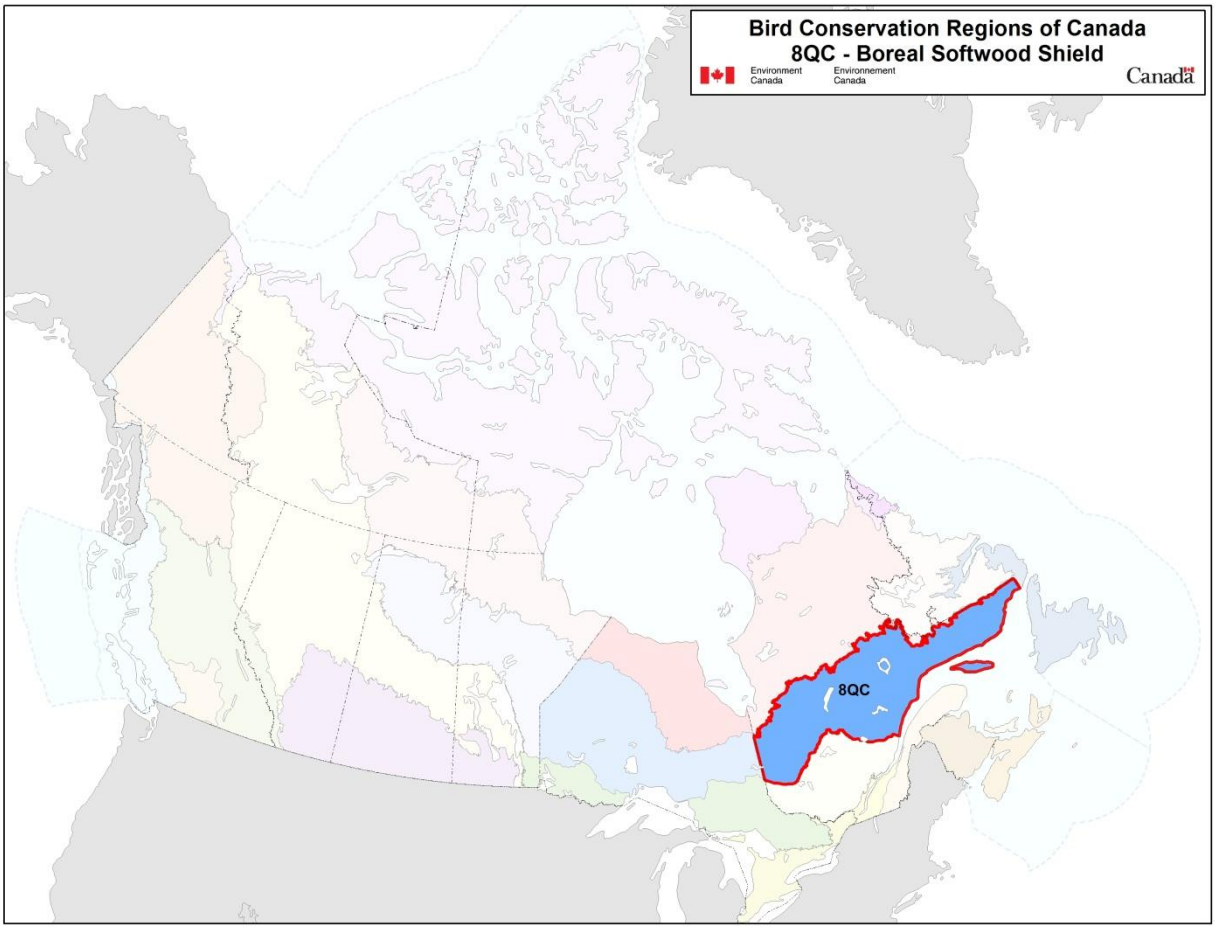
Bird Conservation Strategy for Bird Conservation Region 8 in Quebec Region – Boreal Softwood Shield



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Executive Summary

The Quebec portion of the Boreal Softwood Shield Bird Conservation Region (BCR 8-QC) covers Quebec from east to west between roughly the 48th and 52nd parallels, with a surface area of 543 003 km^2. BCR 8-QC has primarily hilly terrain and, to a large extent, is covered with coniferous forest. The aquatic portion of the region includes the entire northern half of the Lower Estuary and Gulf of St. Lawrence, as well as a large number of rivers and lakes. There are limited farming and urban areas, and the main human activities include forestry, mining and hydroelectric power. The birds that nest in BCR 8-QC are primarily forest species. The numerous coastal islands provide nesting sites for seabirds and the coastal habitats are inhabited by several shorebird species during migration.

After an assessment of 246 bird species found in BCR 8-QC, 97 species were identified as priorities in this BCR. The priority list includes species from four bird groups: landbirds (56%), waterbirds (19%), waterfowl (13%) and shorebirds (12%). These priority species include 21 species considered at risk either provincially or federally. Priority species use 10 habitat types in BCR 8-QC. The habitats that attract the most birds are the wetlands (31% of priority species), coastal areas (30%), coniferous forests (30%), mixed wood forests (29%), waterbodies (16%), and riparian areas (15%).

Each priority species was assigned a population objective based on its population trend. Assessing/maintaining populations at current levels was the objective most often selected for priority species in BCR 8-QC (44% of priority species), while maintaining the populations was the objective assigned to 19% of the species. Better population trend data are required for all species that have been assigned one of these two objectives. A recovery objective was assigned to 16% of the species (all are species at risk), and population increase objectives were also assigned to 21% of the priority species. Overall, 37% of priority species identified in BCR 8-QC have a population objective related to population increase, reflecting the magnitude of the threats to bird populations in this BCR.

A threat assessment identified a number of conservation issues facing priority species in the various habitats of BCR 8-QC. Major threats include habitat loss and degradation caused by forestry and agriculture, as well as climate change and severe weather. The lack of biological or demographic data on priority species and the ongoing need for the finalization of recovery strategies and management plans for federally listed species at risk were also considered to be significant conservation issues, as a total of 95% of the priority species are affected. The habitats most severely affected by the threats in BCR 8-QC include wetlands, coastal areas, cultivated and managed areas, and urban habitat.

Conservation objectives have been established to counter threats and provide the missing information on priority species. Conservation objectives in BCR 8-QC aim mainly to improve bird population monitoring in order to gather the missing ecological and demographic information on most of the priority species in this BCR. Another important conservation

objective is to provide adequate habitat for priority species, by ensuring, for example, that resource and land use policies and practices maintain or improve bird habitat.

Conservation actions have been recommended for priority species in BCR 8-QC in order to achieve established conservation objectives. The recommended actions largely relate to population monitoring and include on-the-ground activities such as increasing the coverage of the Breeding Bird Survey (BBS), conducting species specific surveys, expanding the current migration monitoring program, and updating existing waterfowl banding and survey programs. Another large proportion of the recommended actions involves the development and adoption of beneficial management practices by the renewable power, forestry, mining, and agriculture sectors.

Migratory birds found in BCR 8-QC also face threats that are difficult to analyze with the standardized methodology used in this strategy. These threats include widespread issues that may sometimes not apply to a particular habitat (e.g., collisions with human-made structures, air pollution and climate change), research needs and population monitoring, as well as threats to migratory birds when they are outside Canada. An overview of these issues, the affected species and the recommended conservation actions is also presented.

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; Lepage et al. (in progress).
[2] Milko et al. 2003; Chapdelaine and Rail (2004).
[3] Donaldson et al. 2000; Aubry and Cotter (2007).
[4] Rich et al. (2004); Drolet et al. (2010); Falardeau et al. (2010).

Strategy Structure

Section 1 of this strategy presents general information about the BCR and the subregion, with an overview of the six elements[5] that provide a summary of the state of bird conservation at the subregional level. Section 2 provides more detail on the threats, objectives and actions for priority species grouped by each of the broad habitat types in the subregion. Section 3 presents additional widespread conservation issues that are not specific to a particular habitat or were not captured by the threat assessment for individual species, as well as research and monitoring needs, and threats to migratory birds while they are outside of Canada. The approach and methodology are summarized in the appendices, but details are available in a separate document (Kennedy et al. 2012). A national database houses all the underlying information summarized in this strategy and is available from Environment Canada.

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

Characteristics of Bird Conservation Region 8

The Boreal Softwood Shield Bird Conservation Region (BCR 8) is a vast region extending from the Alberta–Saskatchewan border to Newfoundland. The Quebec portion of BCR 8-QC covers Quebec from east to west between roughly the 48th and 52nd parallels, with a surface area of 543 003 km^2 (Fig. 1). It includes northern Abitibi, the southern portion of northern Quebec, and most of Saguenay–Lac-St-Jean and the North Shore. It also includes the northern half of the Lower Estuary and Gulf of St. Lawrence, Anticosti Island, and all the coastal islands in this area.

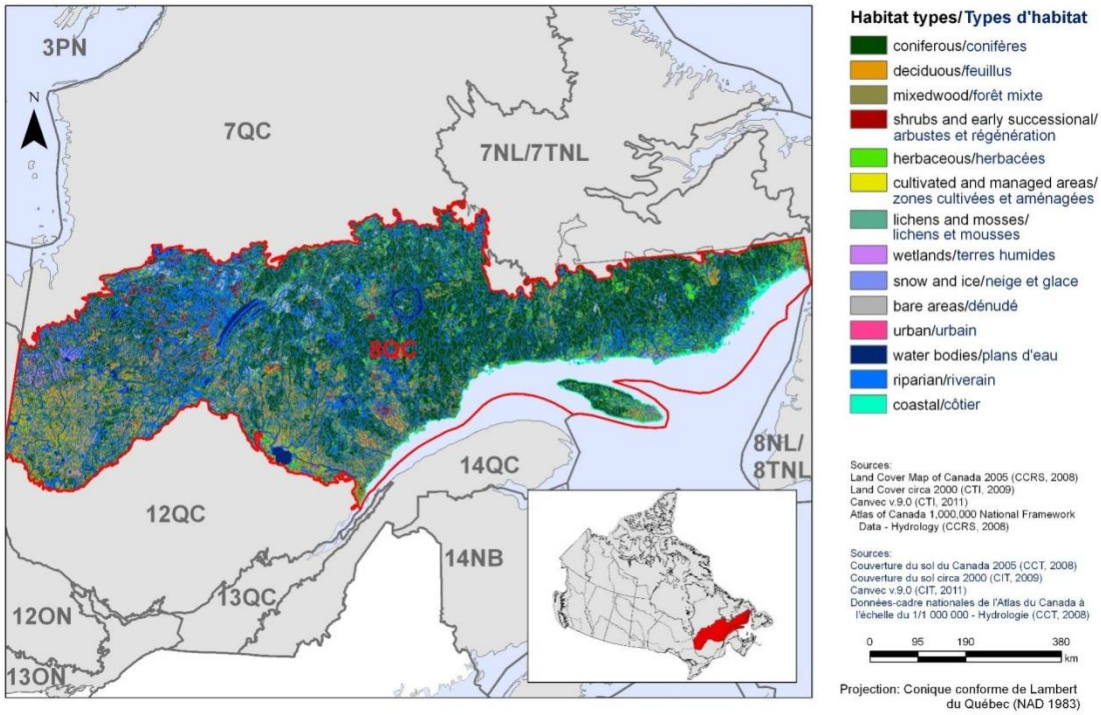

Figure 1. Landcover in BCR 8-QC: Boreal Softwood Shield.

Physical environment

Topography

The topography of BCR 8-QC consists mostly of large hills with elevations varying between 300 and 600 m (Ecological Stratification Work Group 1996). While the topography of the BCR's western end (Abitibi Plains) and Anticosti Island is rather gentle, the remainder of the region is more hilly. The highest summits include the Otish Mountains (with Mount Yapeitso at an elevation of 1128 m), the Groulx Mountains (including Mount Veyrier at an elevation of 1104 m), the Valin Mountains (rising to 980 m), and Mount Babel (952 m; Commission de toponymie Québec 2012).

Hydrography and hydrology

The drainage system of BCR 8-QC includes the entire northern half of the Lower Estuary and the Gulf of St. Lawrence. It also includes large rivers, such as the Saguenay, Péribonka, Mégiscane, Manicouagan, Moisie, Nottaway, Aux Outardes and Romaine rivers. The BCR includes a large number of small lakes and several large lakes: for example, lakes Mistassini (2113 km^2), Saint-Jean (1041 km^2), Abitibi (878 km^2), Manouane (461 km^2), Plétipi (339 km^2) and Waswanipi (205 km^2; Gouvernement du Quebec 2002). The region is also home to large reservoirs created for hydroelectric purposes: for example, the Manicouagan (2072 km^2), Pipmuacan (779 km^2) and Outardes 4 (730 km^2) reservoirs.

Climate

Summers are cool in most of BCR 8-QC, with the exception of the Saguenay–Lac St-Jean region where they are rather hot and humid. Summers are also rainy on the coast of the Gulf of St. Lawrence and Anticosti Island. The average summer temperature of the BCR varies between 11.5° and 12.5°C. Winters are cold throughout the subregion. The average winter temperature varies between -13.5° and -12.5°C in the western portion of the subregion and -9°C in the east. The average annual temperature is 0°C in the west and ranges between 1° and 1.5°C in the east. The average annual rainfall varies between 650 and 900 mm in the west and 800 and 1100 mm in the east. It exceeds 1000 mm on the coast of the Gulf of St. Lawrence where the shore is continually windy (Ecological Stratification Working Group 1996).

Land cover and land use

Most of the land in BCR 8-QC is covered by forest, which is mainly coniferous (Fig. 1). Wetlands cover nearly 6% of the BCR's area and are especially common in the western part of the subregion. Cultivated and managed areas account for only 0.4% of the land area and are limited to Abitibi and Saguenay–Lac-Saint-Jean regions. Urban areas are also limited, accounting for only 0.1% of the subregion area. Almost all of the land in the BCR is publicly owned (Drolet et al. 2010). The main human activities in this BCR are forestry, mining, hydroelectric power, hunting, trapping, and recreation and tourism activities (Ecological Stratification Working Group 1996).

BCR 8-QC is also part of the zone covered by the northern development initiative of the government of Quebec, the objective of which is to sustainably develop the economic potential of northern Quebec. The economic sectors included in this initiative in BCR 8-QC are mining, energy, forestry, transportation and telecommunications (Gouvernement du Québec 2013). The government of Quebec is committed to allocating 50% of the northern development area for environmental protection, to preserve biodiversity and the enhancement of natural heritage. The implementation of this initiative could possibly change the face of BCR 8-QC.

Biological environment

Vegetation

BCR 8-QC is represented by three vegetation subzones: mixed wood forest in the Saguenay and Lac Saint-Jean lowlands, continuous boreal forest in most of the BCR, and taiga in a thin strip at the northern boundary of the subregion (Ministère des Ressources naturelles 2013).

The mixed wood forest consists of the balsam fir-yellow birch domain, which is a transition area between the deciduous and boreal forest. This type of forest is characterized by mixed stands of yellow birch and conifers such as balsam fir, white spruce, and cedar. The main factors of forest dynamics in this vegetation subzone are outbreaks of spruce budworm and fires.

The continuous boreal forest consists of two types of vegetation in BCR 8-QC: balsam fir-white birch stands in certain parts of the south and spruce-moss stands in most of the subregion. The balsam fir-white birch domain is characterized by fir and white spruce mixed with white birch mesic sites, while less favourable sites include black spruce, jack pine and larch, accompanied by white birch or trembling aspen. The main factors of forest dynamics for this type of vegetation are outbreaks of spruce budworm and fires. The spruce-moss forest is clearly dominated by black spruce, but there are also balsam fir and some deciduous trees such as white birch and trembling aspen. This type of vegetation is also characterized by undergrowth covered with feather mosses and ericaceous shrubs, and a limited number of herbaceous species. The fire cycle is the main element of forest dynamics in the spruce-moss domain.

Lastly, the taiga covers a small portion of northern BCR 8-QC and consists of spruce-lichen forests. Tree density is lower here than in the spruce-moss forest, and the moss layer is dominated by lichens. Aside from black spruce, balsam fir and jack pine are also found here at the northern edge of their range. Fire is the main driver of forest dynamics for this type of vegetation.

Wildlife

Mammals representative of BCR 8-QC include the Woodland caribou (a vulnerable species in Quebec and threatened in Canada), Black Bear, beaver, fisher, Canada lynx, American marten and wolf (Li and Ducruc 1999). The marine portion of BCR 8-QC includes marine mammals considered at risk in Canada (Species at Risk Public Registry 2012): the right whale and blue whale, both endangered species; the beluga, a species that is “threatened” in both Quebec and Canada (Ministère du Développement durable, de l’Environnement, de la Faune et des Parcs 2013); and the Fin Whale, a species of “special concern.”

The herpetofauna of BCR 8-QC includes characteristic species such as the American toad, wood frog, northern leopard frog, spring peeper, two-lined salamander and Eastern garter snake. The leatherback turtle, a species at risk in both Quebec and Canada (Ministère du Développement durable, de l’Environnement, de la Faune et des Parcs 2013; Species at Risk Public Registry 2012), is present in the marine portion of the BCR.

BCR 8-QC is home to a diverse fish fauna. Representative fish species include the walleye, northern pike, lake trout, brook trout, Atlantic salmon, Atlantic herring and capelin (Li and Ducruc 1999; Bourdages and Ouellette 2011). The American shad, a “Vulnerable” species in Quebec, and Atlantic sturgeon, a species “Likely to be designated threatened or vulnerable” in Quebec, are also present in BCR 8-QC.

The avifauna of BCR 8-QC consists mostly of boreal forest species. These species include the Spruce Grouse, Black-backed Woodpecker, American Three-toed Woodpecker, Yellow-bellied Flycatcher, Bay-breasted Warbler, Tennessee Warbler, Cape May Warbler, Mourning Warbler and White-winged Crossbill. Species using the numerous lakes and wetlands of the BCR during nesting season include the Red-throated Loon, American Black Duck, Common Teal, Ring-necked Duck, Common Goldeneye and Common Merganser. Some aquatic bird species reach the limit of their range in BCR 8-QC (for example, the Pied-billed Grebe, Green Heron, Virginia Rail, Common Moorhen, and American Coot; Chapdelaine and Rail 2004). The numerous coastal islands of the northern coast and the steep cliffs on the northern side of Anticosti Island provide nesting sites for several seabird species. These species include the Double-crested Cormorant, Great Cormorant, Black-legged Kittiwake, Black Guillemot, Razorbill, Common Murre and Atlantic Puffin. BCR 8-QC is home to half the nesting shorebird species in Quebec (Aubry and Cotter 2007). Representative species include the Greater Yellowlegs, Solitary Sandpiper, Spotted Sandpiper and Wilson's Snipe. In addition, several shorebird species frequent the coastal habitats of the BCR during migration: for example, the Dunlin, Sanderling, Semipalmated Sandpiper, White-rumped Sandpiper, Black-bellied Plover and Semipalmated Plover. Lastly, the Estuary and Gulf of St. Lawrence are a wintering area for several duck species, such as the Long-tailed Duck, Common Eider, Barrow's Goldeneye and Red-breasted Merganser.

Human environment

Approximately 514 000 people live in BCR 8-QC, which represents 6.5% of the Quebec population (adapted from Statistics Canada 2012). The main population centres are Saguenay (144 746 inhabitants), Rouyn-Noranda (41 012), Val-d'Or (31 862), Alma (30 904), Sept-Îles (25 686) and Baie-Comeau (22 113). BCR 8-QC includes 14 Aboriginal communities totalling nearly 19 000 inhabitants (Aboriginal Affairs and Northern Development Canada 2010), nearly half of whom live in the North Shore region. The two largest Aboriginal communities are Mistissini (Cree Nation) and Takuaikan Uashat mak Mani-Utenam (Innu Nation), each of which has more than 3 000 inhabitants.

Protected and designated areas

Protected areas and other designated areas cover approximately 8% of the land in BCR 8-QC (Fig. 2). Four Quebec national parks (operated by Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs) and a Canadian national park reserve (operated by Parks Canada) are entirely located within the BCR, covering a total area of 1237 km^2. These parks are the Mingan Archipelago National Park Reserve of Canada and the national parks of Aiguebelle, Pointe-Taillon, Monts-Valin and Anticosti. BCR 8-QC also includes nearly 75% of Fjord-du-Saguenay national park (of Quebec) and 70% of the Saguenay–St. Lawrence Marine Park (joint responsibility of Parks Canada and Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs).

Protected areas in BCR 8-QC also include 9 migratory bird sanctuaries (under Environment Canada's mandate) covering an area of 326 km^2 and 43 exceptional forest ecosystems (old-growth forests, rare forests and shelter forests; responsibility of Quebec's Ministère des

Ressources naturelles) totalling 141 km^2. There are also 236 waterfowl staging areas that together cover an area of 1667 km^2, and 6 planned aquatic reserves (responsibility of Quebec's Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs) representing an area of 4863 km^2.

Lastly, BCR 8-QC also includes areas designated as important for birds, but that do not have legal protection status. There are 25 Important Bird Areas (IBA) totalling 1598 km^2 (most of these overlap some of the protected areas mentioned above).

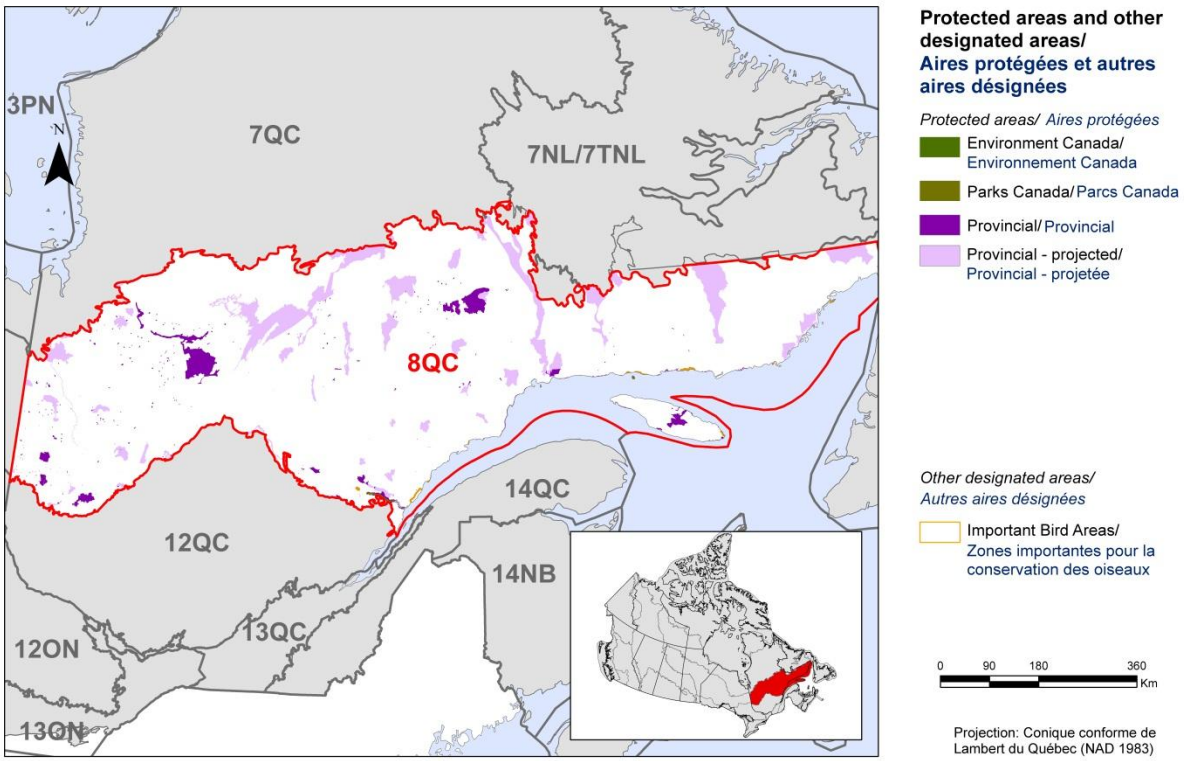

Figure 2. Map of protected and designated areas in BCR 8-QC: Boreal Softwood Shield.

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. Tables 2 and 3 summarize the number of priority species in BCR 8-QC by bird group and by the reason for priority status.

The standard method for selecting priority species was used to identify 94 priority species, sub-species or populations (hereinafter referred to as "species") on a preliminary basis, among the 246 species found in BCR 8-QC (Appendix 1). Regional experts reviewed the preliminary list and 17 pre-selected species were excluded and 20 others were added, leading to a final list of 97 priority species (Table 1). The reasons for these decisions are presented in Appendix 3.

The 97 priority species identified are not evenly distributed among the 4 bird groups. The 54 landbird species are the most represented group with 56% of all priority species in BCR 8-QC (Table 2). This is a representative picture of the importance of landbirds in the subregion, as they account for 58% of all species present (Appendix 1). Thirty-five percent (12 species) and 34% (13 species) of shorebird species and waterfowl species, respectively, found in BCR 8-QC have been identified as priority species. Lastly, 60% (18 species) of aquatic bird species found in BCR 8-QC have been identified as priority species, which shows the precarious status of this group of birds in the BCR.

More than half of the priority species (58%) have been identified for conservation reasons (Table 1, shaded cells). They include 21 species at risk, which are either listed provincially under Quebec's *Loi sur les espèces menacées ou vulnérables* [Act respecting threatened or vulnerable species] or listed nationally under the *Species at Risk Act* ((SARA), or have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Thirteen species are considered at risk provincially and nationally, 5 species are considered at risk only provincially

(Golden Eagle, Leach's Storm-Petrel, Bald Eagle, Caspian Tern and Sedge Wren), while 3 species are considered at risk only under national legislation. The latter species include the Bobolink, Barn Swallow and Eastern Meadowlark, which were assessed by COSEWIC but are not currently listed on Schedule 1 of SARA. Apart from the conservation species, 41 others have been identified as priority species for stewardship reasons (Table 1; unshaded cells).

Table 1. Priority species in BCR 8-QC, population objective, and the reason for priority status.

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
Alder Flycatcher	Landbird	Maintain						Yes	Yes				
American Three-toed Woodpecker	Landbird	Assess/Maintain											Yes
Bald Eagle	Landbird	Recovery objective			V			Yes					
Barn Swallow	Landbird	Increase 100%	T										
Bay-breasted Warbler	Landbird	Increase 50%				Yes	Yes		Yes				
Belted Kingfisher	Landbird	Maintain							Yes				
Bicknell's Thrush[10]	Landbird	Recovery objective	T	T	V	Yes	Yes						
Black-and-white Warbler	Landbird	Assess/Maintain							Yes				
Black-backed Woodpecker	Landbird	Assess/Maintain						Yes	Yes				

[1] Conservation species are in shaded cells. Stewardship species are in unshaded cells.
[2] Assessed by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) as E, Endangered; T, Threatened; SC, Special Concern
[3] Species listed on Schedule 1 of the *Species at Risk Act* (SARA) as E, Endangered; T, Threatened; SC, Special Concern (Species at Risk Public Registry).
[4] Status under the *Loi sur les espèces menacées ou vulnérables* (Quebec): T = Threatened, V = Vulnerable, L = Likely to be designated threatened or vulnerable.
[5] Taken from the database downloaded from www.partnersinflight.org. Refer to Panjabi et al. (2005) for the analytical method.
[6] Conservation concern in the United States of America and Canada, as identified in the Canadian Shorebird Conservation Plan (Donaldson et al. 2000). A score of 5 means "Highly imperiled" and a score of 1 means "Species not at risk." Refer to Donaldson et al. (2000) for the complete description of conservation categories.
[7] National priority level as identified in Canada's Waterbird Conservation Plan (Milko et al. 2003). Tier 1 is the highest priority tier.
[8] NAWMP: North American Waterfowl Management Plan (North American Waterfowl Management Plan, Plan Committee, 2004)
[9] Expert review indicates that a species was added or removed from the priority list as a result of local expert opinion (reasons for the addition or removal are presented in Appendix 3).
[10] Species at risk listed on Schedule 1 of SARA, but whose management plans or recovery strategies have not yet been finalized.

Table 1 continued

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
Black-billed Cuckoo	Landbird	Increase 50%											Yes
Blackburnian Warbler	Landbird	Assess/Maintain				Yes		Yes					
Black-throated Green Warbler	Landbird	Assess/Maintain				Yes		Yes	Yes				
Bobolink	Landbird	Increase 50%	T			Yes							
Boreal Chickadee	Landbird	Assess/Maintain						Yes					
Boreal Owl	Landbird	Assess/Maintain							Yes				
Brown Creeper	Landbird	Assess/Maintain											Yes
Canada Warbler[10]	Landbird	Recovery objective	T	T	L	Yes			Yes				
Cape May Warbler	Landbird	Assess/Maintain				Yes		Yes	Yes				
Chestnut-sided Warbler	Landbird	Assess/Maintain				Yes		Yes	Yes				
Chimney Swift[10]	Landbird	Recovery objective	T	T	L	Yes							
Common Nighthawk[10]	Landbird	Recovery objective	T	T	L	Yes							
Connecticut Warbler	Landbird	Increase 50%				Yes	Yes	Yes	Yes				
Eastern Meadowlark	Landbird	Increase 100%	T										
Eastern Whip-poor-will[10]	Landbird	Recovery objective	T	T	L	Yes							
Evening Grosbeak	Landbird	Assess/Maintain							Yes				
Fox Sparrow	Landbird	Assess/Maintain				Yes		Yes					
Golden Eagle	Landbird	Recovery objective			V								
Gray Jay	Landbird	Assess/Maintain						Yes					
Long-eared Owl	Landbird	Assess/Maintain											Yes

Table 1 continued

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
Magnolia Warbler	Landbird	Assess/Maintain				Yes		Yes					
Mourning Warbler	Landbird	Assess/Maintain				Yes		Yes	Yes				
Nashville Warbler	Landbird	Assess/Maintain						Yes	Yes				
Northern Flicker	Landbird	Maintain							Yes				
Northern Saw-whet Owl	Landbird	Assess/Maintain											Yes
Olive-sided Flycatcher[10]	Landbird	Recovery objective	T	T	L	Yes	Yes						
Orange-crowned Warbler	Landbird	Assess/Maintain											Yes
Ovenbird	Landbird	Assess/Maintain							Yes				
Peregrine Falcon (*anatum*/*tundrius*)[10]	Landbird	Recovery objective	SC	SC	V[11]	Yes							
Philadelphia Vireo	Landbird	Assess/Maintain						Yes	Yes				
Pine Grosbeak	Landbird	Assess/Maintain				Yes		Yes					
Purple Finch	Landbird	Assess/Maintain					Yes		Yes				
Ruby-crowned Kinglet	Landbird	Assess/Maintain							Yes				
Rusty Blackbird[10]	Landbird	Recovery objective	SC	SC	L	Yes							
Sedge Wren	Landbird	Increase			L								
Sharp-shinned Hawk	Landbird	Assess/Maintain							Yes				
Short-eared Owl[10]	Landbird	Recovery objective	SC	SC	L	Yes							
Solitary Sandpiper	Landbird	Assess/Maintain											Yes
Spruce Grouse	Landbird	Assess/Maintain						Yes					

[11] Under the *Loi sur les espèces menacées ou vulnérables* (Quebec), the subspecies *anatum* is designated Vulnerable whereas the subspecies *tundrius* is listed as Likely to be designated as threatened or vulnerable.

Table 1 continued

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
Swamp Sparrow	Landbird	Maintain				Yes		Yes	Yes				
Tennessee Warbler	Landbird	Assess/Maintain						Yes					
White-throated Sparrow	Landbird	Assess/Maintain				Yes		Yes					
Winter Wren	Landbird	Assess/Maintain						Yes	Yes				
Yellow-bellied Flycatcher	Landbird	Assess/Maintain						Yes	Yes				
Yellow-bellied Sapsucker	Landbird	Assess/Maintain						Yes	Yes				
Black-bellied Plover	Shorebird	Assess/Maintain								3a			
Dunlin	Shorebird	Assess/Maintain								3a			
Hudsonian Godwit	Shorebird	Assess/Maintain								4b			
Killdeer	Shorebird	Increase 50%								3a			
Purple Sandpiper	Shorebird	Increase 50%								2b			Yes
Red Knot (*rufa*)[10]	Shorebird	Recovery objective	E	E	L					4a			
Ruddy Turnstone	Shorebird	Increase 50%								4a, b			
Sanderling	Shorebird	Increase 50%								4a			
Semipalmated Sandpiper	Shorebird	Increase 100%								3a			
Short-billed Dowitcher (*griseus*)	Shorebird	Assess/Maintain								3a			
Solitary Sandpiper	Shorebird	Assess/Maintain								3b			Yes
Whimbrel	Shorebird	Assess/Maintain								4a			
American Bittern	Waterbird	Assess/Maintain									Tier 1		
Atlantic Puffin	Waterbird	Maintain									Tier 3		Yes
Black Guillemot	Waterbird	Maintain									Tier 3		Yes
Black Tern	Waterbird	Assess/Maintain									Tier 1		

Table 1 continued

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
Black-legged Kittiwake	Waterbird	Increase 50%									Tier 3		Yes
Bonaparte's Gull	Waterbird	Assess/Maintain									Tier 1		
Caspian Tern	Waterbird	Recovery objective			T						Tier 3		
Common Loon	Waterbird	Maintain									Tier 1		
Common Murre	Waterbird	Maintain									Tier 3		Yes
Common Tern	Waterbird	Maintain									Tier 2		
Great Black-backed Gull	Waterbird	Maintain									Tier 3		Yes
Great Cormorant	Waterbird	Increase 100%									Tier 3		Yes
Herring Gull	Waterbird	Increase 50%									Tier 2		
Leach's Storm-Petrel	Waterbird	Increase 50%			L						Tier 1		
Razorbill	Waterbird	Maintain									Tier 3		Yes
Sora	Waterbird	Assess/Maintain									Tier 2		
Virginia Rail	Waterbird	Assess/Maintain									Tier 2		
Yellow Rail	Waterbird	Recovery objective	SC	SC	T						Tier 1		
American Black Duck	Waterfowl	Increase										High	
Barrow's Goldeneye (Eastern population)	Waterfowl	Recovery objective	SC	SC	V							High	
Blue-winged Teal	Waterfowl	Maintain										Mod low	Yes
Canada Goose (North Atlantic population)	Waterfowl	Maintain										Mod high	
Canada Goose (Atlantic population)	Waterfowl	Maintain										Mod	Yes
Common Eider (*borealis*)	Waterfowl	Increase										Very	

Table 1 continued

Priority species[1]	Bird group	Population objective	COSEWIC[2]	SARA[3]	Provincial listing[4]	National/continental concern[5] (landbirds)	Regional concern[5] (landbirds)	Continental stewardship[5] (landbirds)	Regional stewardship[5] (landbirds	Conservation category and rule[6] (shorebirds)	National priority level[7] (Waterbirds)	NAWMP rank[8] (waterfowl)	Expert review[9] (changes to priority list)
												high	
Common Eider (*dresseri*)	Waterfowl	Maintain										Very high	
Common Goldeneye	Waterfowl	Increase										High	
Harlequin Duck (Eastern population)	Waterfowl	Recovery objective	SC	SC	V							Mod high	
Hooded Merganser	Waterfowl	Increase										Mod	Yes
Long-tailed Duck	Waterfowl	Maintain										Mod high	
Red-breasted Merganser	Waterfowl	Maintain										Mod	Yes
Surf Scoter	Waterfowl	Maintain										High	

Table 2. Summary of priority species, by bird group, in BCR 8-QC.

Bird Group	Total Species	Total Priority Species	Percent Listed as Priority	Percent of Priority List
Landbird	144	54	38%	56%
Shorebird	34	12	35%	12%
Waterbird	30	18	60%	19%
Waterfowl	38	13	34%	13%
Total	**246**	**97**	**39%**	**100%**

Table 3. Number of priority species in BCR 8-QC by reason for priority status.

Reason for Priority Listing[1]	Landbirds	Shorebirds	Waterbirds	Waterfowl
COSEWIC[2]	12	1	1	2
Federal SARA listed[3]	9	1	1	2
Provincially listed[4]	12	1	3	2
National/Continental Concern[5]	22	-	-	-
Regional Concern[5]	5	-	-	-
Continental Stewardship[5]	23	-	-	-
Regional Stewardship[5]	24	-	-	-
Conservation category[6]	-	10	-	-
Priority level[7]	-	-	10	-
NAWMP[8]	-	-	-	9
Expert review[9]	7	2	7	4

[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.

[3] Species listed on Schedule 1 of the SARA as Endangered, Threatened, or Special Concern.

[4] *Provincially Listed* indicates species listed by the *Loi sur les espèces menacées ou vulnérables* (Quebec) as Threatened, Vulnerable or Likely to be designated threatened or vulnerable.

[5] See Table 1.

[6] *Conservation category* indicates a species ranked in *Canada's Shorebird Conservation Plan* (Donaldson et al. 2000) as having a 5, 4a, 4b or 3a conservation category in the United States of America and Canada.

[7] *Priority level* indicates a species ranked in *Canada's Waterbird Conservation Plan* (Milko et al. 2003) as belonging to Tier 1 or Tier 2.

[8] NAWMP indicates species ranked in the North American Waterfowl Management Plan (Plan Committee 2004) as having Highest, High or Moderately High breeding or non-breeding conservation and/or monitoring needs in the BCR.

[9] Species that did not meet the standard criteria but were added by the experts.

Element 2: Habitats Important to Priority Species

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

Priority species use 10 habitat types in BCR 8-QC (Fig. 3). Although they represent only 6% of the BCR land area, wetlands are the type of habitat most used by priority species (30 species or 31% of all priority species in the BCR). This habitat class is used by all four bird groups, with landbirds dominating (14 species).

The second most-frequently used habitat classes in BCR 8-QC are coastal areas and coniferous forests (each used by 29 species, or 30% of priority species). The coastal areas are used by all 4 bird groups (waterbirds dominate with 12 species) while the coniferous forest is only frequented by landbirds.

Mixed wood forests (used by 29% of priority species), waterbodies (16%) and riparian areas (15%) are among the habitats most used by priority species. Mixed wood forests are only used by landbirds, whereas the riparian areas and waterbodies are used by species from the four bird groups.

See Section 2 for additional details on priority species, threats, and conservation actions for each habitat class in BCR 8-QC.

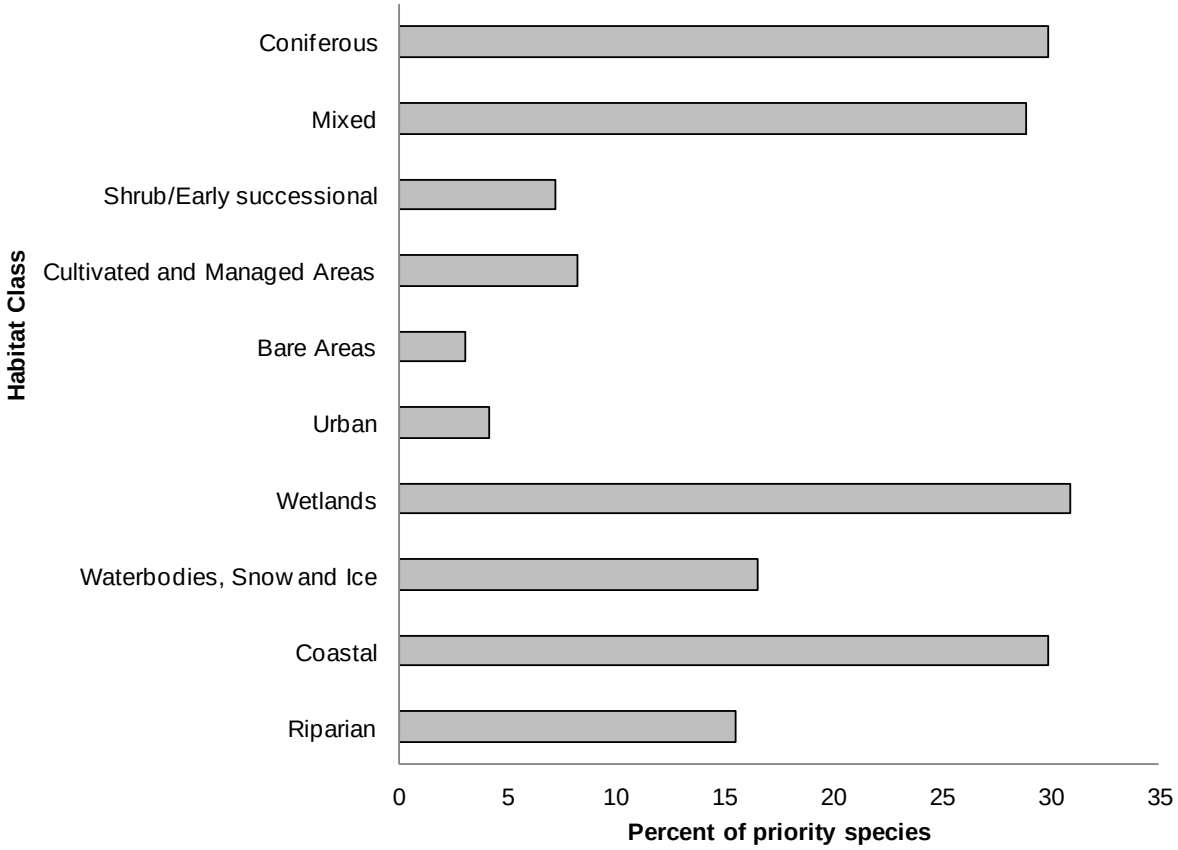

Figure 3. Percent of priority species that are associated with each habitat type in BCR 8-QC.
Note: The total exceeds 100% because each species may be assigned to more than one habitat.

Element 3: Population Objectives

Population objectives allow us to measure and evaluate conservation success. The objectives in this strategy are assigned to categories and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as “assess and maintain” and a monitoring objective is given (see Appendix 2). For any species listed under 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.

“Assess/Maintain” was the objective assigned to the greatest number of priority species in BCR 8-QC (44% of priority species; Fig. 4). For all species with this objective, there is a lack of the biological or demographic information required for adaptive population management. This is also the case for species that have been assigned the objective of maintaining populations at their current level (19% of priority species).

A recovery objective was assigned to 16% of priority species in BCR 8-QC, reflecting the proportion of priority species in BCR 8-QC that are listed in Schedule 1 of SARA or that have a status of “threatened” or “vulnerable” according to Quebec's *Loi sur les espèces menacées ou vulnérables*. In addition to these recovery objectives, which all seek to increase populations of species at risk, population increase objectives were also assigned to 21% of priority species under the categories “Increase,” “Increase 50%,” and “Increase 100%.” Overall, 37% of priority species identified in BCR 8-QC were assigned a population increase objective. This reflects the magnitude of the threats affecting bird populations in this BCR.

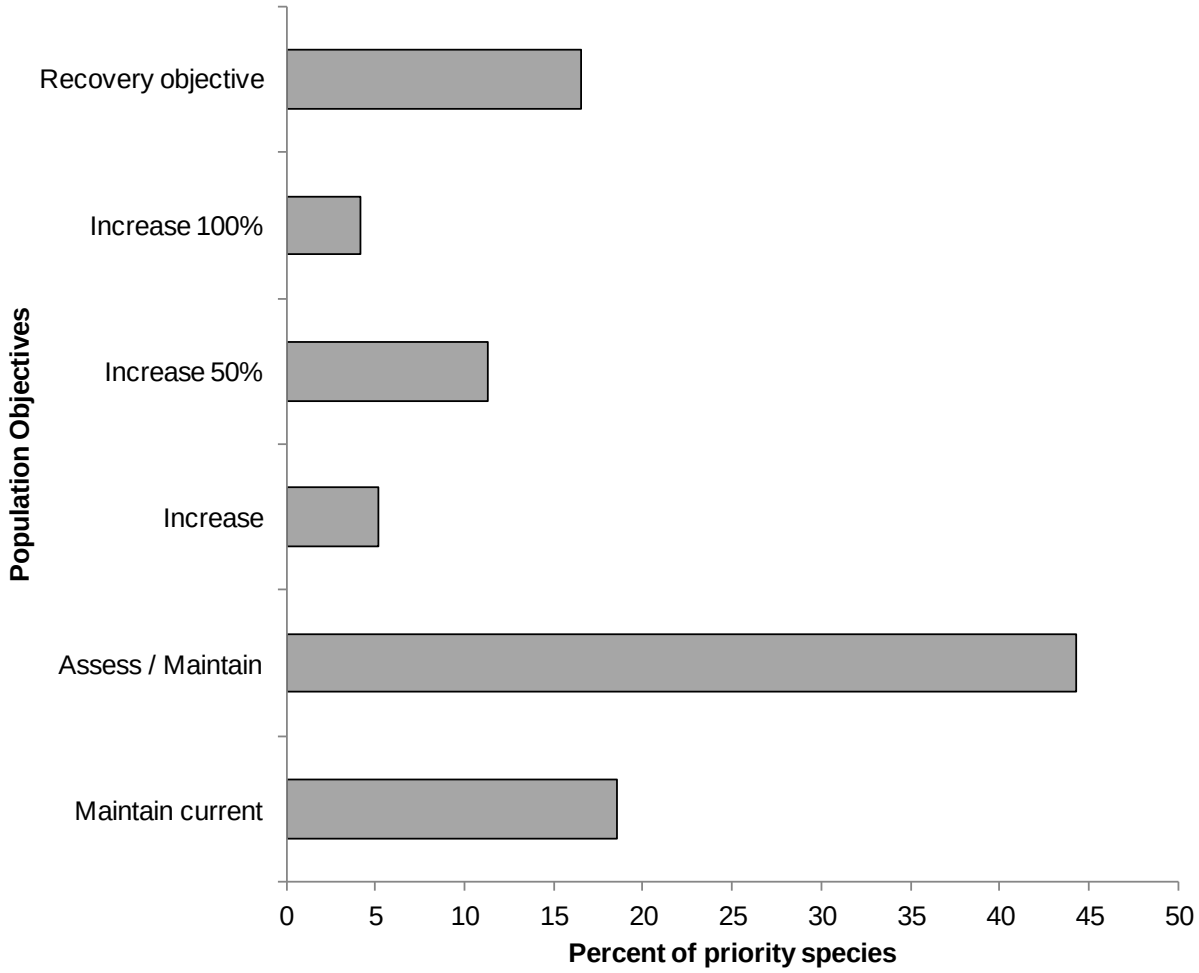

Figure 4. Percent of priority species that are associated with each population objective category in BCR 8-QC.

Element 4: Threat Assessment for Priority Species

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

Bird populations found in BCR 8-QC face many threats from different sources. No less than 453 threats classified into 11 categories and 24 sub-categories have been identified and are summarized in Figure 5. Threat category “12. Other direct threats,” represented by sub-category “12.1 Information lacking,” is the category most frequently associated with priority species in BCR 8-QC and includes 41% of all identified low-magnitude threats (Table 4). This category includes the lack of biological or demographic information required for adaptive population management and the ongoing need for the finalization of recovery strategies and management plans for federally listed species at risk. Only 5 of the 21 species at risk in BCR 8-QC had a finalized recovery or management plan when this strategy was written. The need for more information was an issue raised for 92 of the 97 priority species (95%) in BCR 8-QC.

The category “5. Biological resource use” ranks second for the percentage of threats affecting priority species in BCR 8-QC, with 15% of all threats. This high-magnitude category is primarily represented by sub-categories “5.1 Hunting & collecting terrestrial animals” and “5.3 Logging & wood harvesting,” which account for 6% and 8% of the identified threats, respectively. These high-magnitude sub-categories consist of threats such as a lack of knowledge on the extent of subsistence hunting and its impact on bird populations, and habitat loss and degradation (for example, disappearance of mature forests, logging in forested wetlands, and the scarcity of large-diameter trees, dead tree stands, and snags for cavity-nesting birds).

The category “3. Energy production and mining” includes 10% of all identified threats and has a “Medium” overall magnitude. This category is represented primarily by the medium-magnitude sub-categories “3.2 Mining & quarrying” and “3.3 Renewable energy,” which include threats of habitat loss and degradation from mining projects and permanent or seasonal flooding of natural habitats.

Category “2. Agriculture & aquaculture” has a “High” overall magnitude and is primarily represented by the sub-category “2.1 Annual & perennial non-timber crops,” which accounts for nearly 8% of all identified threats. This sub-category includes elements such as the drainage

and filling of wetlands for farming purposes, habitat loss and degradation due to the transition from perennial to annual crops, intensification of agriculture, and incidental bird mortality at harvest time.

Category “9. Pollution” includes 7% of identified threats and has a “Medium” overall magnitude. This category is represented primarily by sub-categories “9.2 Industrial & military effluents” and “9.3 Agricultural & forestry effluents.” The first sub-category is associated with oil spills while the second is associated with overuse of pesticides, which can cause bird poisoning, eggshell thinning, and a reduction in prey insect and fish populations.

Category “11. Climate change & severe weather” includes only 4% of identified threats, but its overall magnitude is “High.” This category includes two high-magnitude sub-categories in BCR 8-QC: “11.1 Habitat shifting & alteration” and “11.5 Other impacts.” The only threat in sub-category 11.1 is changes in the number, size and location of wetlands due to global climate change, while sub-category 11.5 involves the higher frequency of adverse weather events that may affect migration, reproductive success, nesting phenology and prey availability.

Each of the “1. Residential & commercial development”, “4. Transportation & service corridors,” “6. Human intrusions & disturbance,” “7. Natural system modifications,” and “8. Invasive & other problematic species & genes” threat categories includes less than 5% of all identified threats and have a “Low” or “Medium” overall magnitude.

The overall magnitude of threats is “High” in 4 of the 10 habitat classes in BCR 8-QC: cultivated and managed areas, urban areas, wetlands, and coastal areas. Of these habitats, the urban habitat is the only one to experience “High” magnitude threats due to residential and commercial development (category 1), while the cultivated and managed areas are the only habitat class affected by “Very high” magnitude threats due to agriculture and aquaculture (category 2). Category “5. Biological resource use” has a “High” magnitude impact on coniferous habitats, wetlands and coastal areas. Lastly, cultivated and managed areas, urban habitat, wetlands, and riparian areas are affected by “High” magnitude threats due to climate change and severe weather (category 11), while only coastal areas face “High” magnitude threats due to pollution (category 9).

Section 2 provides additional details on the threats associated with the various habitat classes. Threats to priority species while they are outside Canada during the non-breeding season were also assessed and are presented in the section entitled Threats Outside Canada.

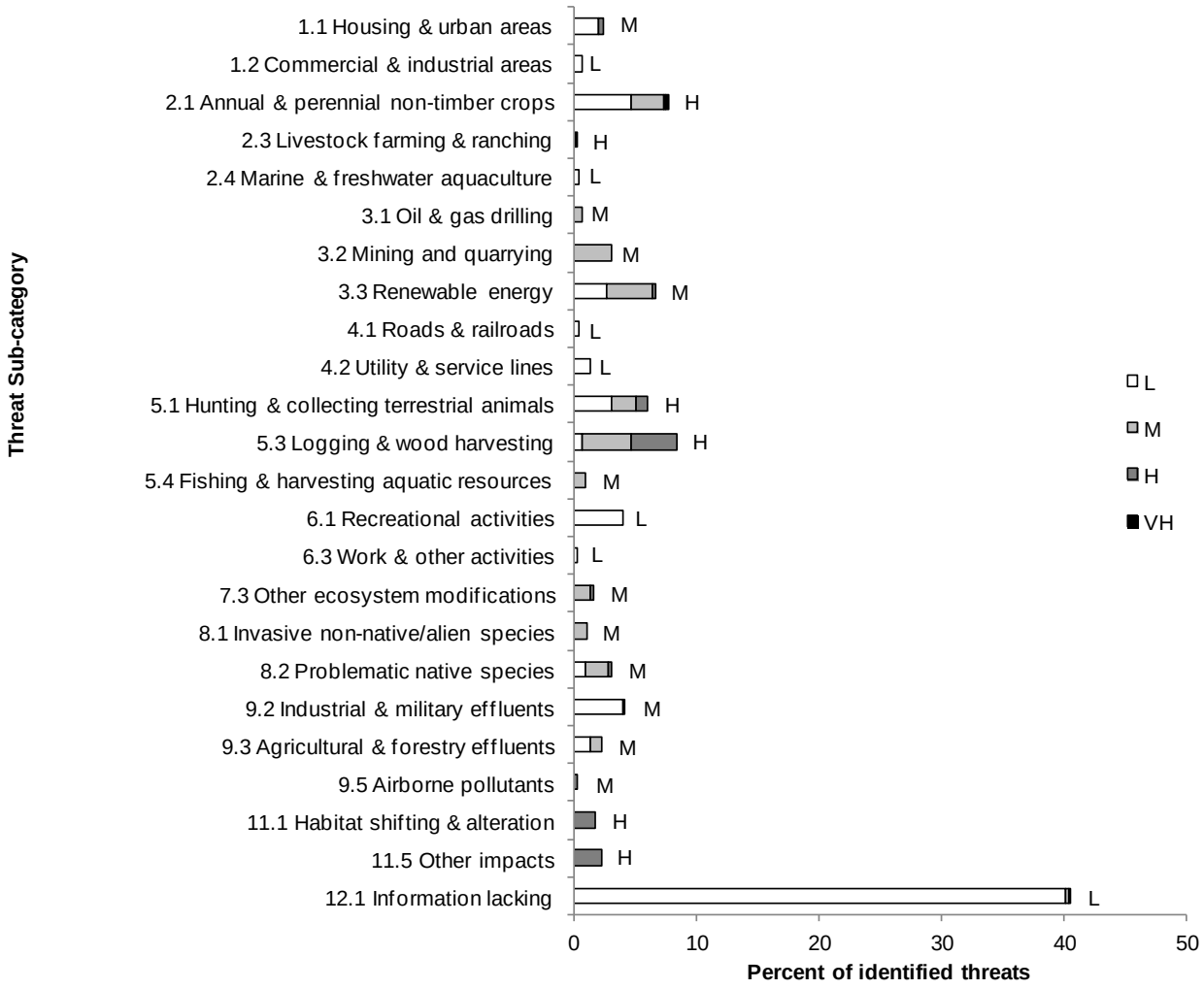

Figure 5. Percent of identified threats to priority species within BCR 8-QC by threat sub-category.
Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 8 (for example, if 100 threats were identified in total for all priority species in BCR 8, and 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 (VH = very high, H = high, M = medium and L = low) represents the overall magnitude of all threats in each threat sub-category in the BCR. (See Appendix 2 for details on how magnitude was assessed).

Table 4. Relative magnitude of identified threats to priority species within BCR 8-QC by threat category and broad habitat class.

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

Threat category	Habitat categories										
	Coniferous	Mixed	Shrub/Early successional	Cultivated and managed areas	Bare areas	Urban	Wetlands	Waterbodies	Coastal	Riparian	Overall
Overall	**M**	**L**	**L**	**H**	**L**	**H**	**H**	**M**	**H**	**M**	
1 Residential & commercial development						H	L	L		L	**M**
2 Agriculture & aquaculture	M	L		VH			L	L	L	L	**H**
3 Energy production & mining							M	L	M	M	**M**
4 Transportation & service corridors			L	L	L	L	L			L	**L**
5 Biological resource use	H	M	L		L		H		H	M	**H**
6 Human intrusions & disturbance					L		L		L		**L**
7 Natural system modifications			L	M				M		M	**M**
8 Invasive & other problematic species & genes							M		H		**M**
9 Pollution				M			M	M	H		**M**
11 Climate change & severe weather				H		H	H			H	**H**
12. Other direct threats	L	L	L	L	L	L	L	L	M	L	**L**

Element 5: Conservation Objectives

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

Conservation objectives have been divided into the seven categories presented in Figure 6. In BCR 8-QC, 35% of suggested conservation objectives are in category "7. Improve understanding" (of population status, limiting factors, and mitigation). The vast majority of the objectives in this category are from sub-category "7.1 Improve population/demographic monitoring," while the other objectives are associated with the sub-categories "7.2 Improve harvest monitoring," "7.3. Improve habitat monitoring" and "7.4. Improve understanding of causes of population declines." This situation demonstrates a need for increased monitoring in this BCR for many priority species in the four bird groups.

Objective category "1. Ensure adequate habitat" ranks second with 28% of all suggested conservation objectives. This category applies to all habitats in BCR 8-QC, with the exception of bare areas, and consists of three sub-categories: "1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat," "1.3 Ensure the continuation of natural processes that maintain bird habitat" and "1.4 Maintain important bird features on the landscape."

Fifteen percent of the objectives involve managing individual species (category 3). Nearly all of the objectives in this category are from the sub-category "3.4 Implement recovery plans for species at risk" because there are 21 species at risk in BCR 8-QC. Sub-category "3.5 Prevent and control the spread of invasive and exotic species" includes the other objectives of this category.

Objective category "2. Reduce mortality/increase productivity" represents 14% of the conservation objectives in BCR 8-QC. A little more than half the objectives of this category are in sub-category "2.3. Reduce mortality and/or sub-lethal effects of oil pollution." The other objectives in this category are part of sub-categories "2.1. Reduce mortality and/or sub-lethal effects from pesticide use," "2.2. Reduce mortality and/or sub-lethal effects from exposure to contaminants," "2.4. Reduce incidental mortality," "2.5. Reduce parasitism/predation," "2.6. Reduce the spread of disease" and "2.7. Reduce incidental mortality from collisions."

Categories "4. Reduce disturbance" and "6. Manage for climate change" each accounted for 4% of all the objectives raised for BCR 8-QC. Sub-category "4.1. Reduce disturbance from human recreation," which especially affects birds in coastal areas, is the only source in category 4. All category 6 threats are from sub-category "6.2. Manage for habitat resilience as climate changes" and are mainly associated with aerial insectivores and certain waterbirds. No objectives have been assigned to sub-category "5. Ensure adequate food supplies" in BCR 8-QC.

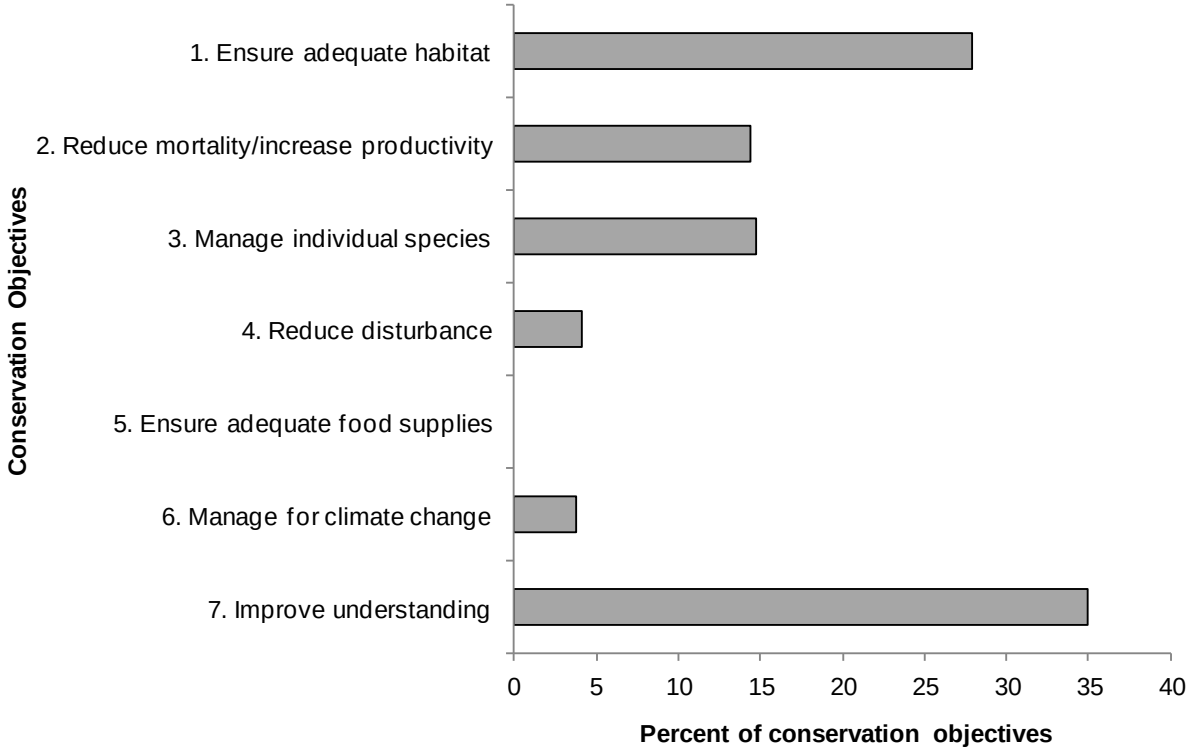

Figure 6. Percent of all conservation objectives assigned to each conservation objective category in BCR 8-QC.

Note: Objective "7. Improve understanding" means improving our understanding of population status, limiting factors and mitigation.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (Fig. 7). 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.

Figure 7 shows that 40% of the recommended actions in BCR 8-QC are in sub-category "8.2 Monitoring." The high frequency of this recommendation is primarily due to the lack of biological or demographic information on the priority species in the BCR. The actions suggested in this category include increasing the coverage of the Breeding Bird Survey (BBS), conducting specific surveys (for example, surveys involving high-altitude birds, birds nesting in boreal forests, nocturnal birds or colonial waterbirds), supporting the current migration monitoring program of the Tadoussac bird observatory and establishing additional stations in the BCR, updating waterfowl survey programs, and developing a shorebird monitoring program during the fall migration. For additional details, refer to the Research and Population Monitoring Needs section.

Sub-category "5.3 Private sector standards and codes" (primarily the renewable energy, forestry, mining and agriculture sectors) is the second largest with more than 14% of all recommended actions. Among other things, these actions include managing water levels to avoid flooding of nests during the nesting period, applying silvicultural treatments that maintain the key elements of habitats and landscape structure, applying proposed avoidance or mitigation measures in environmental assessments of projects, and supporting sustainable development of agriculture.

Sub-category "1.1 Site/area protection" is the third sub-category of actions most often mentioned at 13%. The actions recommended in this category mainly target wetlands and include protecting a variety of wetlands through stewardship or the legal designation of wetlands as conservation areas, the adoption of municipal urban plans that protect wetlands, and the protection of nesting and staging sites. These actions are focused on minimizing the impact of threats from the renewable energy, mining and agriculture sectors, and from residential development.

Sub-category "3.2 Species recovery" includes 8% of the recommended actions and mainly concerns the development and implementation of recovery or management plans for species at risk.

Habitat and natural process restoration (sub-category 2.3) represents 7% of recommended actions and primarily concerns coastal areas and wetlands. The actions recommended in this category include maintaining efficient emergency response programs, restoring habitat after

site operations have ended, and reducing the use of pollutants which can contaminate the environment.

Sub-category “5.2 Policies and regulations” includes 5% of the recommended actions and refers primarily to improving the protection of wetlands by enforcing existing policies and regulations. Each of the other sub-categories represents less than 5% of recommended actions (Fig. 7).

More details on recommended actions for the various habitat classes are presented in Section 2.

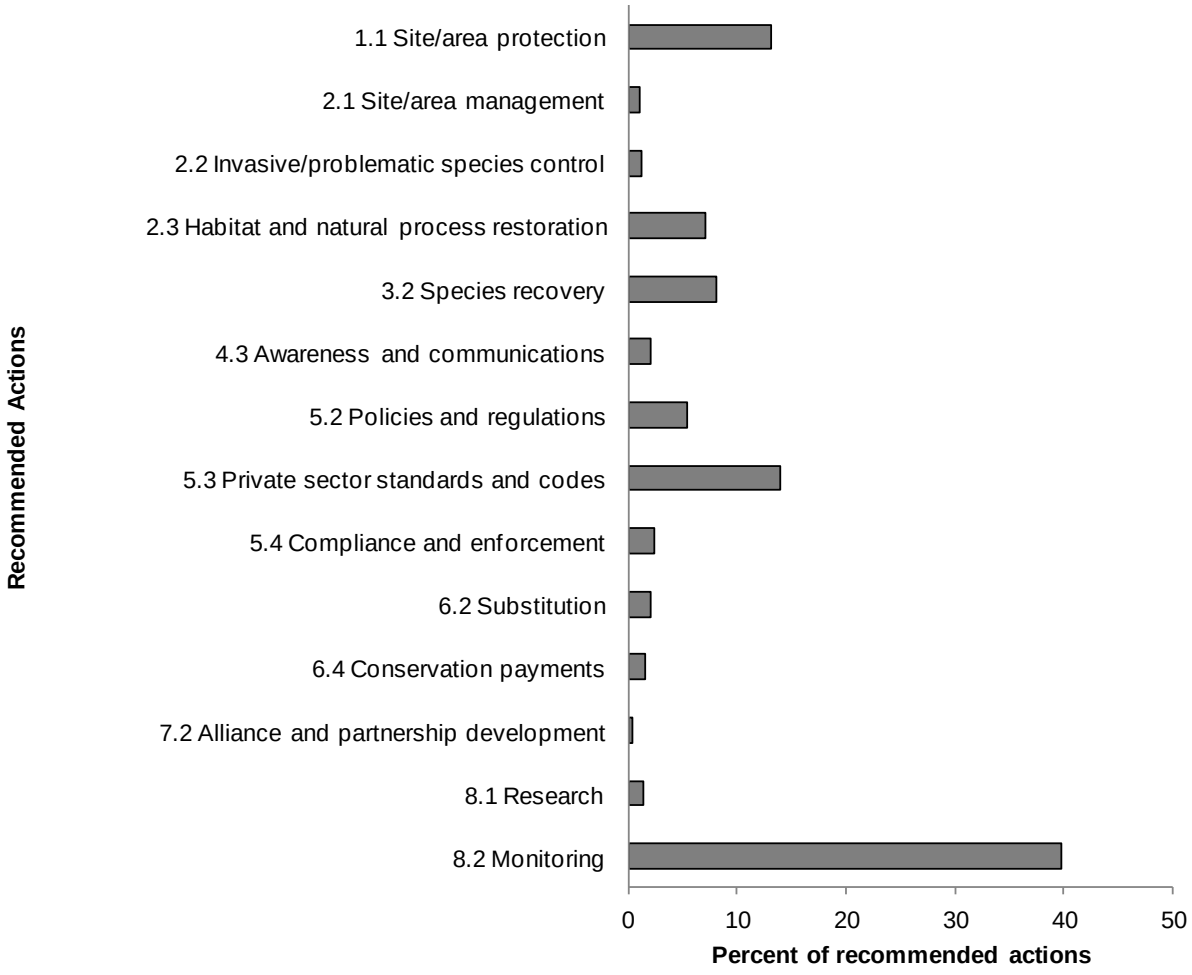

Figure 7. Percent of recommended actions assigned to each sub-category in BCR 8-QC.
“Research” and “monitoring” refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see the section Research and Population Monitoring Needs.

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 8-QC. 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 their low-level threats have not been assigned objectives or actions and/or identified threats are addressed in the Widespread Issues section of the strategy.

Coniferous

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System, coniferous habitats are defined as forest or woodland dominated by evergreen trees whose foliage is typically needle-shaped. In BCR 8-QC, coniferous habitats occupy 45% of the land and are thus the dominant habitat class in the BCR (Fig. 8). Coniferous habitats are mainly represented by the balsam fir-white birch bioclimatic domain and include species such as balsam fir, white spruce, black spruce, Jack pine, larch, white birch and trembling aspen.

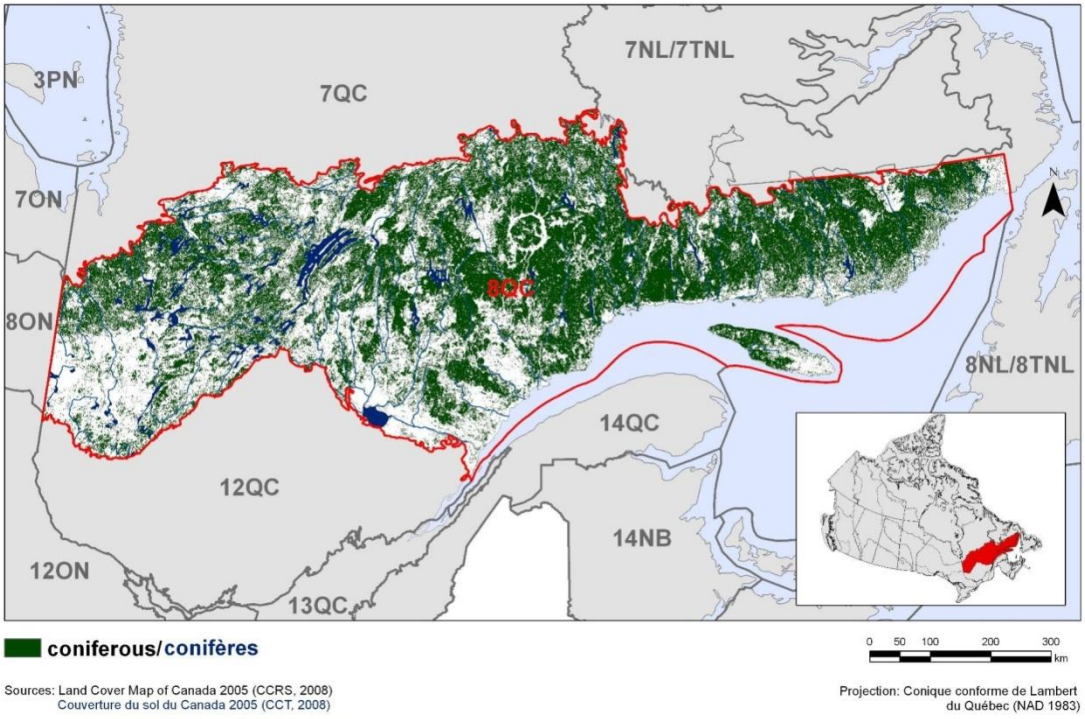

Figure 8. Map of coniferous habitat in BCR 8-QC: Boreal Softwood Shield.

Twenty-nine priority species, all landbirds, use coniferous habitats in BCR 8-QC (Table 5). Thirteen of these species were included for conservation reasons, while 16 were included for stewardship purposes. Four priority species found in this habitat class are species at risk and have been listed on Schedule 1 of SARA as “Threatened”: the Whip-poor-will, Bicknell's Thrush, Olive-sided Flycatcher and Canada Warbler. The recovery strategies for these 4 species have not yet been finalized.

Threat sub-category “5.3 Logging & wood harvesting” has a “High” overall magnitude and includes practically all (94%) of the threats observed in the coniferous habitat (Fig. 9). The main threats identified include: habitat loss and fragmentation, loss of mature forest, loss of naturally disturbed habitats, and the growing scarcity of stands of dead trees, large diameter trees, and snags with cavities.

The only other sub-category of threats reported in the coniferous habitat is “2.1 Annual & perennial non-timber crops,” which has a “Medium” overall magnitude. The only threat associated with this category is the conversion of Jack pine stands to blueberry fields in the Saguenay–Lac-Saint-Jean region, which affects the Connecticut Warbler.

The full list of threats in the coniferous habitat of BCR 8-QC, as well as the objectives, conservation actions and species that could benefit, are presented in Table 6. Conservation objectives aim mainly to conserve and restore coniferous habitats and the characteristics that make them important for birds. Conservation actions primarily seek to have forestry stakeholders establish standards and good practices to preserve the characteristics of coniferous habitats that are important for priority species.

Table 5. Priority species that use coniferous habitat, regional habitat sub-class, details on the habitat used, population objectives and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At Risk[1]	CC[2]	S[3]
American Three-toed Woodpecker	Disturbed forests (burnt out areas/windfall)	Assess/Maintain		X	
Bay-breasted Warbler	Mature coniferous forest	Increase 50%		X	
Bicknell's Thrush[4]	Dense coniferous forest, shrubland, arboreal succession, stunted trees	Recovery objective	X	X	
Black-backed Woodpecker	Disturbed forests (burnt out areas/windfall), dense mature coniferous forest	Assess/Maintain		X	
Blackburnian Warbler	Stands of mature conifers	Assess/Maintain			X
Black-throated Green Warbler	Stands of conifers with a closed canopy and complex vertical layers	Assess/Maintain			X
Boreal Chickadee	Dense mature coniferous forest	Assess/Maintain		X	
Boreal Owl	Dense mature coniferous forest	Assess/Maintain		X	
Brown Creeper	Mature coniferous forest	Assess/Maintain		X	
Canada Warbler[4]	Relatively open stands of conifers	Recovery objective	X	X	
Cape May Warbler	Open stands of conifers	Assess/Maintain			X
Connecticut Warbler	Open coniferous forest	Increase 50%		X	
Eastern Whip-poor-will[4]	Several types of dry forest habitats with clearings, stands of young pine	Recovery objective	X	X	
Evening Grosbeak	Stands of mature conifers	Assess/Maintain			X
Gray Jay	Stands of conifers (spruce)	Assess/Maintain			X
Magnolia Warbler	Stands of regenerating conifers	Assess/Maintain			X

[1] "At risk" includes: species considered Endangered, Threatened or Special Concern pursuant to an assessment by the Committee on the Status of Endangered Wildlife in Canada; listed on Schedule 1 of the *Species at Risk Act* (SARA) as Endangered, Threatened or Special Concern; and listed as Endangered, Vulnerable or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Species listed on Schedule 1 of SARA, but whose recovery strategies have not yet been finalized. Official documents related to SARA will prevail as soon as they are published; however, the interim population objectives for these species are Eastern whip-poor-will: Increase 100%; Bicknell's Thrush: Increase 100%; Olive-sided Flycatcher: Increase 100%; Canada Warbler: Increase 100%.

Table 5 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At Risk[1]	CC[2]	S[3]
Northern Flicker	Open stands of conifers	Maintain			X
Northern Hawk Owl	Open coniferous forest	Assess/Maintain			X
Olive-sided Flycatcher[4]	Stands of conifers	Recovery objective	X	X	
Ovenbird	Mature dense forest	Assess/Maintain			X
Pine Grosbeak	Coniferous	Assess/Maintain		X	
Purple Finch	Stands of conifers (open)	Assess/Maintain		X	
Ruby-crowned Kinglet	Dense stands of regenerating conifers	Assess/Maintain			X
Sharp-shinned Hawk	Dense stands of conifers (25-50 years)	Assess/Maintain			X
Spruce Grouse	Climax coniferous forests	Assess/Maintain			X
Tennessee Warbler	Regenerating stands of boreal forest with a dense layer of deciduous trees	Assess/Maintain			X
White-throated Sparrow	Stands of conifers	Assess/Maintain			X
Winter Wren	Various types of stands, often poorly drained and with a dense shrub layer	Assess/Maintain			X
Yellow-bellied Flycatcher	Dense and wet conifer stands	Assess/Maintain			X

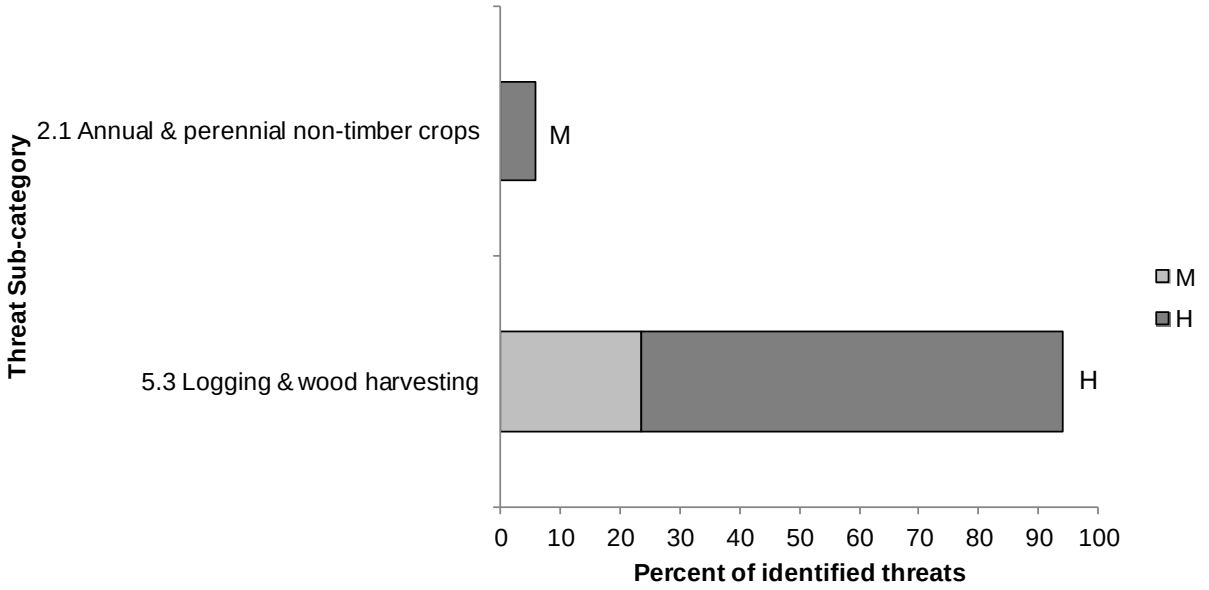

Figure 9. Percent of identified threats to priority species in coniferous habitat in each threat sub-category.

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 (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category). The overall magnitude of the sub-threat in coniferous habitat is shown at the end of each bar. See Element 4 in Appendix 2 for more details.

Table 6. Threats addressed, conservation objectives, recommended actions and priority species affected for coniferous habitat in BCR 8-QC.

Threats addressed	Threat sub-category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Conversion of Jack pine stands into blueberry fields in the Saguenay–Lac-Saint-Jean region.	2.1 Annual & perennial non-timber crops	Conserve mature coniferous forests and the features that make them important for birds.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect important nesting sites through stewardship or by legally designating them as conservation areas.	1.1 Site/area protection	Connecticut Warbler
Gradual disappearance of mature forests due to shorter turnaround time in forestry.	5.3 Logging & wood harvesting	Increase the quantity of mature coniferous forests on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Extend the period between logging operations. Promote forest management that maintains the landscape structure (stand composition and age) within the natural range of variation.	2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Pine Grosbeak, Brown Creeper, Boreal Chickadee, Boreal Owl, Bay-breasted Warbler, Black-backed Woodpecker, American Three-toed Woodpecker
Habitat loss and fragmentation due to the reduced average size of forest habitats and their increasing isolation.	5.3 Logging & wood harvesting	Maintain connectivity between coniferous forests.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Adopt practices that maximize habitat connectivity (better spatial configuration).	5.3 Private sector standards and codes	Bicknell's Thrush

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 6 continued

Threats addressed	Threat sub-category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Simplification of forest structure through the regeneration of forest cover or by the use of intermediate silvicultural treatments (i.e. precommercial thinning).	5.3 Logging & wood harvesting	Conserve the diversity of types of coniferous forest on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Reduce use of intermediate silvicultural treatments (precommercial thinning). Promote forest management that maintains the landscape structure (stand composition and age) within the natural range of variation.	5.3 Private sector standards and codes	Bicknell's Thrush
Habitat loss (scarcity of large-diameter trees).	5.3 Logging & wood harvesting	Restore features in coniferous forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Promote silvicultural treatments that maintain key habitat features (large-diameter trees, snags with cavities, stands of dead trees and irregular structure).	5.3 Private sector standards and codes	Brown Creeper
Habitat loss (scarcity of snags for cavity-nesting birds).	5.3 Logging & wood harvesting	Restore features in coniferous forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Install nest boxes. Promote silvicultural treatments that maintain key habitat features (large diameter trees, snags with cavities, dead trees and irregular structure).	3.2 Species recovery 5.3 Private sector standards and codes	Boreal Owl, Boreal Chickadee
Habitat loss (scarcity of stands of dead trees).	5.3 Logging & wood harvesting	Restore features in coniferous forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Promote silvicultural treatments that maintain key habitat features (large-diameter trees, snags with cavities, stands of dead trees and irregular structure).	5.3 Private sector standards and codes	Black-backed Woodpecker, American Three-toed Woodpecker

Table 6 continued

Threats addressed	Threat sub-category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Loss of naturally disturbed habitat (due to fire suppression, control of insect infestations and increased salvage harvesting).	5.3 Logging & wood harvesting	Conserve an appropriate percentage of dead trees in recently disturbed forests.	1.4. Maintain important bird habitat features on the landscape.	Limit salvage harvesting.	5.3 Private sector standards and codes	Black-backed Woodpecker, American Three-toed Woodpecker

Mixed Wood

Mixed wood habitats are defined as forests or woodlands characterized by a mixture of coniferous and deciduous species. In BCR 8-QC, mixed wood habitats occupy 19% of the land, making this habitat class the second largest in the BCR in terms of area (Fig. 10). Mixed wood habitats are composed of a blend of deciduous trees and conifers, such as yellow birch, balsam fir, white spruce and cedar.

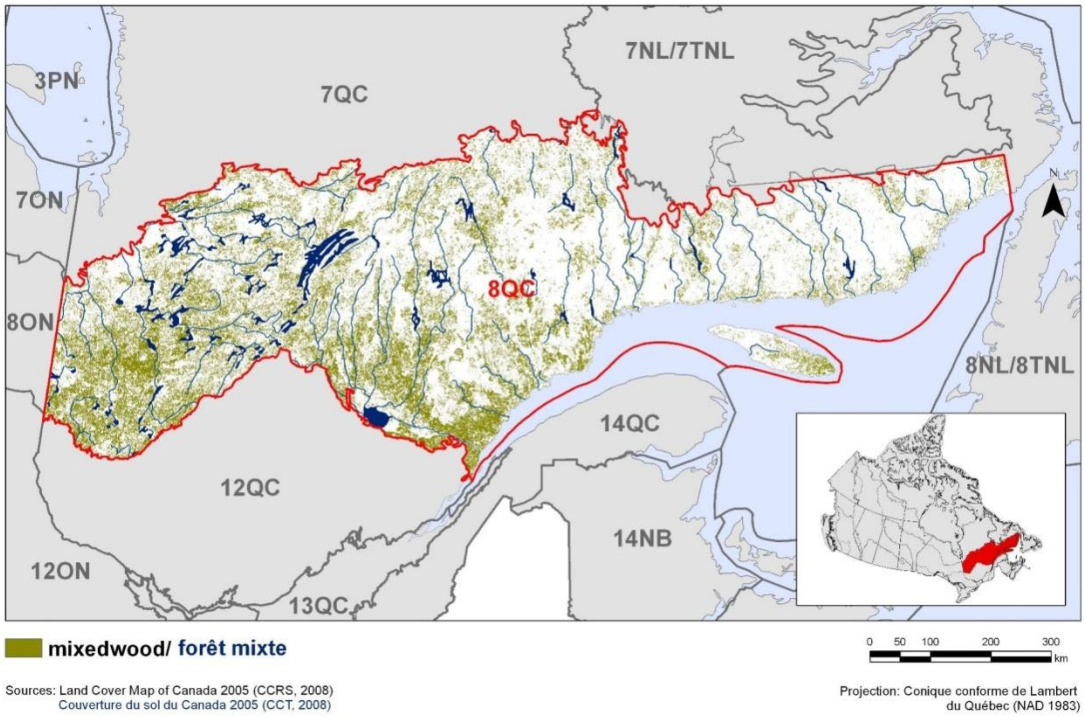

Figure 10. Map of mixed wood forest in BCR 8-QC: Boreal Softwood Shield.

Mixed wood habitats in BCR 8-QC are inhabited by 28 priority species (all landbirds, Table 7). Ten of these species were selected for conservation reasons, while 18 were chosen for stewardship purposes. Three species found in this habitat type are species at risk listed on Schedule 1 of SARA as “Threatened”: the Whip-poor-will, Olive-sided Flycatcher and Canada Warbler. The recovery strategies for these species have not yet been finalized.

As with coniferous habitats, the vast majority (88%) of threats observed in mixed wood forests involve logging and wood harvesting (Fig. 11). This sub-category of threats has a “Medium” overall magnitude and the main threats associated with it are essentially the same as those found in coniferous forests. They include loss of mature forest, the growing scarcity of stands of dead trees, large-diameter trees, and snags with cavities, and loss of naturally disturbed habitat. The overall magnitude of this sub-category is lower than in coniferous forest habitats, mainly because of the smaller number of conservation species affected (4 vs 8) and identified

threats (10 vs 24). There is also an absence of “High” magnitude threats from this sub-category in the mixed wood habitats.

The only other sub-category of threats reported in the mixed wood habitat is “2.1 Annual & perennial non-timber crops,” which has a “Low” overall magnitude. The only threat associated with this category is loss of mature forest through the conversion of forested farmland into arable land, which affects the Long-eared Owl.

The full list of threats affecting mixed wood habitats in BCR 8-QC, as well as the objectives, conservation actions, and species that could benefit, are presented in Table 8. Conservation objectives are mainly aimed at conserving and restoring mixed wood forests. Conservation actions primarily seek to have forestry stakeholders establish standards and good practices to preserve the characteristics of mixed wood forests that are important for priority birds and the landscape structure.

Table 7. Priority species that use mixed wood habitat, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
American Three-toed Woodpecker	Disturbed forests (burnt out areas/windfall)	Assess/Maintain		X	
Bay-breasted Warbler	Mature mixed wood forests	Increase 50%		X	
Black-and-white Warbler	Mixed wood stands	Assess/Maintain			X
Black-billed Cuckoo	Mixed wood stands of intermediate age	Increase 50%		X	
Blackburnian Warbler	Mature mixed wood stands	Assess/Maintain			X
Black-throated Green Warbler	Mixed wood stands with a closed canopy and complex vertical layers	Assess/Maintain			X
Brown Creeper	Mature mixed wood forests	Assess/Maintain		X	
Canada Warbler[4]	Relatively open mixed wood stands	Recovery objective	X	X	
Chestnut-sided Warbler	Early successional areas around mixed wood stands	Assess/Maintain			X
Eastern Whip-poor-will[4]	Several types of dry forest habitats with clearings, and edges of cultivated fields interspersed with bushes and especially young stands of pine, oak, and beech.	Recovery objective	X	X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Endangered, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Species listed on Schedule 1 of SARA, but whose recovery strategies have not yet been finalized. Official documents related to SARA will prevail once published. However, the interim population objectives for these species are Eastern Whip-poor-will: Increase 100%; Olive-sided Flycatcher: Increase 100%; Canada Warbler: Increase 100%.

Table 7 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Evening Grosbeak	Mixed wood stands	Assess/Maintain			X
Long-eared Owl	Mature dense mixed wood forests	Assess/Maintain		X	
Magnolia Warbler	Regenerating mixed wood stands	Assess/Maintain			X
Mourning Warbler	Primarily early successional stands with a dense layer of deciduous trees	Assess/Maintain			X
Nashville Warbler	Young mixed wood stands with a dense shrub layer dominated by deciduous trees	Assess/Maintain			X
Northern Flicker	Sparse mixed wood stands	Maintain			X
Northern Hawk Owl	Mixed wood forests	Assess/Maintain			X
Northern Saw-whet Owl	Mature dense mixed wood forests	Assess/Maintain		X	
Olive-sided Flycatcher[4]	Mixed wood stands	Recovery objective	X	X	
Orange-crowned Warbler	Deciduous stands of mixed wood forest	Assess/Maintain			X
Ovenbird	Mature dense forest	Assess/Maintain			X
Philadelphia Vireo	Successional stands dominated by deciduous trees (poplar, alder, birch, ash)	Assess/Maintain			X
Purple Finch	Open mixed wood stands	Assess/Maintain		X	
Ruby-crowned Kinglet	Mixed wood stands	Assess/Maintain			X
Sharp-shinned Hawk	Dense mixed wood stands (25-50 years)	Assess/Maintain			X
White-throated Sparrow	Mixed wood stands	Assess/Maintain			X
Winter Wren	Various types of stands, often poorly drained and with a dense shrub layer	Assess/Maintain			X
Yellow-bellied Sapsucker	Primarily mature mixed wood stands	Assess/Maintain			X

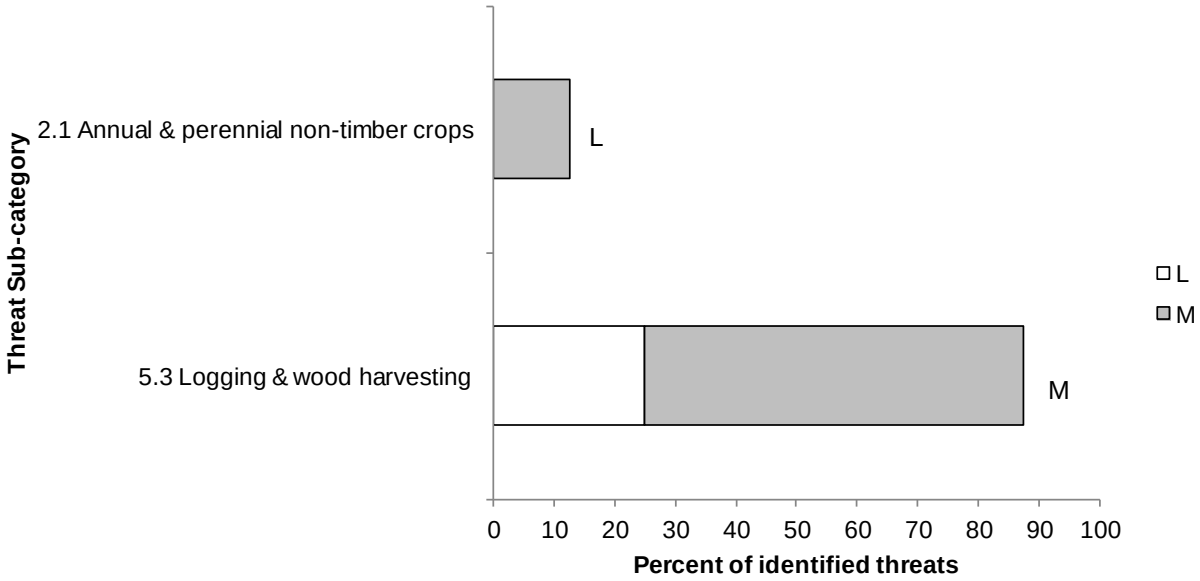

Figure 11. Percent of identified threats to priority species in mixed wood habitat in each threat sub-category.

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 the mixed wood habitat, and 10 of those threats were in category "1.1 Housing & urban areas," the bar would indicate 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in the mixed wood habitat is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 8. Identified threats, conservation objectives, recommended actions and priority species affected in the mixed wood habitat of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Loss of mature forest (conversion of forested farmland into arable land).	2.1 Annual & perennial non-timber crops	Conserve and restore the quality and quantity of mixed wood forests on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Develop incentives to maintain woodlands in agricultural areas.	6.4 Conservation incentives	Long-eared Owl
Gradual disappearance of mature forests due to shorter turnaround time in forestry.	5.3 Logging & wood harvesting	Increase the quantity of mature mixed wood forests on the landscape	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Extend the period between logging operations. Promote forest management that maintains the landscape structure (stand composition and age) within the natural range of variation.	2.3 Habitat and natural process restoration 5.3 Private sector standards and codes	Brown Creeper, Bay-breasted Warbler, American Three-toed Woodpecker
Habitat loss (scarcity of large-diameter trees).	5.3 Logging & wood harvesting	Restore features in mixed wood forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Promote silvicultural treatments that maintain key habitat features (large-diameter trees, snags with cavities, stands of dead trees and irregular structure).	5.3 Private sector standards and codes	Brown Creeper
Habitat loss (scarcity of snags for cavity-nesting birds).	5.3 Logging & wood harvesting	Restore features in mixed wood forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Install nest boxes. Promote silvicultural treatments that maintain key habitat features (large-diameter trees, snags with cavities, stands of dead trees, and irregular structure).	3.2 Species recovery 5.3 Private sector standards and codes	Northern Saw-whet Owl

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 8 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (scarcity of stands of dead trees).	5.3 Logging & wood harvesting	Restore features in mixed wood forests that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Promote silvicultural treatments that maintain key habitat features (large-diameter trees, snags with cavities, stands of dead trees and irregular structure).	5.3 Private sector standards and codes	American Three-toed Woodpecker
Loss of naturally disturbed habitat (due to fire suppression, control of insect infestations and increased salvage harvesting).	5.3 Logging & wood harvesting	Conserve an appropriate percentage of dead trees in recently disturbed forests.	1.4. Maintain important bird habitat features on the landscape.	Limit salvage harvesting.	5.3 Private sector standards and codes	American Three-toed Woodpecker

Shrub/Early Successional

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System, “shrub and early successional” habitats are defined as woody vegetation less than five metres in height. Shrub and early successional habitats occupy only 2% of the land in BCR 8-QC and are mostly situated in the western part of this conservation subregion (Fig. 12).

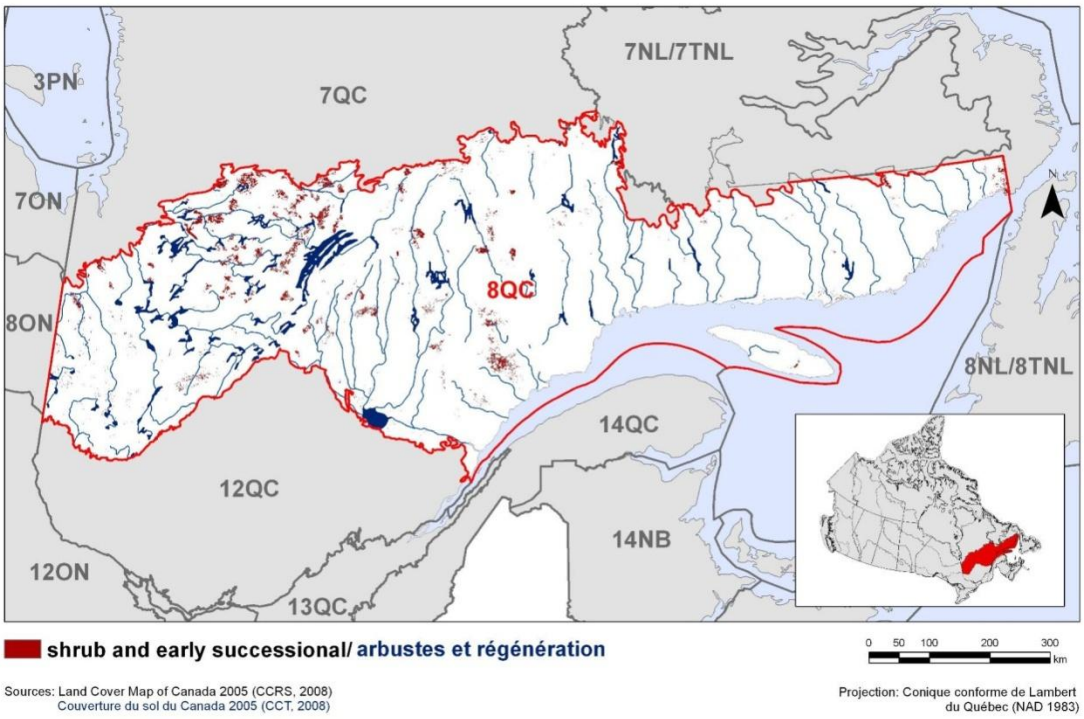

Figure 12. Map of shrub and early successional habitat in BCR 8-QC: Boreal Softwood Shield.

In BCR 8-QC, the shrub and early successional habitat is used by seven priority species: six landbirds and one waterfowl species (Blue-winged Teal; Table 9). Three species have been selected for conservation reasons while four have been chosen for stewardship purposes. There are two species at risk: the Olive-sided Flycatcher, which is listed on Schedule 1 of SARA (Threatened), and the Golden Eagle (designated as Vulnerable provincially).

The threats in the shrub and early successional habitat are broken down into three sub-categories, each of which includes 33% of the threats identified in this habitat. The three threat sub-categories have “Low” overall magnitudes (Fig. 13). Sub-category “4.2 Utilities & service lines” only includes one threat, collisions with power lines and other human-made structures, and relates to the Golden Eagle. Sub-category “5.1 Hunting & collecting terrestrial animals” also affects the Golden Eagle and consists of the

deliberate killing or accidental trapping of this species. The third sub-category associated with the shrub and early successional habitat is “7.3 Other ecosystem modifications,” for which the sole threat consists of the abandonment of uncultivated lands, making it unsuitable for the Blue-winged Teal.

The full list of threats in the shrub and early successional habitat of BCR 8-QC as well as the objectives and conservation actions are presented in Table 10. The conservation objectives are mainly to recover the Golden Eagle and to conserve and restore the shrub and early successional habitats on the landscape. The recommended actions consist in continuing to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005) and developing incentives to maintain abandoned agricultural shrubland.

Table 9. Priority species that use shrub and early successional habitat, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Alder Flycatcher	Shrub layer	Maintain			X
Blue-winged Teal	Shrublands	Maintain		X	
Fox Sparrow	Low and dense tree and shrub layers (coniferous or mixed wood)	Assess/Maintain			X
Golden Eagle	Logging and burnt out areas	Provincial recovery objective[4]	X	X	
Northern Hawk Owl	Logging and burnt out areas	Assess/Maintain			X
Olive-sided Flycatcher[5]	Logging and burnt out areas	Recovery objective	X	X	
Orange-crowned Warbler	Regenerating areas in burnt out areas or clearings	Assess/Maintain			X

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Endangered, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Refer to Équipe de rétablissement de l'aigle royal au Québec (2005).

[5] Species at risk listed on Schedule 1 of SARA, but whose recovery strategies have not yet been finalized. The official SARA-related document will prevail as soon as it is published. However, the interim population objective for this species is Assess/Increase 100%.

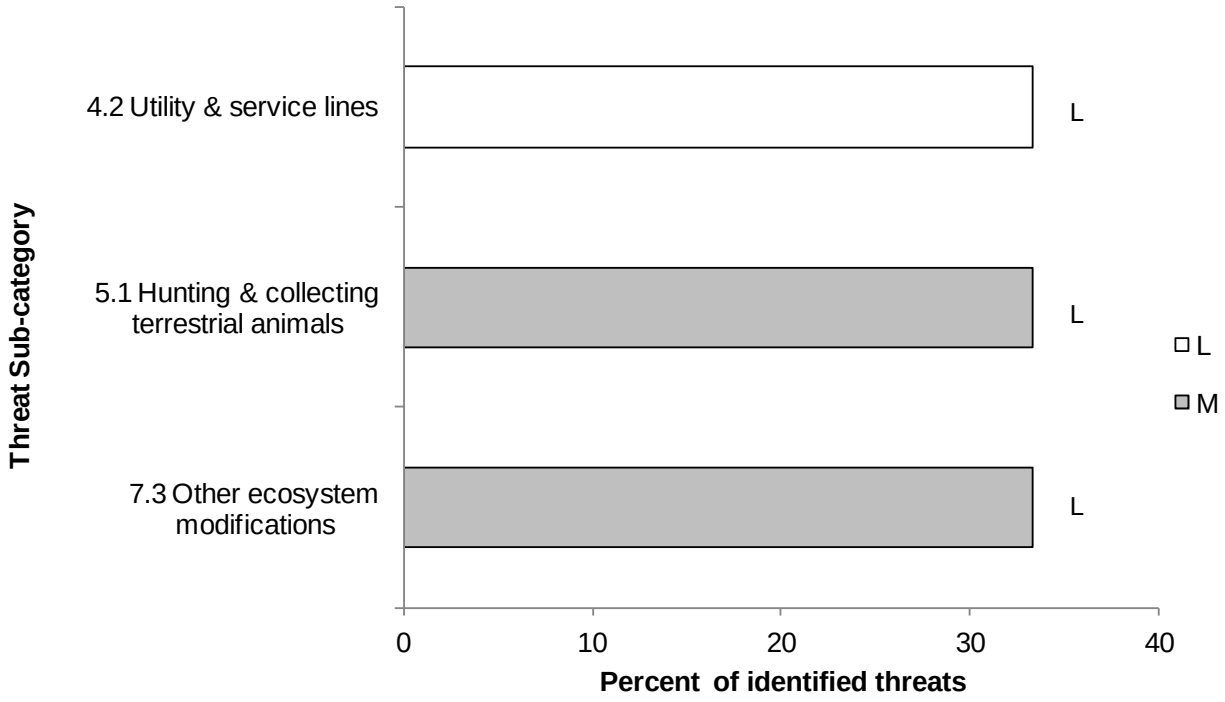

Figure 13. Percent of identified threats to priority species in the shrub and early successional habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in shrub and early successional habitat (for example, if 100 threats were identified in total for all priority species in shrub and early successional habitat, and 10 of those threats were in category "1.1 Housing & urban areas," the bar would indicate 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in shrub and early successional habitat is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 10. Threats addressed, conservation objectives, recommended actions and priority species affected in the shrub and early successional habitat of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Collisions with power lines and other human-made structures.	4.2 Utilities & service lines	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	3.2 Species recovery	Golden Eagle
Deliberate hunting or accidental trapping.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	3.2 Species recovery	Golden Eagle
Abandonment of uncultivated shrublands.	7.3 Other ecosystem modifications	Conserve and restore the quality and quantity of shrub and early successional habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Develop incentives to maintain abandoned agricultural shrubland.	6.4 Conservation incentives	Blue-winged Teal

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Cultivated and Managed Areas

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System, cultivated and managed habitats are composed of vegetation from a specific crop or development. They include tree plantations, orchards, grass crops as well as urban vegetation such as urban parks, golf courses and lawns. This type of habitat is rather marginal in BCR 8-QC, representing only 0.4% of this conservation subregion's total land area (Fig. 14). It is mostly present in the lowlands of Saguenay–Lac-Saint-Jean and Abitibi-Témiscamingue.

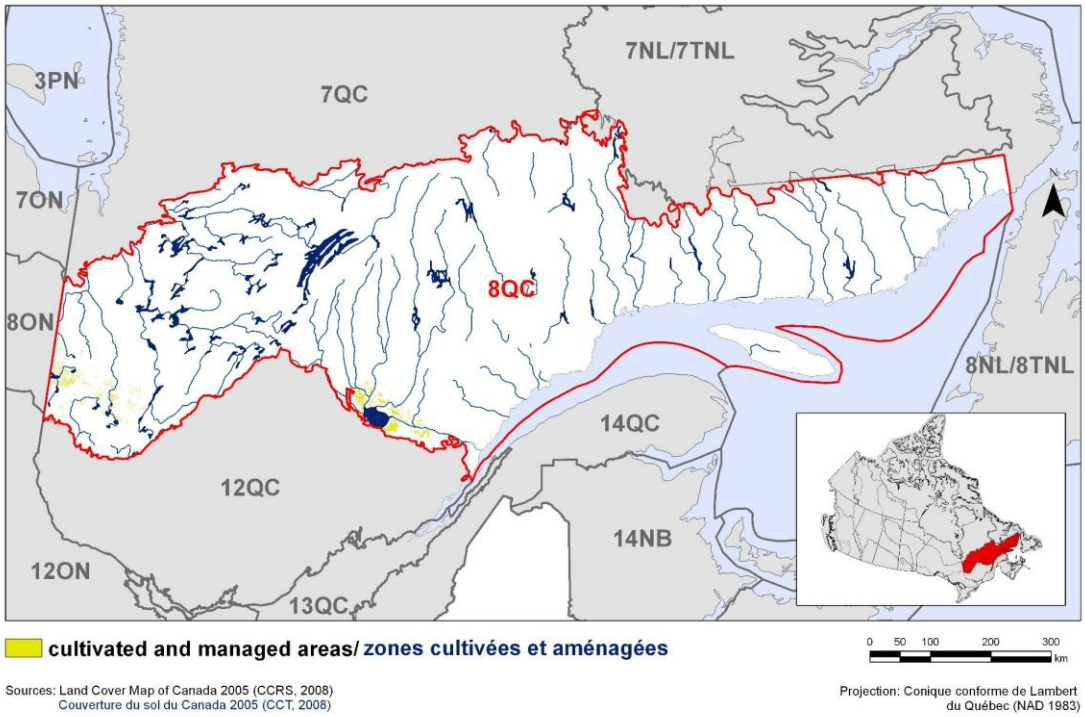

Figure 14. Map of cultivated and managed areas in BCR 8-QC: Boreal Softwood Shield.

Cultivated and managed areas in BCR 8-QC are used by eight priority species, most of which are landbirds. All have been selected for conservation reasons (Table 11). Three quarters of the priority species found in this habitat class are also species at risk; three are listed on Schedule 1 of SARA (Common Nighthawk, Short-eared Owl and Chimney Swift), while three others have been assessed as "Threatened" by COSEWIC (Bobolink, Barn Swallow and Eastern Meadowlark).

The most frequently identified threat sub-category in the cultivated and managed habitat is "2.1 Annual & perennial non-timber crops," which accounts for 53% of all threats reported for this habitat (Fig. 15). The main conservation issue in this category, whose overall magnitude is "High," is the conversion of perennial crops to annual crops, intensification of agriculture and incidental bird mortality during harvest.

With 18% of threats, sub-category “9.3 Agricultural & forestry effluents” ranks second with regard to frequency and has a “Medium” overall magnitude. The only threat relating to this sub-category in the cultivated and managed habitat is the overuse of pesticides, which can cause bird poisoning, eggshell thinning and a reduction in insect prey.

Sub-category “7.3 Other ecosystem modifications” includes 15% of identified threats and has a “Medium” rolled-up overall magnitude. The only threat included in this sub-category is the abandonment of agricultural land, which then becomes unsuitable for some species of farmland birds.

Sub-category “11.5 Other impacts” accounts for 9% of threats reported in the cultivated and managed habitat and has a “High” overall magnitude. The increased frequency of adverse weather events relating to climate change is the only threat in this sub-category and is implicitly associated with aerial insectivores and the decline of their food sources. The increased frequency of extreme weather events during the migration period could also be a major issue for many bird species.

Threat sub-category “2.3 Livestock farming & ranching” has a “High” overall magnitude. The conservation issue associated with this category is the increasing scarcity of nesting sites for the Barn Swallow due to the reduction in the number of farm buildings. The modern construction standards for these buildings make them less suitable for building nests.

The full list of threats in the cultivated and managed habitat of BCR 8-QC as well as the objectives, conservation actions and species that could benefit are presented in Table 12. Conservation objectives are mainly to conserve, protect and restore open habitats and the features that make them important for birds, reduce the impacts of pesticide contamination and climate change, and reduce incidental bird mortality at harvest.

Conservation actions include various suggestions such as adopting beneficial agricultural management practices to reduce incidental bird mortality, supporting sustainable agriculture through approaches such as maintaining large tracts of wildland, pasture and forage, and reducing pesticide use by promoting integrated pest management.

Table 11. Priority species that use cultivated and managed areas, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Barn Swallow	Hayfield, pasture	Increase 100%	X	X	
Blue-winged Teal	Hayfield, pasture	Maintain		X	
Bobolink	Hayfield, pasture	Increase 50%	X	X	
Chimney Swift[4]	Hayfield, pasture	Recovery objective	X	X	
Common Nighthawk[4]	Hayfield, pasture	Recovery objective	X	X	
Eastern Meadowlark	Hayfield, pasture	Increase 100%	X	X	
Killdeer	Cultivated fields	Increase 50%		X	
Short-eared Owl[4]	Hayfield	Recovery objective	X	X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Endangered, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Species listed on Schedule 1 of SARA, but whose management plans or recovery strategies have not yet been finalized. Official documents related to SARA will prevail as soon as they are published; however, the interim population objectives for these species are Common Nighthawk: Assess; Short-eared Owl: Assess; Chimney Swift: Increase.

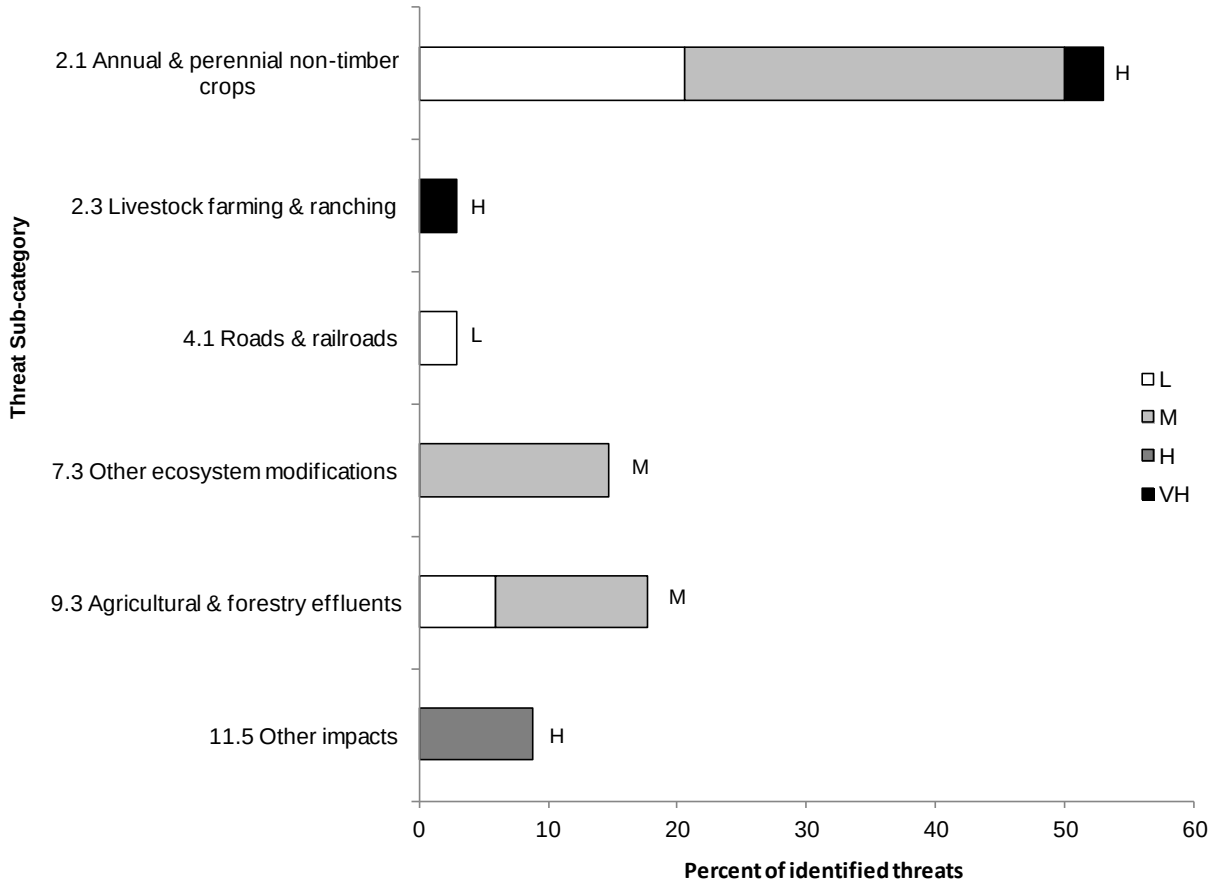

Figure 15. Percent of identified threats to priority species in cultivated and managed areas in each threat sub-category.

Each bar represents the percentage 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 indicate 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in cultivated and managed areas is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 12. Threats addressed, conservation objectives, recommended actions and priority species affected in the cultivated and managed areas of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected
Habitat loss and degradation (conversion of perennial crops to annual crops).	2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of open habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Develop incentives to maintain large tracts of pasture and forage land.	6.4 Conservation incentives	Common Nighthawk, Bobolink, Short-eared Owl, Barn Swallow, Chimney Swift, Blue-winged Teal, Eastern Meadowlark
Habitat loss and degradation (intensification of agriculture).	2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of open habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Support sustainable agricultural development.	5.3 Private sector standards and codes	Bobolink, Short-eared Owl, Barn Swallow, Kildeer, Blue-winged Teal, Eastern Meadowlark
Incidental bird mortality at harvest.	2.1 Annual & perennial non-timber crops	Reduce bird mortality at harvest.	2.4 Reduce incidental mortality	Develop beneficial management practices for harvesting when incidental bird mortality may occur (delay harvest, raise blade height, etc.).	5.3 Private sector standards and codes	Bobolink, Short-eared Owl, Blue-winged Teal, Eastern Meadowlark
Reduction in the number of artificial nesting sites.	2.1 Annual & perennial non-timber crops 2.3. Livestock farming & ranching	Conserve and restore the diversity and quality of open habitats on the landscape.	1.4. Maintain important bird habitat features on the landscape.	Install nesting boxes.	3.2 Species recovery	Barn Swallow
Collisions with vehicles when birds nest along roads.	4.1 Roads & railroads	Reduce bird mortality along roads.	2.7 Reduce incidental mortality from collisions.	Adapt road shoulders in such a way as to limit nesting.	2.1 Site/area management	Killdeer

Table 12 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected
Abandonment of farmland.	7.3 Other ecosystem modifications	Conserve and restore the diversity and quality of open habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Develop incentives to maintain abandoned agricultural shrubland.	6.4 Conservation incentives	Bobolink, Short-eared Owl, Barn Swallow, Blue-winged Teal, Eastern Meadowlark
Overutilization of pesticides (bird poisoning, eggshell thinning, decrease in insect prey, leaching into adjacent habitats, reduced prey fish).	9.3 Agricultural & forestry effluents	Reduce impact of human contaminants on cultivated and managed habitats.	2.1. Reduce mortality and/or sub-lethal effects from pesticide use.	Reduce pesticide use and promote an integrated pest management system.	2.3 Habitat and natural process restoration	Common Nighthawk, Bobolink, Barn Swallow, Chimney Swift, Killdeer, Eastern Meadowlark
Higher frequency of adverse weather events due to climate change that may affect migration, reproductive success, availability of prey or nesting phenology.	11.5 Other impacts	Reduce potential impact of climate change on agricultural and open habitats.	6.2. Manage for habitat resilience as climate changes.	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Common Nighthawk, Barn Swallow, Chimney Swift

Bare Areas

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System adapted for developing BCR strategies, bare areas are habitats with less than 4% plant cover whose cover is not artificial and the result of anthropogenic activities. They include bare rocks, sandy areas, and cliffs. However, they do not include coastal habitats, which will be addressed separately. This type of habitat accounts for less than 2% of the entire land cover in BCR 8-QC and is mainly concentrated in the western portion of this conservation subregion (Fig. 16).

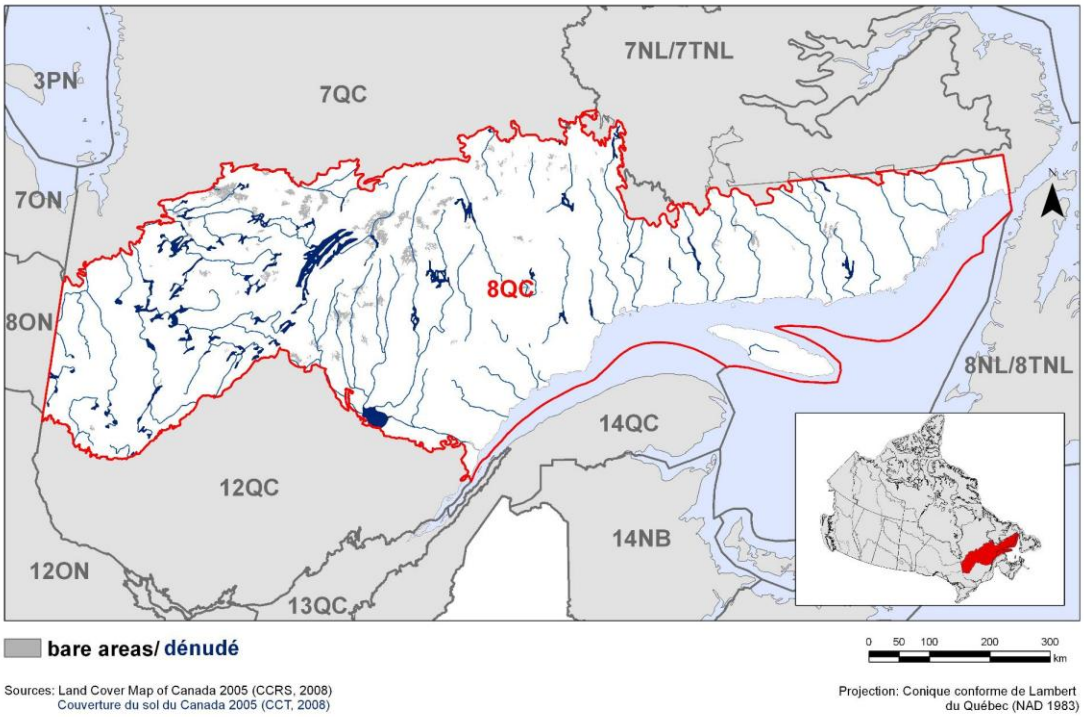

Figure 16. Map of bare areas in BCR 8-QC: Boreal Softwood Shield.

The bare areas in BCR 8-QC are used by only three priority species, all of which are landbirds and species at risk: the Golden Eagle, Common Nighthawk, and Peregrine Falcon (*anatum*/ *tundrius*; Table 13).

Threat sub-category "6.1 Recreational activities," which has a "Low" overall magnitude, accounts for half the threats associated with priority species in bare areas (Fig. 17). The only threat included in this sub-category is the disturbance of Golden Eagle and Peregrine Falcon nesting sites.

Each of threat sub-categories "4.2 Utility & Service lines" and "5.1 Hunting & collecting terrestrial animals" represents 25% of identified threats for this habitat and has a "Low" overall magnitude. The only threat associated with public utilities involves collisions with power lines

and other human-made structures, whereas the only threat included in sub-category 5.1 is the deliberate killing or accidental trapping of the Golden Eagle.

The full list of threats in the bare areas of BCR 8-QC as well as the objectives, conservation actions, and species that could benefit are presented in Table 14. Conservation objectives aim to reduce mortality caused by collisions with human-made structures, minimize disturbances around nesting sites and restore the Golden Eagle. Recommended actions include establishing buffer zones around known nesting sites, raising public awareness about the vulnerability of certain species to disturbances and continuing to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).

Table 13. Priority species that use bare areas, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Common Nighthawk[4]	Outcrops, gravel or sand deposits, burnt out areas	Recovery objective	X	X	
Golden Eagle	Cliffs	Provincial recovery objective[5]	X	X	
Peregrine Falcon [4] *(anatum/tundrius)*	Cliffs	Recovery objective	X	X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Endangered, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Species listed on Schedule 1 of SARA, but whose management plans or recovery strategies have not yet been finalized. Official documents related to SARA will prevail as soon as they are published; however, the interim population objectives for these species are Common Nighthawk: Assess; Peregrine Falcon (*anatum/tundrius)*: Assess.

[5] Refer to Équipe de rétablissement de l'aigle royal au Québec (2005).

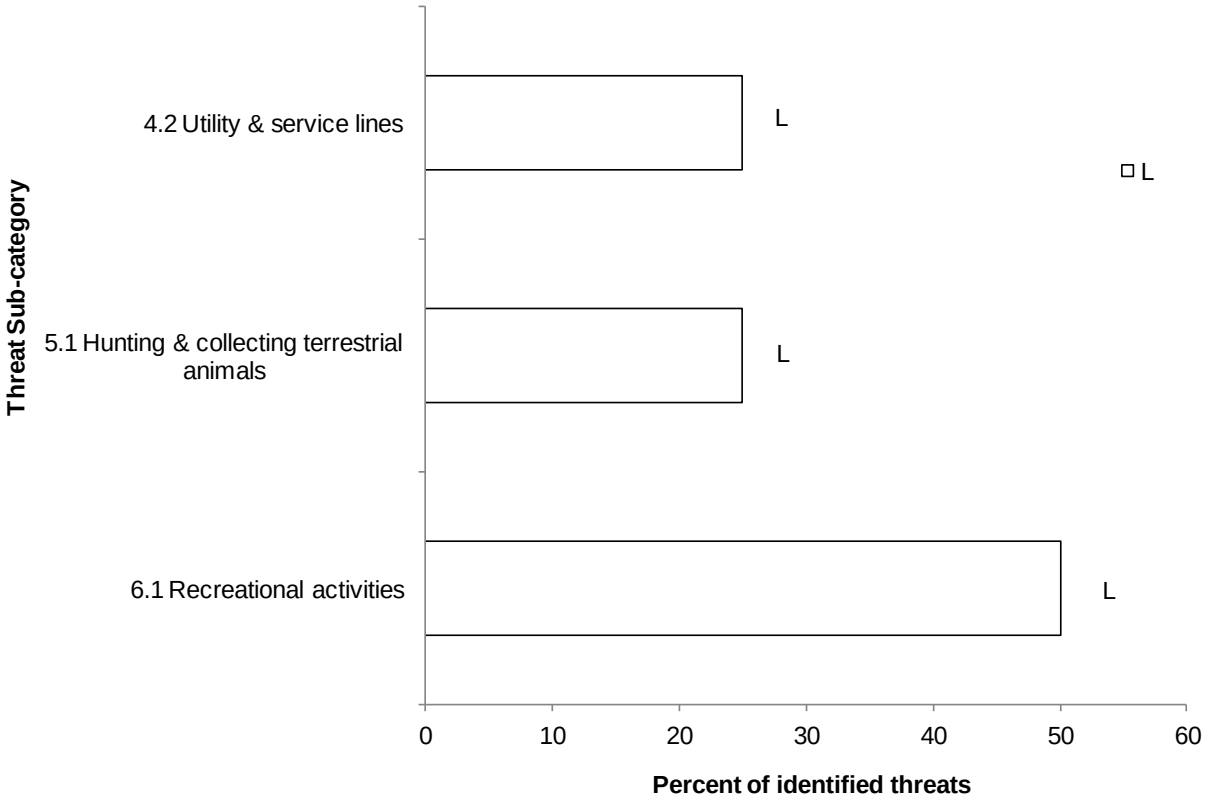

Figure 17. Percent of identified threats to priority species in bare areas in each threat sub-category. Each bar represents the percentage of the total number of threats identified in each threat sub-category in bare areas (for example, if 100 threats were identified in total for all priority species in bare 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 (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in bare areas is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 14. Threats addressed, conservation objectives, recommended actions and priority species affected in the bare areas of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Collisions with power lines and other human-made structures.	4.2 Utilities & service lines	Reduce mortality due to collisions with human-made structures.	2.7 Reduce incidental mortality from collisions.	Promote actions to reduce collisions with human-made structures.	2.1 Site/area management	Peregrine Falcon (*anatum*/*tundrius*)
Deliberate killing or accidental trapping.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	3.2 Species recovery	Golden Eagle
Disturbance of nesting sites.	6.1 Recreational activities	Recovery of species at risk. Minimize disturbance near nesting sites.	3.4. Implement recovery plans for species at risk 4.1. Reduce disturbance from human recreation	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005). Limit activities near nesting sites during the breeding season. Establish buffer zones around known nesting sites. Increase public awareness through outreach campaigns on the vulnerability of certain species to disturbance.	3.2 Species recovery 2.1 Site/area management 4.3 Awareness and communications	Golden Eagle, Peregrine Falcon (*anatum*/*tundrius*)

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Urban

Urban habitat consists primarily of human-made surfaces and structures. These include structures associated with cities, towns and transport routes as well as landfill sites. This type of habitat is uncommon in BCR 8-QC, representing only 0.1% of this conservation subregion's total land area (Fig. 18).

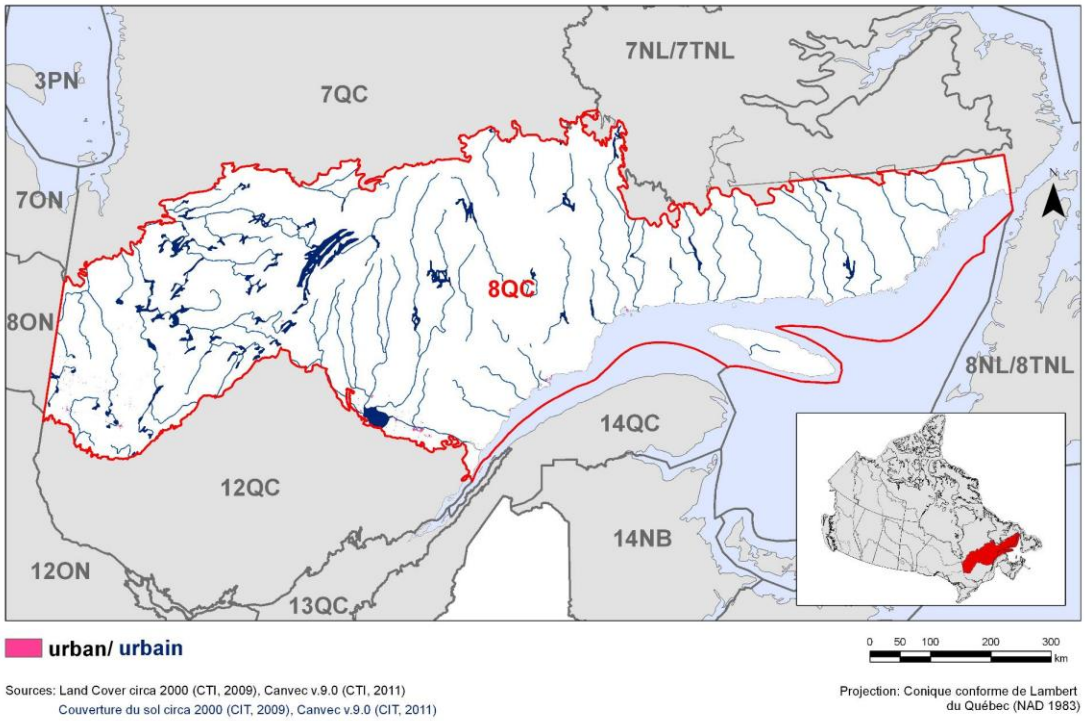

Figure 18. Map of urban areas in BCR 8-QC: Boreal Softwood Shield.

Four priority species (three landbirds and one shorebird), all selected for conservation reasons, are found in the urban habitats of BCR 8-QC (Table 15). These include three species at risk: the Common Nighthawk, Chimney Swift (both listed on Schedule 1 of SARA) and the Golden Eagle (designated Vulnerable provincially).

Each of the sub-categories “1.1 Housing & urban areas” and “11.5 Other impacts” includes 33% of reported threats in urban habitats, and both have a “High” overall magnitude (Fig. 19). The conservation issues associated with these sub-categories are, respectively, the decrease in artificial nesting sites and the increased frequency of violent weather events, two threats that affect the Chimney Swift and Common Nighthawk.

The other two sub-categories reported for urban areas are “4.1 Roads & railroads” and “4.2 Utility & service lines,” each of which represents 17% of identified threats and have a “Low” overall magnitude. The first sub-category concerns the Killdeer, which is susceptible to

collisions with vehicles when it nests along roads, while the second involves the risk of the Golden Eagle colliding with power transmission structures.

The full list of threats in the urban habitat of BCR 8-QC, as well as the objectives, conservation actions, and species that could benefit, are presented in Table 16. Conservation objectives are mainly to restore urban habitats and the features that make them important for birds, reduce the impacts of climate change, and reduce incidental mortality. Conservation actions include various suggestions such as installing nesting structures, reducing greenhouse gas emissions, as well as working on roadsides so as to limit nesting.

Table 15. Priority species that use the urban habitat, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Chimney Swift[4]	Chimneys suitable for nesting.	Recovery objective	X	X	
Common Nighthawk[4]	Gravel roofs	Recovery objective	X	X	
Golden Eagle	Human-made structures	Provincial recovery objective[5]	X	X	
Killdeer	Gravel or broken asphalt road shoulders and parking lots	Increase 50%		X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Endangered, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

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[4] Species listed on Schedule 1 of SARA, but whose management plans or recovery strategies have not yet been finalized. Official documents related to SARA will prevail as soon as they are published; however, the interim population objectives for these species are Common Nighthawk: Assess; Chimney Swift: Increase.

[5] Refer to Équipe de rétablissement de l'aigle royal au Québec (2005).

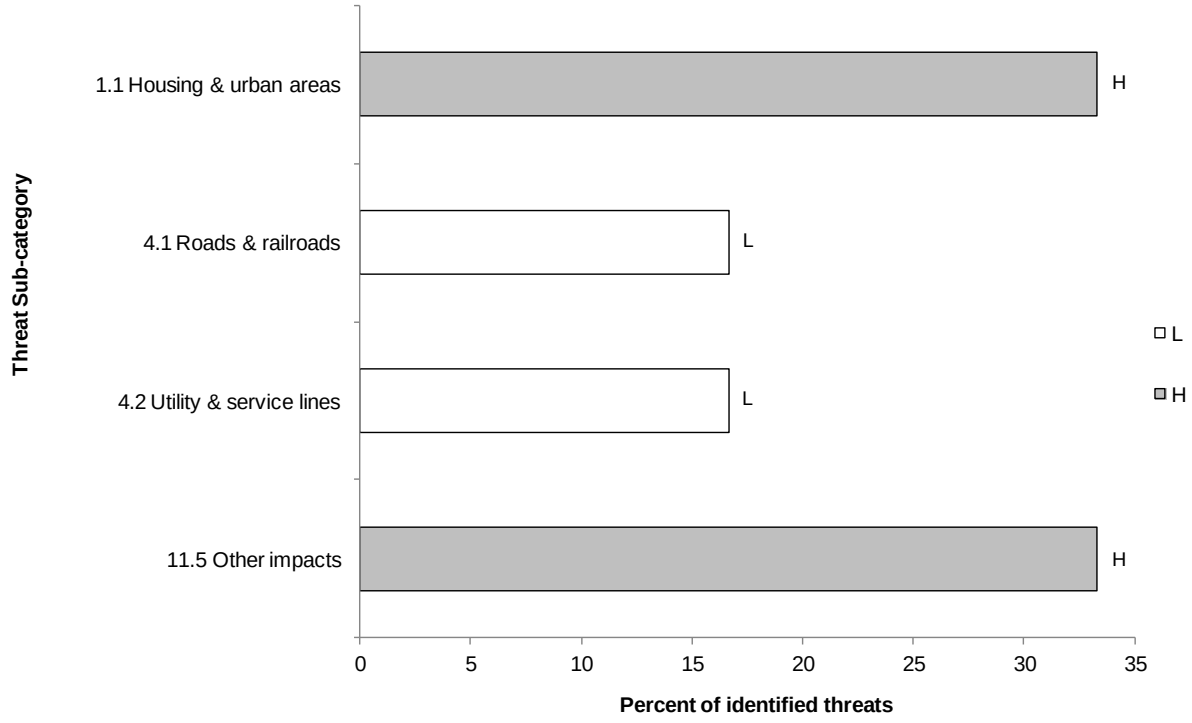

Figure 19. Percent of identified threats to priority species in the urban habitat in each threat sub-category.

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 (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in the urban habitat is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 16. Threats addressed, conservation objectives, recommended actions and priority species affected in the urban habitat of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected
Reduction in the number of artificial nesting sites.	1.1 Housing & urban areas	Restore features in open habitats that are important for birds.	1.4. Maintain important bird habitat features on the landscape.	Install/preserve nesting boxes.	3.2 Species recovery	Common Nighthawk, Chimney Swift
Collisions with vehicles when birds nest along roads.	4.1 Roads & railroads	Reduce bird mortality along roads.	2.7 Reduce incidental mortality from collisions.	Adapt road shoulders to limit nesting.	2.1 Site/area management	Killdeer
Collisions with power lines and other human-made structures.	4.2 Utilities & service lines	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	3.2 Species recovery	Golden Eagle
Higher frequency of adverse weather events due to climate change that may affect migration, reproductive success, availability of prey or nesting phenology.	11.5 Other impacts	Reduce potential impact of climate change on urban habitats.	6.2. Manage for habitat resilience as climate changes	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Common Nighthawk, Chimney Swift

Wetlands

In the context of the BCR strategies, the habitat class defined as “wetlands” is any terrestrial habitat that is either temporarily saturated with water or permanently flooded. A wetland can be a bog, a swamp or a freshwater, brackish or saltwater marsh. Wetlands cover 6% of BCR 8-QC and are most common in the western part of the subregion (Fig. 20).

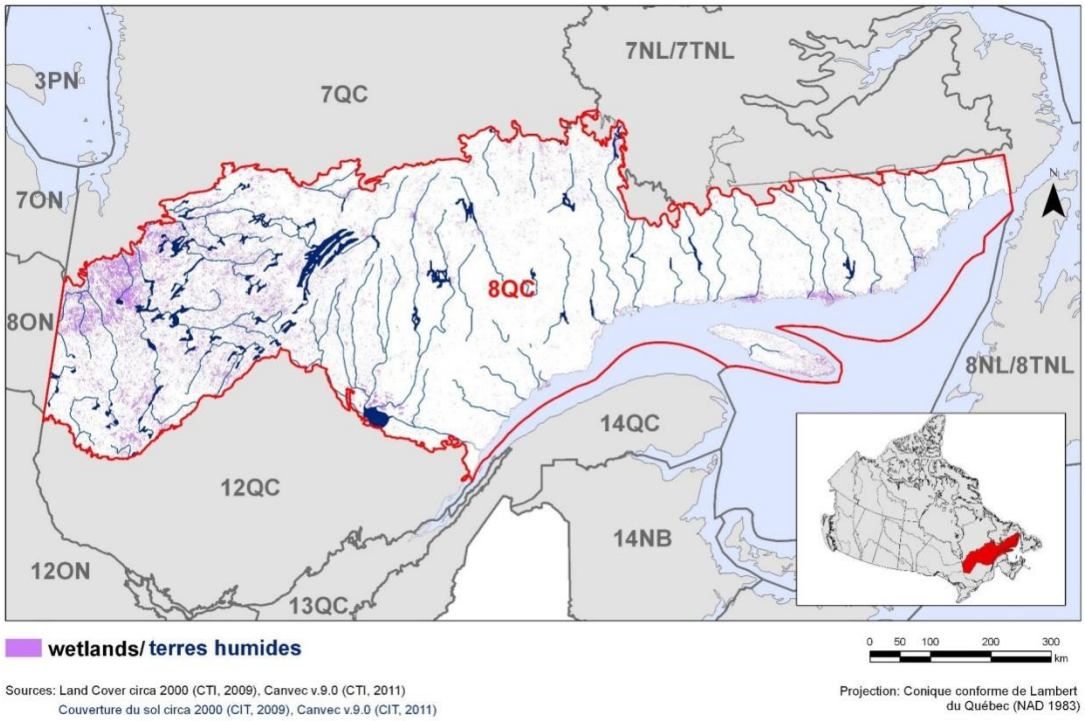

Figure 20. Map of wetlands in BCR 8-QC: Boreal Softwood Shield.

Although they only cover a small portion of BCR 8-QC, wetlands are the habitat class most used by priority species. There are a total of 30 priority species from all 4 bird groups, including 14 landbird, 6 shorebird, 6 waterbird and 4 waterfowl species (Table 17). Twelve species found in this habitat are species at risk, and 9 of them are listed on Schedule 1 of SARA. Twenty-two species were selected for conservation reasons, while 8 were chosen for stewardship purposes.

Fifteen threat sub-categories affect the wetlands, which makes wetlands the habitat class with the greatest variety of threats in BCR 8-QC (Fig. 21). The most frequently reported sub-category is “3.3 Renewable energy,” which accounts for 17% of all threats affecting this habitat. With a “Medium” overall magnitude, this sub-category affects just over half of the priority species found in wetlands. The only associated threat is habitat loss and degradation due to permanent or seasonal flooding of natural habitats and/or a potential change in salinity as a result of modifications in the hydrological system.

Each comprising 12% of the threats reported in this habitat, sub-categories “2.1 Annual & perennial non-timber crops” and “3.2 Mining and quarrying” both ranked second in frequency with “Low” and “Medium” overall magnitudes, respectively. The conservation issues associated with sub-category 2.1 are drainage and filling of wetlands for agricultural purposes and the resulting reduction of insect prey. The only threat included in sub-category 3.2 is habitat loss and degradation caused by mining.

Sub-categories “5.3 Logging & wood harvesting” and “11.1 Habitat shifting & alteration” each account for 8% of threats reported in wetlands and both have a “High” overall magnitude. Threats associated with sub-category 5.3 are habitat loss and degradation due to logging in forest wetlands and the loss of wooded riparian strips. The conservation issues associated with sub-category 11.1 are habitat loss and degradation due to climate change, which could alter the number, size and location of wetlands, and result in lost productivity of staging sites.

Although it represents only 4% of the reported threats, sub-category “11.5 Other impacts” has a “High” overall magnitude. The only threat in this sub-category is the increased frequency of adverse weather events that may affect migration, reproductive success, nesting phenology or prey availability (specifically affecting aerial insectivores).

The other threat sub-categories affecting wetlands individually account for 5% of threats or less and have a “Low” or “Medium” overall magnitude.

The full list of threats in the wetlands of BCR 8-QC, as well as the objectives, conservation actions and species that could benefit, are presented in Table 18. Conservation objectives are mainly to conserve and restore the diversity and quality of wetlands on the landscape. Recommended conservation actions include protecting a variety of wetlands through stewardship or by legally designating them as conservation areas, improving wetland protection by enforcing existing policies and regulations, and implementing mitigation and prevention actions proposed during environmental assessments of projects.

Table 17. Priority species that use wetlands, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Alder Flycatcher	Bogs	Maintain			X
American Bittern	Freshwater marshes, salt marshes, swamps	Assess/Maintain		X	
American Black Duck	Bogs, freshwater marshes, salt marshes, swamps	Increase			X
Barn Swallow	Marshes	Increase 100%	X	X	
Black Tern	Marshes	Assess/Maintain		X	
Blue-winged Teal	Freshwater marshes	Maintain		X	
Bonaparte's Gull	Conifers near bogs	Assess/Maintain		X	
Canada Goose (Atlantic population)	Bogs	Maintain			X
Canada Goose (North Atlantic population)	Bogs	Maintain			X
Canada Warbler[4]	Treed swamps, bogs	Recovery objective	X	X	
Chimney Swift[4]	Marshes	Recovery objective	X	X	
Common Nighthawk[4]	Marshes	Recovery objective	X	X	
Dunlin	Salt marshes	Assess/Maintain		X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Threated, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Species listed on Schedule 1 of SARA, but whose management plans or recovery strategies have not yet been finalized. Official documents related to SARA shall prevail as soon as they are published; however, the interim population objectives for these species are as follows: Red Knot (*rufa*): Increase 100%; Common Nighthawk: Assess; Peregrine Falcon (*anatum/tundrius)*: Assess; Short-eared Owl: Assess; Chimney Swift: Increase; Olive-sided Flycatcher: Increase 100%; Canada Warbler: Increase 100%; Rusty Blackbird: Increase 100%.

Table 17 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Golden Eagle	Bogs	Provincial recovery objective[5]	X	X	
Olive-sided Flycatcher[4]	Treed swamps	Recovery objective	X	X	
Peregrine Falcon (*anatum*/*tundrius*)[4]	Marshes	Recovery objective	X	X	
Red Knot *(rufa*)[4]	Salt marshes	Recovery objective	X	X	
Rusty Blackbird[5]	Wetlands	Recovery objective	X	X	
Sedge Wren	Freshwater marshes	Increase	X	X	
Semipalmated Sandpiper	Coastal marshes	Increase 100%		X	
Short-billed Dowitcher (*griseus*)	Marshy and wetland areas of the boreal forest	Assess/Maintain			X
Short-eared Owl[4]	Freshwater marshes, salt marshes	Recovery objective	X	X	
Solitary Sandpiper	Marshy and wetland areas of the boreal forest	Assess/Maintain		X	
Sora	Marches, salt marshes, areas of emergent vegetation associated with rivers and lakes	Assess/Maintain		X	
Spruce Grouse	Bogs	Assess/Maintain			X
Swamp Sparrow	Freshwater marshes, salt marshes	Maintain			X
Virginia Rail	Marshes, salt marshes	Assess/Maintain		X	
Whimbrel	Coastal marshes	Assess/Maintain		X	
Yellow Rail	Marshes (wet meadow), salt marshes, bogs (herbaceous part)	Recovery objective[6]	X	X	
Yellow-bellied Flycatcher	Bogs	Assess/Maintain			X

[5] Refer to Équipe de rétablissement de l'aigle royal au Québec (2005).
[6] Refer to Environment Canada (2012).

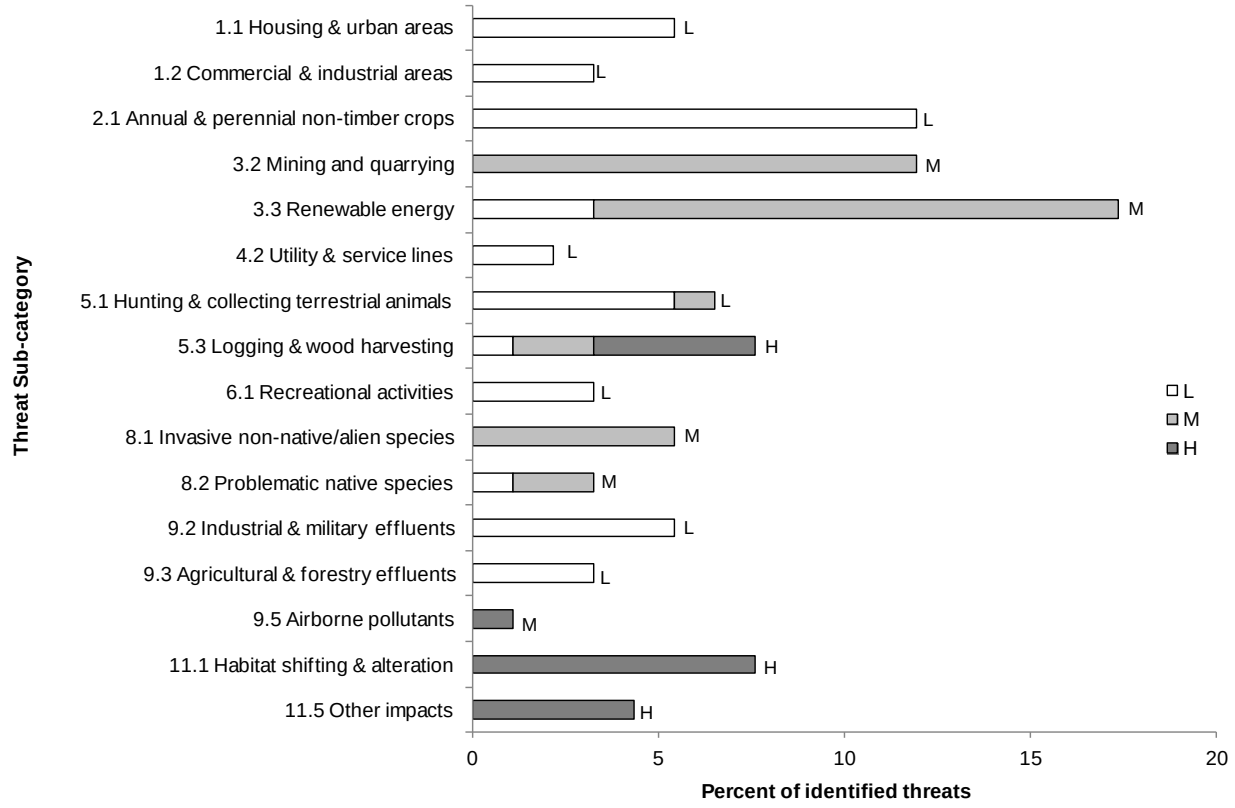

Figure 21. Percent of identified threats to priority species in wetlands in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in wetlands (for example, if 100 threats were identified in total for all priority species in wetlands, 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 (L), Medium (M), High (H) and Very High (VH) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in wetland areas is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 18. Threats addressed, conservation objectives, recommended actions and priority species affected in the wetlands of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (drainage and filling of wetlands for residential or commercial development).	1.1 Housing & urban areas 1.2 Commercial & industrial areas	Conserve and restore the diversity and quality of wetlands on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands for priority species through stewardship or by legally designating them as conservation areas. Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. In municipalities, adopt urban plans that protect wetlands. Improve the protection of wetlands by enforcing existing policies and regulations.	1.1 Site/area protection 5.2 Policies and regulations	Peregrine Falcon (*anatum*/*tundrius*), Short-eared Owl, Sedge Wren

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Decrease in the number of insect prey due to the loss of wetlands.	1.1 Housing & urban areas 1.2 Commercial & industrial areas 2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of wetlands on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands for priority species through stewardship or by legally designating them as conservation areas. Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. In municipalities, adopt urban plans that protect wetlands. Improve the protection of wetlands by enforcing existing policies and regulations.	1.1 Site/area protection 5.2 Policies and regulations	Barn Swallow, Chimney Swift

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (drainage and filling of wetlands for agricultural development).	2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of wetlands on the landscape. Protect at least 65% of suitable nesting sites along the St. Lawrence River and Saguenay River (for the Yellow Rail).	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands (including important nesting sites) for priority species through stewardship or by legally designating them as conservation areas. Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. Improve the protection of wetlands by enforcing existing policies and regulations. Support sustainable agricultural development.	1.1 Site/area protection 5.2 Policies and regulations 5.3 Private sector standards and codes	American Bittern, Common Nighthawk, Peregrine Falcon (*anatum*/*tundrius*), Black Tern, Short-eared Owl, Sora, Virginia Rail, Yellow Rail, Blue-winged Teal
		Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	3.2 Species recovery	

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss and degradation (mining).	3.2 Mining and quarrying	Conserve and restore the diversity and quality of wetlands on the landscape. Protect at least 65% of suitable nesting sites along the St. Lawrence River and Saguenay River (for the Yellow Rail).	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands (including important nesting sites) for priority species through stewardship or by legally designating them as conservation areas. Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. Restore habitat once site operations have concluded. Improve the protection of wetlands by enforcing existing policies and regulations. Encourage the adoption of more environmentally friendly operating methods. Implement the mitigation and prevention actions identified during environmental assessments of projects. Ensure that sites of operation offer restored habitats of the same quality as the original habitats (through wildlife monitoring programs before and after operations).	1.1 Site/area protection 2.3 Habitat and natural process restoration 5.2 Policies and regulations 5.3 Private sector standards and codes 8.2 Monitoring	American Bittern, Solitary Sandpiper, Black Tern, Sora, Olive-sided Flycatcher, Bonaparte's Gull, Canada Warbler, Rusty Blackbird, Virginia Rail, Yellow Rail, Blue-winged Teal
		Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	3.2 Species recovery	

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss and degradation (permanent or seasonal flooding of natural habitats and/or a potential change in salinity as a result of modifications in the hydrological system).	3.3 Renewable energy	Conserve and restore the diversity and quality of wetlands on the landscape. Protect at least 65% of suitable nesting sites along the St. Lawrence River and Saguenay River (for the Yellow Rail). Recovery of species at risk.	1.3. Ensure the continuation of natural processes that maintain bird habitat 3.4. Implement recovery plans for species at risk	Protect wetlands (including important nesting and staging sites) for priority species through stewardship or by legally designating them as conservation areas. Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. Improve the protection of wetlands by enforcing existing policies and regulations. Manage water levels to avoid flooding nests during the nesting period. Implement the mitigation and prevention actions identified during environmental assessments of projects. Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	1.1 Site/area protection 5.2 Policies and regulations 5.3 Private sector standards and codes 3.2 Species recovery	Red Knot (*rufa*), Semipalmated Sandpiper, Dunlin, American Bittern, Solitary Sandpiper, Whimbrel, Black Tern, Short-eared Owl, Sora, Olive-sided Flycatcher, Bonaparte's Gull, Canada Warbler, Rusty Blackbird, Virginia Rail, Yellow Rail, Blue-winged Teal
Collisions with power lines and other human-made structures	4.2 Utilities & service lines	Reduce mortality due to collisions with human-made structures. Recovery of species at risk.	2.7 Reduce incidental mortality from collisions. 3.4. Implement recovery plans for species at risk	Promote actions to reduce collisions with human-made structures. Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	2.1 Site/area management 3.2 Species recovery	Golden Eagle, Peregrine Falcon (*anatum*/*tundrius*)

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Deliberate killing or accidental trapping.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Golden Eagle provincial recovery strategy (Équipe de rétablissement de l'aigle royal au Québec 2005).	3.2 Species recovery	Golden Eagle
Lack of knowledge about the extent of subsistence hunting and its impact on bird populations.	5.1 Hunting & collecting terrestrial animals	Ensure adequate levels of subsistence harvest.	7.2. Improve harvest monitoring	Monitor the collection of migratory birds and eggs by Aboriginal persons in order to assess the impact on the species.	8.2 Monitoring	Red Knot (*rufa*), Semipalmated Sandpiper, Dunlin, Solitary Sandpiper, Whimbrel
Loss of wooded riparian strips.	5.3 Logging & wood harvesting	Conserve and restore the diversity and quality of wetlands on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Expand the wooded riparian strips to be conserved as part of forest management.	5.3 Private sector standards and codes	Bonaparte's Gull
Habitat loss and degradation (logging in forest wetlands).	5.3 Logging & wood harvesting	Conserve and restore the diversity and quality of wetlands on the landscape. Protect at least 65% of suitable nesting sites along the St. Lawrence River and Saguenay River (for the Yellow Rail). Recovery of species at risk.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat. 3.4. Implement recovery plans for species at risk	Protect important nesting sites through stewardship or by legally designating them as conservation areas. Promote compliance with provincial legislation relating to logging in forest wetlands. Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	1.1 Site/area protection 5.4 Compliance and enforcement 3.2 Species recovery	Solitary Sandpiper, Olive-sided Flycatcher, Bonaparte's Gull, Canada Warbler, Rusty Blackbird, Yellow Rail

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Disturbance of staging sites.	6.1 Recreational activities	Minimize disturbance near staging sites.	4.1. Reduce disturbance from human recreation	Increase public awareness through outreach campaigns on the vulnerability of certain species to disturbance.	4.3 Awareness and communications	Red Knot (*rufa*), Semipalmated Sandpiper, Whimbrel
Habitat loss and degradation (invasive species).	8.1 Invasive non-native/alien species	Limit the impact of invasive plants on landscape structure and composition. Recovery of species at risk.	3.5 Prevent and control the spread of invasive and exotic species 3.4. Implement recovery plans for species at risk	Track invasive species and assess the possibility of developing a control program. Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	8.2 Monitoring 3.2 Species recovery	American Bittern, Black Tern, Sora, Virginia Rail, Yellow Rail
Predation at staging sites.	8.2 Problematic native species	Reduce mortality and disturbance at staging sites.	2.5. Reduce parasitism/predation	Maintain existing predator control programs and explore the possibility of introducing new ones.	2.2 Invasive/problematic species control	Red Knot (*rufa*), Semipalmated Sandpiper
Red tide.	8.2 Problematic native species	Maintain and improve emergency response programs.	7.3. Improve habitat monitoring	Maintain the effectiveness of emergency response programs.	2.3 Habitat and natural process restoration	Red Knot (*rufa*)
Oil spills.	9.2 Industrial & military effluents	Reduce deliberate oil spills into the ocean by ships.	2.3 Reduce mortality and/or sub-lethal effects of oil pollution	Maintain the effectiveness of emergency response programs. Prevent ships from spilling oily waste into the ocean by promoting compliance with federal law.	2.3 Habitat and natural process restoration 5.4 Compliance and enforcement	Red Knot (*rufa*), Semipalmated Sandpiper, Dunlin, Whimbrel

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Overutilization of pesticides (bird poisoning, eggshell thinning, decrease in insect prey, leaching into adjacent habitats, reduced prey fish).	9.3 Agricultural & forestry effluents	Improve water quality in the wetlands.	2.1. Reduce mortality and/or sub-lethal effects from pesticide use	Reduce the use of pollutants that could contaminate the environment.	2.3 Habitat and natural process restoration	Black Tern, Sora, Virginia Rail
Habitat loss and degradation (acidification of wetlands may affect food availability and increase mercury poisoning).	9.5 Air-borne pollutants	Conserve and restore the diversity and quality of wetlands on the landscape.	2.2. Reduce mortality and/or sub-lethal effects from exposure to contaminants	Encourage the reduction of gas emissions that cause acid rain.	5.3 Private sector standards and codes	American Bittern
Habitat loss and degradation (climate change could cause a loss of productivity at staging sites).	11.1 Habitat shifting & alteration	Reduce potential impact of climate change on wetlands.	6.2. Manage for habitat resilience as climate changes	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Solitary Sandpiper

Table 18 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss and degradation (climate change could alter the number, size, and location of wetlands).	11.1 Habitat shifting & alteration	Reduce potential impact of climate change on wetlands. Recovery of species at risk.	6.2. Manage for habitat resilience as climate changes 3.4. Implement recovery plans for species at risk	Promote the reduction of greenhouse gas emissions. Continue to implement the Management Plan for the Yellow Rail (Environment Canada 2012).	6.2 Substitution 3.2 Species recovery	American Bittern, Black Tern, Sora, Bonaparte's Gull, Virginia Rail, Yellow Rail
Higher frequency of adverse weather events due to climate change that may affect migration, reproductive success, availability of prey or nesting phenology.	11.5 Other impacts	Reduce potential impact of climate change on wetlands.	6.2. Manage for habitat resilience as climate changes	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Red Knot (*rufa*), Common Nighthawk, Barn Swallow, Chimney Swift, Olive-sided Flycatcher

Waterbodies, Snow and Ice

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System adapted for developing BCR strategies, “waterbodies, snow and ice” are primarily areas covered with water such as lakes, reservoirs, rivers and ponds. Expanses of snow and ice (permanent, seasonal, moving, or stable) are also included in this class, but no priority species use this type of habitat in BCR 8-QC. The waterbodies (excluding the St. Lawrence system) represent close to 10% of the BCR 8-QC land area and include numerous rivers and several large lakes (Fig. 22). Note that Figure 22 exaggerates the real extent of the hydrologic network by increasing the width of water courses to better highlight them.

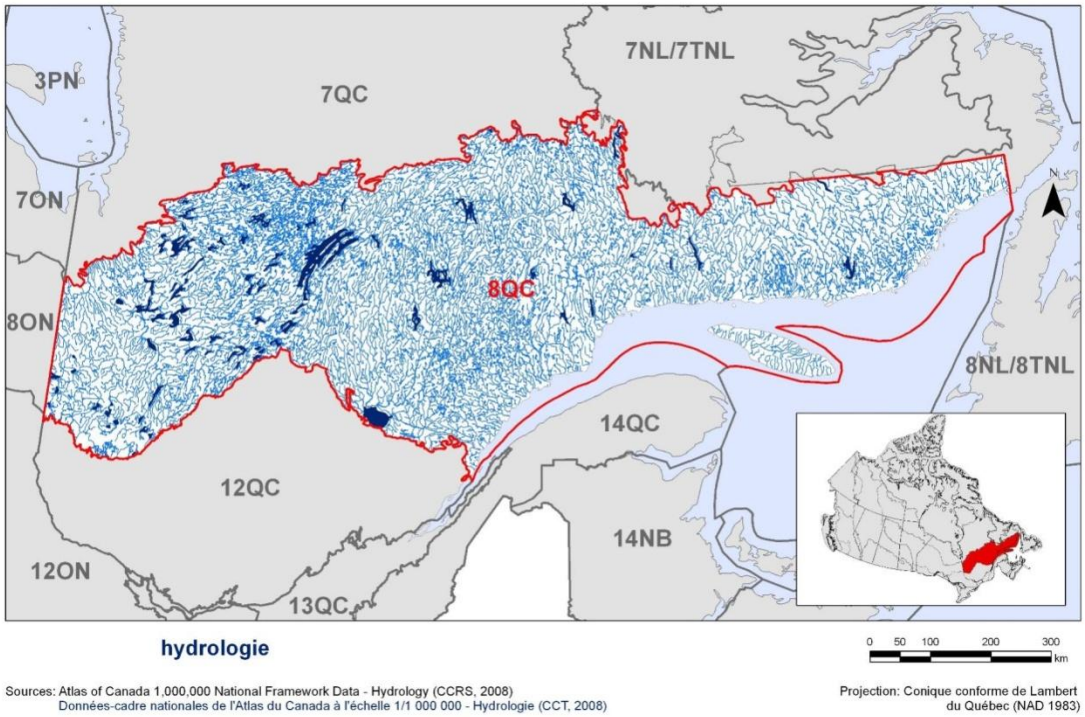

Figure 22. Hydrology map of BCR 8-QC: Boreal Softwood Shield.

Sixteen priority species are found in the waterbodies of BCR 8-QC, 9 of which are waterfowl species (Table 19). These priority species include 3 species at risk: Harlequin Duck (Eastern population) and Barrow's Goldeneye (Eastern population), which are listed on Schedule 1 of SARA, and the Bald Eagle (Vulnerable at the provincial level). Eight species are listed as priorities for conservation reasons, while 8 others were selected for stewardship purposes.

Threat sub-categories “1.1 Housing & urban areas,” “2.1 Annual & perennial non-timber crops,” and “5.1 Hunting & collecting terrestrial animals” each include 29% of reported threats to priority species in waterbodies, and are of “Low”, “Low” and “Medium” magnitude respectively (Fig. 23). The conservation issues associated with sub-categories 1.1 and 2.1 include habitat loss due to drainage and filling of wetlands near waterbodies for residential and agricultural

development. Wetlands near lakes and rivers are essential components of the quality of these habitats. For this reason, some threats affecting this type of wetlands are also considered for waterbodies. Habitat loss caused by an intensification of agriculture is another threat related to annual and perennial non-timber crops (2.1). Sub-category 5.1 includes the poaching of Harlequin Ducks (Eastern population) and the contamination of Bald Eagle prey from fishing tackles or lead shot[6] used for hunting.

Lastly, the threat sub-categories “3.3 Renewable energy” and “7.3 Other ecosystem modifications” each consist of 14% of reported threats to priority species in waterbodies and their overall magnitudes are “Low” and “Medium,” respectively. Sub-category 3.3 involves habitat loss and degradation caused by permanent or seasonal flooding of natural habitats, whereas sub-category 7.3 relates to fish stocking in historically fishless lakes, a threat affecting the Barrow's Goldeneye (Eastern population).

The conservation objectives for the waterbodies of BCR 8-QC are to conserve and restore fresh water habitats and their features that are important for birds, and to continue the recovery of species at risk. The recommended actions include protecting wetland environments near waterbodies through stewardship or by legally designating them as conservation areas, and by continuing to implement management/recovery plans for the affected species at risk (Table 20).

[6] Note that, under Article 15 of the *Migratory Birds Regulations*, the use of lead shot for hunting migratory birds is prohibited. However, this type of shot can still be found in the environment due to historic hunting practices, that predate the enactment of these regulations, and also because it is still legal for other types of hunting (i.e. small game hunting in Quebec).

Table 19. Priority species that use waterbodies, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
American Black Duck	Lakes and beaver ponds	Increase			X
Bald Eagle	Large perennial lakes, perennial rivers	Provincial recovery objective[4]	X	X	
Barrow's Goldeneye (Eastern population)	Small fishless lakes (<15 ha) located at higher elevations (>500 m).	Recovery objective[5]	X	X	
Belted Kingfisher	Lakes, rivers	Maintain			X
Blue-winged Teal	Agricultural streams and waterbodies, beaver ponds	Maintain		X	
Canada Goose (Atlantic population)	Grassy islands and islets found in forest streams, rivers, lakes, and ponds	Maintain			X
Canada Goose (North Atlantic population)	Grassy islands and islets found in forest streams, rivers, lakes, and ponds	Maintain			X
Common Goldeneye	Lakes and beaver ponds	Increase		X	
Common Loon	Fish lakes at least five ha in area with a preference for large alkaline lakes (> 50 ha) at low elevations	Maintain			X
Common Tern	Large lakes and reservoirs	Maintain			X

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Threated, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).

[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.

[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.

[4] Refer to Comité de rétablissement du pygargue à tête blanche au Québec (2002).

[5] Refer to Environment Canada (2013).

Table 19 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Harlequin Duck (Eastern population)	Fast-flowing rivers	Recovery objective[6]	X	X	
Herring Gull	Large lakes and reservoirs	Increase 50%		X	
Hooded Merganser	Lakes and beaver ponds	Increase		X	
Short-billed Dowitcher (*griseus*)	Beaver ponds in the boreal forest	Assess/Maintain			X
Solitary Sandpiper	Beaver ponds in the boreal forest	Assess/Maintain		X	
Surf Scoter	Small/medium perennial lakes	Maintain			X

[6] Refer to Environment Canada (2007).

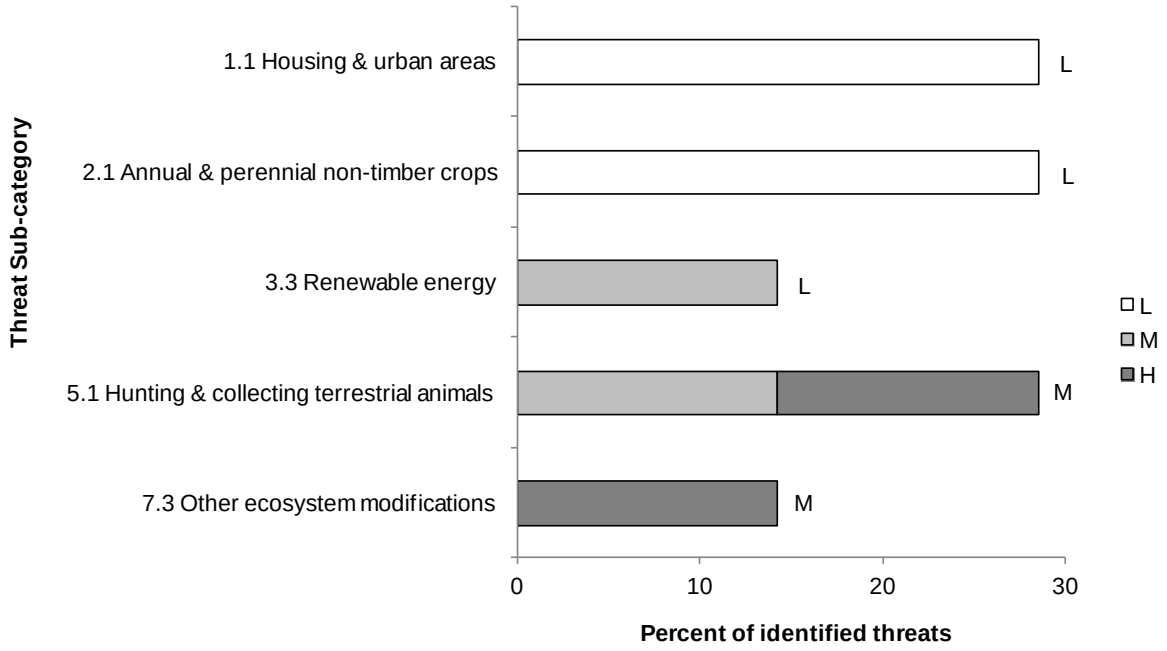

Figure 23. Percent of identified threats to priority species in waterbodies in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in waterbodies (for example, if 100 threats were identified in total for all priority species in waterbodies, and 10 of those threats were in the category "1.1 Housing & urban areas," the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (L), Medium (M), High (H), and Very High (VH) rankings of individual threats within each sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in waterbodies is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 20. Threats addressed, conservation objectives, recommended actions and priority species affected in the waterbodies of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (drainage and filling of wetlands near waterbodies for residential development).	1.1 Housing & urban areas	Conserve and restore the diversity and quality of water bodies on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. Protect wetlands for priority species through stewardship or by legally designating them as conservation areas. In municipalities, adopt urban plans that protect wetlands. Improve the protection of wetlands by enforcing existing policies and regulations.	1.1 Site/area protection 5.2 Policies and regulations	Common Goldeneye, Hooded Merganser
Habitat loss and degradation (intensification of agriculture).	2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of water bodies on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Support sustainable agricultural development.	5.3 Private sector standards and codes	Blue-winged Teal

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 20 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (drainage and filling of wetlands near waterbodies for agricultural development).	2.1 Annual & perennial non-timber crops	Conserve and restore the diversity and quality of water bodies on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect wetlands of various sizes, configurations and habitat conditions to ensure the diversity of habitats and species on the landscape. Protect wetlands for priority species through stewardship or by legally designating them as conservation areas. Improve the protection of wetlands by enforcing existing policies and regulations.	1.1 Site/area protection 5.2 Policies and regulations	Blue-winged Teal
Habitat loss and degradation (permanent or seasonal flooding of natural habitats).	3.3 Renewable energy	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	Harlequin Duck (Eastern population)
Poaching	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	Harlequin Duck (Eastern population)
Contamination of prey from lead shot used in shotgun shells.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Bald Eagle provincial recovery strategy (Comité de rétablissement du pygargue à tête blanche au Québec 2002).	3.2 Species recovery	Bald Eagle

Table 20 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss (scarcity of snags for cavity-nesting birds).	5.3 Logging & wood harvesting	Restore features in freshwater habitats that are important for birds.	1.4. Maintain important bird habitat features on the landscape	Install nest boxes. Promote silvicultural treatments that maintain key habitat features (large diameter trees, snags with cavities, dead trees and irregular structure).	3.2 Species recovery 5.3 Private sector standards and codes	Common Goldeneye, Hooded Merganser
Fish stocking in historically fishless lakes.	7.3 Other ecosystem modifications	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	3.2 Species recovery	Barrow's Goldeneye (Eastern population)

Coastal

Coastal habitats consist of terrestrial and aquatic habitats along the marine coasts. They include estuary areas, mudflats, sandbars, rocky shores and islands. The extent of this habitat type is difficult to calculate, but it is estimated that the BCR 8-QC marine coast stretches 4113 km along the St. Lawrence River and Gulf of St. Lawrence (Fig. 24).

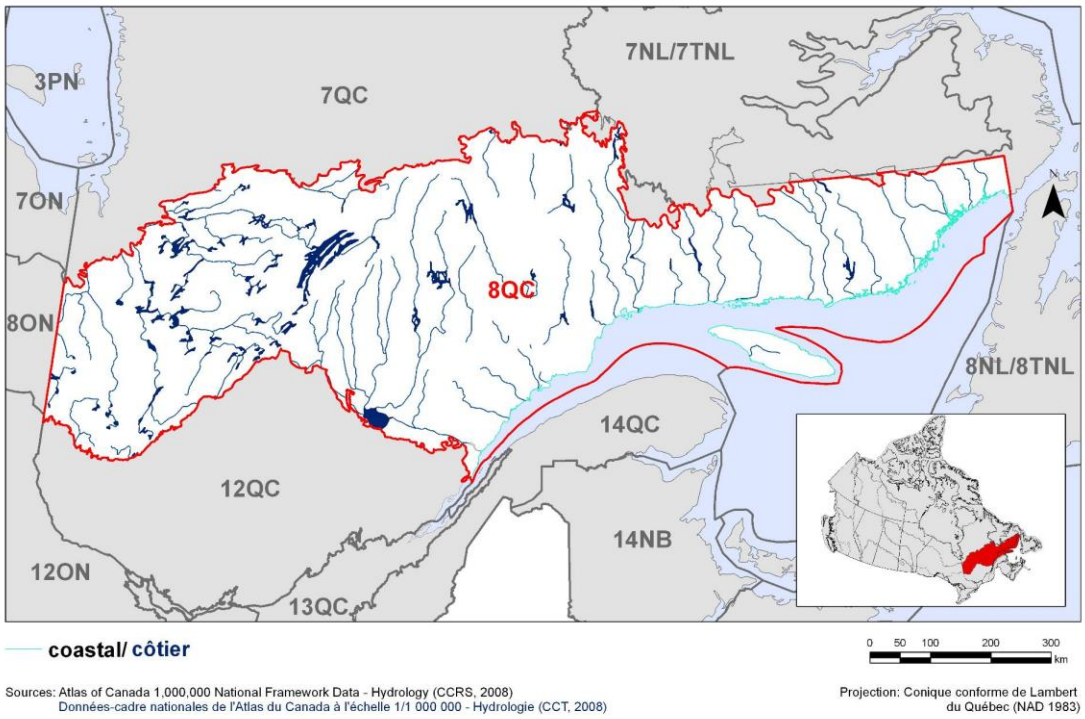

Figure 24. Map of coastal habitats in BCR 8-QC: Boreal Softwood Shield.

The coastal areas are one of the habitat classes most frequently used by priority species in BCR 8-QC (Table 21). They include 29 priority species from all four bird groups, with 12 waterbirds, 9 shorebirds, 7 waterfowl species, and 1 landbird. Twenty of these species were selected for conservation reasons, while 9 were chosen for stewardship purposes.

Three priority species found in the coastal habitats are federal species at risk listed on Schedule 1 of SARA: Harlequin Duck (Eastern population; Special Concern), Barrow's Goldeneye (Eastern population; Special Concern) and Red Knot (*rufa*; Endangered) that are also considered at risk provincially. Three other species at risk in this habitat are considered at risk only provincially: Caspian Tern (Threatened), Bald Eagle (Vulnerable) and Leach's Storm-Petrel (Likely to be designated threatened or vulnerable).

Nine threat sub-categories affect priority species in coastal habitats, thus coastal habitats have the second highest diversity of threats in BCR 8-Qc (Fig. 25). The most frequently reported threat sub-category is “9.2 Industrial & military effluents,” with 22% of all threats in this

habitat. With a “Medium” overall magnitude, this sub-category involves oil spills and sediment contamination.

Accounting for 18% of threats, sub-category “6.1 Recreational activities” ranks second in frequency and has a “Low” overall magnitude. The main threats that make up this sub-category are the disturbance of nesting sites (which affects some colonial waterbird species) and disturbance of staging sites (which affects shorebirds).

Another threat sub-category is “5.1 Hunting & collecting terrestrial animals,” which has a “High” overall magnitude and includes 17% of threats reported for priority species in coastal areas. The threats associated with this sub-category include poaching of Harlequin Ducks (Eastern population), hunting Barrow's Goldeneye (Eastern population, often confused with the Common Goldeneye) and contamination of Bald Eagle prey from lead fishing jigs or lead shot[7] from shotgun cartridges. Another conservation issue in this sub-category is the lack of knowledge about the extent and impact on bird populations of subsistence hunting in Aboriginal communities in accordance with their rights. This issue concerns certain shorebird and waterbird species as well as the Common Eider (*dresseri*).

Another notable threat sub-category is “8.2 Problematic native species,” which has a “High” overall magnitude and includes 15% of threats reported for priority species in coastal habitats. The conservation issues associated with this sub-category are predation of the nests of certain waterbird species and the Common Eider (*dresseri*; primarily by foxes and gulls), predation of certain shorebirds at staging sites, avian cholera outbreaks, and red tide.

Sub-category “3.3 Renewable energy” accounts for 14% of threats reported in coastal habitats and has a “Low” overall magnitude. The threats associated with this sub-category are offshore wind farms and habitat loss and degradation due to permanent or seasonal flooding of natural habitats caused by upstream hydroelectric structures. The other threat sub-categories affecting coastal habitats individually account for 6% of threats or less and have a “Low” or “Medium” overall magnitude.

The full list of threats affecting priority species in the coastal habitats of BCR 8-QC, as well as the objectives, conservation actions and species that could benefit, are presented in Table 22. Conservation objectives include conserving and restoring coastal habitats on the landscape, reducing oil pollution, maintaining and improving emergency response programs, and contributing to species at risk recovery. Some of the recommended conservation actions are to protect important nesting and staging sites, promote compliance with federal legislation on oil spills, implement mitigation and prevention actions identified during environmental assessments of projects, and continue implementation of management plans/recovery strategies for the affected species at risk.

[7] See the note on this subject in the “Waterbodies, Snow and Ice” section.

Table 21. Priority species that use coastal areas, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Atlantic Puffin	Coastal islands without predatory mammals; the species nests in burrows dug in the grassy slopes of the coast or uses boulders, crevices or cliff ledges.	Maintain		X	
Bald Eagle	Coast (Anticosti Island)	Provincial recovery objective[4]	X	X	
Barrow's Goldeneye (Eastern population)	Large foreshores of the upper and lower estuaries.	Recovery objective[5]	X	X	
Black Guillemot	Rocky habitat of coastal islands (crevices, boulders, cracks in rocks), crevices in the high cliffs of the mainland coast	Maintain			X
Black-bellied Plover	Flats	Assess/Maintain		X	
Black-legged Kittiwake	Ledges of island cliffs (marine environment).	Increase 50%		X	
Bonaparte's Gull	Flats	Assess/Maintain		X	
Caspian Tern[6]	Low-lying rocky islands with low vegetation.	Recovery objective	X	X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Threated, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Quebec).
[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.
[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.
[4] Refer to Comité de rétablissement du pygargue à tête blanche au Québec (2002).
[5] Refer to Environment Canada (2013).
[6] Species listed as threatened under the *Loi sur les espèces menacées ou vulnérables* (Québec) which does not have a recovery plan. The interim population objective for this species is "Increase".

Table 21 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Common Eider (*borealis*)	Ice-free pelagic zones in the gulf.	Increase			X
Common Eider (*dresseri*)	Edges of coniferous forest, tallgrass or low bush prairies on the islands of the St. Lawrence Estuary and along the shoreline of the Gulf of St. Lawrence, dwarf trees on the islands of the St. Lawrence Estuary, coastal area along the northern Lower Estuary and Gulf of St. Lawrence.	Maintain		X	
Common Murre	Rocky habitat of coastal islands (crevices, boulders, cracks in rocks, cliff ledges; occasionally on flat and open ground).	Maintain		X	
Common Tern	Low islands, barrier beaches, sandbars (on a rocky or sandy substrate) with low vegetation.	Maintain			X
Dunlin	Intertidal shorelines	Assess/Maintain		X	
Great Black-backed Gull	Rocky or sandy islands, islands with low vegetation.	Maintain			X
Great Cormorant	Cliffs and plateaus of rocky islands (without predators), rocky shorelines.	Increase 100%		X	
Harlequin Duck (Eastern population)	Coastal waters	Recovery objective[7]	X	X	
Herring Gull	Rocky or sandy islands, islands with low vegetation.	Increase 50%		X	
Hudsonian Godwit	Intertidal shorelines	Assess/Maintain		X	
Leach's Storm-Petrel	Land on the slopes or plateau of coastal islands (without predatory mammals) for digging a burrow.	Increase 50%	X	X	
Long-tailed Duck	Ice-free pelagic zones in the Gulf of St. Lawrence.	Maintain			X
Purple Sandpiper	Rocky coasts and beaches	Increase 50%			X
Razorbill	Rocky island habitats: boulders, cliff ledges, crevices.	Maintain			X

[7] Refer to Environment Canada (2007).

Table 21 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Red Knot (*rufa*)[8]	Intertidal shorelines	Recovery objective	X	X	
Red-breasted Merganser	Ice-free pelagic areas in the Gulf of St. Lawrence.	Maintain			X
Ruddy Turnstone	Intertidal shorelines	Increase 50%		X	
Sanderling	Intertidal shorelines	Increase 50%		X	
Semipalmated Sandpiper	Intertidal shorelines	Increase 100%		X	
Surf Scoter	Coastal area along the northern Lower Estuary and Gulf of St. Lawrence.	Maintain			X
Whimbrel	Coasts	Assess/Maintain		X	

[8] Species at risk listed on Schedule 1 of SARA, but whose recovery strategy has not yet been finalized. The official SARA-related document will prevail once published. However, the interim population objective for this species is “Increase 100%”.

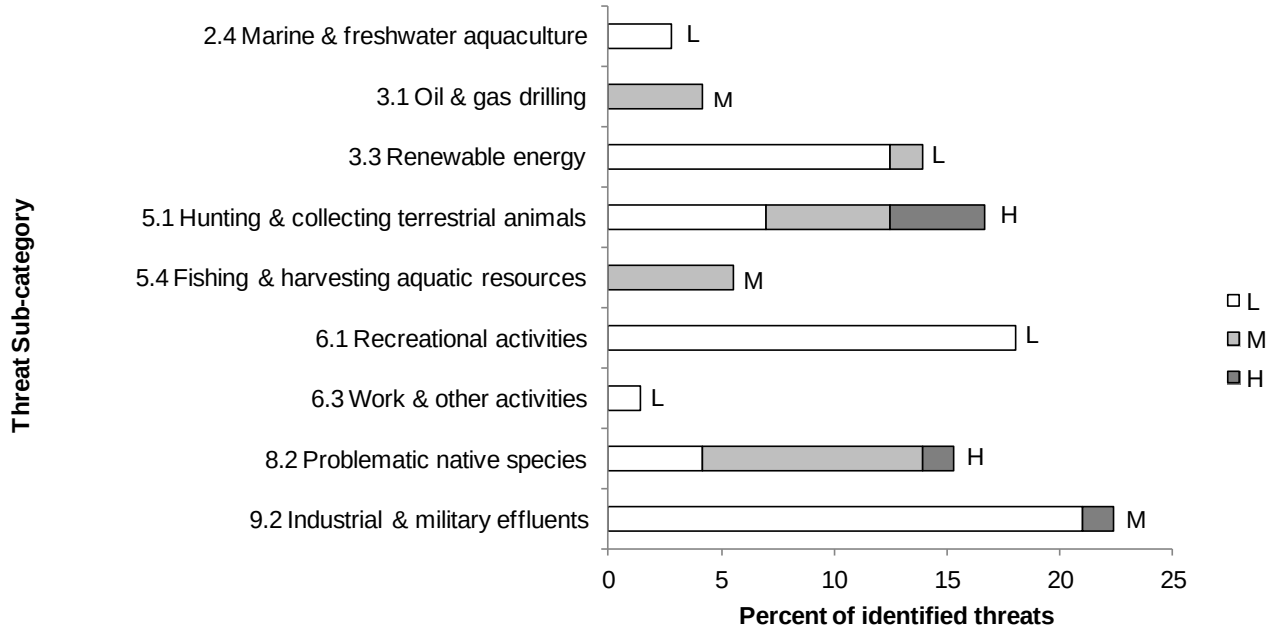

Figure 25. Percent of identified threats to priority species in coastal habitats in each threat sub-category.

Each bar represents the percentage of the total number of threats identified in each threat sub-category in coastal areas (for example, if 100 threats were identified in total for all priority species in bare 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 (L), Medium (M), High (H), and Very High (VH) rankings of individual threats within each sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in coastal areas is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 22. Threats addressed, conservation objectives, recommended actions and priority species affected in the coastal habitats of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss due to current and potential aquaculture.	2.4 Marine & freshwater aquaculture	Conserve and restore the quality and quantity of coastal habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Implement the mitigation and prevention actions identified during environmental assessments of projects. Quantify the potential overlap between mussel harvesting/aquaculture and the use of these resources by priority species, and assess the impact of these activities.	5.3 Private sector standards and codes 8.1 Research	Harlequin Duck (Eastern population), Common Eider (*dresseri*)
		Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Potential offshore oil exploration and exploitation.	3.1 Oil & gas drilling	Protect offshore sites that are important for sea ducks. Conserve and restore the quality and quantity of coastal habitats on the landscape. Maintain and improve emergency response programs. Recovery of species at risk.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat. 2.3. Reduce mortality and/or sub-lethal effects of oil pollution. 3.4. Implement recovery strategies for species at risk.	Creation of marine sanctuaries at sites that are important to sea ducks. Implement the mitigation and prevention actions identified during environmental assessments of projects. Maintain the effectiveness of emergency response programs. Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007). Continue to implement the Management Plan for the Barrow's Goldeneye (Bucephala islandica), Eastern Population (Environment Canada 2013).	1.1 Site/area protection 5.3 Private sector standards and codes 2.3 Habitat and natural process restoration 3.2 Species recovery	Harlequin Duck (Eastern population), Common Eider (*dresseri*), Barrow's Goldeneye (Eastern population)

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Potential offshore wind farms.	3.3 Renewable energy	Protect offshore sites that are important for sea ducks. Conserve and restore the quality and quantity of coastal habitats on the landscape. Recovery of species at risk.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat. 3.4. Implement recovery strategies for species at risk.	Creation of marine protected areas at sites that are important to sea ducks. Implement the mitigation and prevention actions identified during environmental assessments of projects. Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	1.1 Site/area protection 5.3 Private sector standards and codes 3.2 Species recovery	Harlequin Duck (Eastern population), Common Eider (*dresseri*)
Habitat loss and degradation (modification of the natural hydrology in large rivers).	3.3 Renewable energy	Conserve and restore the quality and quantity of coastal habitats on the landscape.	1.3. Ensure the continuation of natural processes that maintain bird habitat	Protect important staging areas through stewardship or by legally designating them as conservation areas. Implement the mitigation and prevention actions identified during environmental assessments of projects.	1.1 Site/area protection 5.3 Private sector standards and codes	Hudsonian Godwit, Red Knot (*rufa*), Sanderling, Semipalmated Sandpiper, Dunlin, Whimbrel, Black-bellied Plover, Ruddy Turnstone
Poaching	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	Harlequin Duck (Eastern population)

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Hunting (confusion with the Common Goldeneye).	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	3.2 Species recovery	Barrow's Goldeneye (Eastern population)
Contamination of prey from lead shot used in shotgun shells.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Bald Eagle provincial recovery strategy (Comité de rétablissement du pygargue à tête blanche au Québec 2002).	3.2 Species recovery	Bald Eagle
Lack of knowledge about the extent of subsistence hunting and its impact on bird populations.	5.1 Hunting & collecting terrestrial animals	Ensure adequate levels of subsistence harvest.	7.2. Improve harvest monitoring	Monitor the collection of migratory birds and eggs by Aboriginals in order to assess the impact on the species.	8.2 Monitoring	Red Knot (*rufa*), Semipalmated Sandpiper, Dunlin, Whimbrel, Common Eider (*dresseri*), Herring Gull, Common Murre, Atlantic Puffin, Caspian Tern
Incidental bird mortality from fishing nets.	5.4 Fishing & harvesting aquatic resources	Reduce incidental bird mortality in fishing gear. Recovery of species at risk.	2.4. Reduce incidental mortality 3.4. Implement recovery strategies for species at risk	Implement Beneficial management practices (BMP). Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	5.3 Private sector standards and codes 3.2 Species recovery	Harlequin Duck (Eastern population), Common Eider (*dresseri*), Common Murre, Atlantic Puffin

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Disturbance of nesting and staging sites.	6.1 Recreational activities 6.3 Work & other activities	Conserve the important nesting sites of this BCR. Minimize disturbance near nesting sites. Minimize disturbance near staging sites.	1.4. Maintain important bird habitat features on the landscape 4.1. Reduce disturbance from human recreation	Protect important nesting and staging sites through stewardship or by legally designating them as conservation areas. Establish buffer zones around known nesting sites. Limit activities near nesting sites during the breeding season. Increase public awareness through outreach campaigns on the species' vulnerability to disturbance. Increase awareness among North Shore fishermen through outreach campaigns.	1.1 Site/area protection 2.1 Site or area management. 4.3 Awareness and communications	Black-bellied Plover, Black-legged Kittiwake, Caspian Tern, Common Eider (*dresseri*), Common Murre, Dunlin, Great Cormorant, Hudsonian Godwit, Red Knot (*rufa*), Sanderling, Semipalmated Sandpiper, Ruddy Turnstone, Whimbrel
Recreational use of coastal areas (e.g. for boating activities).	6.1 Recreational activities	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	Harlequin Duck (Eastern population)
Predation at staging sites.	8.2 Problematic native species	Reduce mortality and disturbance at staging sites.	2.5. Reduce parasitism/predation	Maintain existing predator control programs and explore the possibility of introducing new ones.	2.2 Invasive/problematic species control	Red Knot (*rufa*), Semipalmated Sandpiper

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Nest predation (primarily by foxes and gulls).	8.2 Problematic native species	Increase the survival rate and productivity at nesting sites. Develop research projects to fill knowledge gaps.	2.5. Reduce parasitism/predation 7.4. Improve understanding of causes of population declines	Maintain existing predator control programs and explore the possibility of introducing new ones. Assess the impact of predation by gulls on the survival of Common Eider ducklings (*dresseri*).	2.2 Invasive/problematic species control 8.1 Research	Common Eider (*dresseri*), Herring Gull, Common Murre, Atlantic Puffin, Black-legged Kittiwake, Leach's Storm-Petrel, Caspian Tern
Outbreaks of avian cholera.	8.2 Problematic native species	Maintain and improve emergency response programs. Reduce the impact of wildlife diseases on coastal habitats. Maintain and improve emergency response programs.	2.6. Reduce the spread of disease.	Maintain the effectiveness of emergency response programs.	3.2 Species recovery	Common Eider (*dresseri*)

Table 22 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Red tide.	8.2 Problematic native species	Maintain and improve emergency response programs.	7.3. Improve habitat monitoring	Maintain the effectiveness of emergency response programs.	2.3 Habitat and natural process restoration	Red Knot (*rufa*)
Oil spills	9.2 Industrial & military effluents	Maintain and improve emergency response programs. Reduce deliberate oil spills into the ocean by ships. Recovery of species at risk.	2.3 Reduce mortality and/or sub-lethal effects of oil pollution 3.4. Implement recovery strategies for species at risk	Maintain the effectiveness of emergency response programs. Prevent ships from spilling oily waste into the ocean by promoting compliance with federal law. Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007). Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	2.3 Habitat and natural process restoration 5.4 Compliance and enforcement 3.2 Species recovery	Harlequin Duck (Eastern population), Hudsonian Godwit, Red Knot (*rufa*), Sanderling, Semipalmated Sandpiper, Dunlin, Whimbrel, Common Eider (*dresseri*), Barrow's Goldeneye (Eastern population), Common Murre, Atlantic Puffin, Bonaparte's Gull, Black-bellied Plover, Leach's Storm-Petrel, Ruddy Turnstone
Sediment contamination (polychlorinated biphenyls, polycyclic aromatic hydrocarbons, lead and mercury).	9.2 Industrial & military effluents	Recovery of species at risk.	3.4. Implement recovery plans for species at risk	Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	3.2 Species recovery	Barrow's Goldeneye (Eastern population)

Riparian

Riparian habitats are defined as any habitat located within 15 metres of a freshwater body. Based on BCR 8-QC's hydrographic system (see Figure 22), it is estimated that this habitat accounts for only 0.9% of the land area, but despite its small total area, it occurs commonly on the landscape.

Fifteen priority species are found in the riparian habitats of BCR 8-QC, representing the four bird groups; waterfowl dominates with seven species (Table 23). Eleven of the priority species were selected for conservation reasons, while four were chosen for stewardship purposes. Four species at risk found in the riparian habitats are listed on Schedule 1 of SARA: Harlequin Duck (Eastern population), Barrow's Goldeneye (Eastern population), Olive-sided Flycatcher and Rusty Blackbird. The Bald Eagle is provincially designated at risk.

The most frequently reported threat sub-category in riparian habitats is “5.3 Logging & wood harvesting,” which accounts for 30% of all threats in this habitat and has a “Medium” overall magnitude (Fig. 26). The conservation issues relating to this sub-category are the disappearance of wooded riparian strips and the loss of important bird habitat features such as large-diameter trees and snags for cavity-nesting birds.

With 19% of threats, sub-category “5.1 Hunting & collecting terrestrial animals” ranks second with regard to frequency and has a “Medium” overall magnitude. The threats associated with this sub-category are the deliberate killing or accidental trapping of the Bald Eagle, and a lack of knowledge on the extent of subsistence hunting and its impact on the populations of certain waterfowl species and also the Solitary Sandpiper.

Threat sub-categories “3.2 Mining & quarrying” and “3.3 Renewable energy” each account for 11% of reported threats in the riparian areas, and both are ranked “Medium” in terms of overall magnitude. The only threat found in sub-category 3.2 is habitat loss and degradation caused by mining, while sub-category 3.3 involves habitat loss and degradation due to permanent or seasonal flooding of natural habitats during the creation of reservoirs for hydroelectric power generation.

The other threat sub-categories affecting riparian areas individually account for 7% or less of identified threats and have a “Low” or “Medium” overall magnitude.

The full list of threats in the riparian habitats of BCR 8-QC, as well as the objectives, conservation actions and species that could benefit, are presented in Table 24. Conservation objectives are primarily to conserve and restore the diversity and quality of riparian habitats on the landscape and to recover species at risk. Some recommended conservation actions are to expand wooded riparian strips to be maintained as part of forest management, encourage the adoption of more environmentally friendly operating methods, implement the mitigation and prevention actions identified during environmental assessments of projects, and restore habitat once site operations have concluded.

Table 23. Priority species that use riparian areas, details on habitat used, population objectives, and reason for priority status.

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Alder Flycatcher	Dense beds of shrubs (alders, willows, etc.) often along the edge of watercourses	Maintain			X
American Black Duck	Edges of lakes, rivers and streams	Increase			X
Bald Eagle	Forest areas near or along the shores of major rivers	Provincial recovery objective[4]	X	X	
Barrow's Goldeneye (Eastern population)	Presence of tree cavities (snags and live mature trees) in spruce-moss or balsam fir-white birch stands near small fishless lakes (<15 ha) located at higher elevations (>500 m).	Recovery objective[5]	X	X	
Blue-winged Teal	Herbaceous riparian strips	Maintain		X	
Bonaparte's Gull	Conifers near peat lakes or slow-flowing rivers.	Assess/Maintain		X	
Common Goldeneye	Edges of lakes, rivers, and streams, mature coniferous and mixed wood forests near water.	Increase		X	
Harlequin Duck (Eastern population)	Banks of fast-flowing rivers	Recovery objective[6]	X	X	

[1] "At risk" includes species considered Endangered, Threatened or of Special Concern pursuant to an assessment by COSEWIC; listed on Schedule 1 of SARA as Endangered, Threatened, or of Special Concern; and listed as Threated, Vulnerable, or Likely to be designated threatened or vulnerable under the *Loi sur les espèces menacées ou vulnérables* (Québec).
[2] "Conservation concern" includes species considered of special concern in the Partners in Flight database downloaded from www.partnersinflight.org, the Canadian Shorebird Conservation Plan (Donaldson et al. 2000), Canadian Shorebird Conservation Plan (Milko et al. 2003), the North American Waterfowl Management Plan (Plan Committee 2004), or by regional experts.
[3] "Stewardship" includes abundant species with a wide range with a large percentage of their range or their continental population located in the conservation unit or sub-unit. These species include landbirds considered by Partners in Flight but also species from other bird groups added by experts.
[4] Refer to Comité de rétablissement du pygargue à tête blanche au Québec (2002).
[5] Refer to Environment Canada (2013).
[6] Refer to Environment Canada (2007).

Table 23 continued

Priority species	Details on habitat used	Population objective	Reason for priority status		
			At risk[1]	CC[2]	S[3]
Hooded Merganser	Edges of lakes, rivers, and streams, mature coniferous and mixed wood forests near water.	Increase		X	
Olive-sided Flycatcher[7]	Riparian stands of mixed wood or conifers	Recovery objective	X	X	
Rusty Blackbird[7]	Riparian forests	Recovery objective	X	X	
Semipalmated Sandpiper	Edges of small lakes, ponds, and rivers	Increase 100%		X	
Solitary Sandpiper	Marshy and wetland areas of the boreal forest	Assess/Maintain		X	
Surf Scoter	Mature fir and spruce stands along the edges of shallow lakes, usually less than 10 ha. The presence of islands on these lakes is also a desired feature for the species, as well as an abundance of woody debris on the ground along riparian strips.	Maintain			X
Swamp Sparrow	Riparian shrubland	Maintain			X

[7] Species listed on Schedule 1 of SARA but for which there are not yet any management plans or recovery strategies. Official documents related to SARA will prevail as soon as they are published; however, the interim population objectives for these species are: Olive-sided Flycatcher: Increase 100%; Rusty Blackbird: Increase 100%.

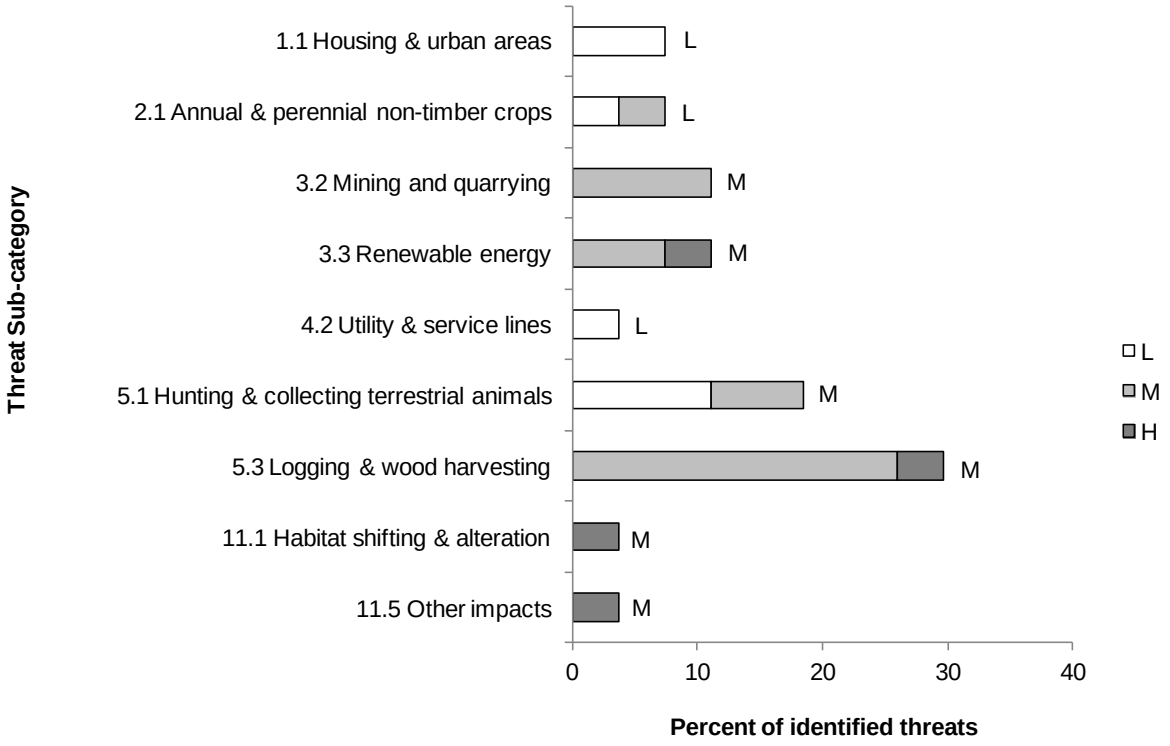

Figure 26. Percent of identified threats to priority species in riparian areas in each threat sub-category. Each bar represents the percentage of the total number of threats identified in each threat sub-category in riparian areas (for example, if 100 threats were identified in total for all priority species in riparian 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 (L), Medium (M), High (H), and Very High (VH) rankings of individual threats within each sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M, H and VH rankings in the sub-category. The overall magnitude of the threat sub-category in riparian areas is indicated at the end of each bar. See the "Element 4" section in Appendix 2 for more information.

Table 24. Threats addressed, conservation objectives, recommended actions and priority species affected in the riparian areas of BCR 8-QC.

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Increased human presence around lakes resulting in disturbance to birds, loss of wetlands and shoreline development.	1.1 Housing & urban areas	Minimize disturbance near nesting and feeding sites in the riparian habitat.	4.1. Reduce disturbance from human recreation	Establish buffer zones around known nesting and feeding sites in recreational areas. Increase public awareness through outreach campaigns on the vulnerability of certain species to disturbance.	2.1 Site or area management. 4.3 Awareness and communications	Common Goldeneye, Hooded Merganser
Habitat loss and degradation (intensification of agriculture).	2.1 Annual & perennial non-timber crops	Conserve and restore the quantity and quality of riparian habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Support sustainable agricultural development.	5.3 Private sector standards and codes	Blue-winged Teal
Incidental mortality at harvest.	2.1 Annual & perennial non-timber crops	Reduce bird mortality at harvest.	2.4 Reduce accidental mortality	Develop beneficial management practices for harvesting when incidental bird mortality may occur (delay harvest, raise blade height, etc.).	5.3 Private sector standards and codes	Blue-winged Teal

[1] Priority species for which the only identified threat is in category "12.1 Information lacking" are not included in this table.

Table 24 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss and degradation (mining).	3.2 Mining and quarrying	Conserve and restore the diversity and quality of riparian habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Protect important riparian habitats through stewardship or by legally designating them as conservation areas. Restore habitat once site operations have concluded. Encourage the adoption of more environmentally friendly operating methods. Implement the mitigation and prevention actions identified during environmental assessments of projects. Ensure that sites of operation offer restored habitats of the same quality as the original habitats (through wildlife monitoring programs before and after operations).	1.1 Site/area protection 2.3 Habitat and natural process restoration 5.3 Private sector standards and codes 8.2 Monitoring	Harlequin Duck (Eastern population), Semipalmated Sandpiper, Solitary Sandpiper
		Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	3.2 Species recovery	

Table 24 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Habitat loss and degradation (permanent or seasonal flooding of natural habitats).	3.3 Renewable energy	Conserve and restore the diversity and quality of riparian habitats on the landscape. Recovery of species at risk.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat. 1.3. Ensure the continuation of natural processes that maintain bird habitat 3.4. Implement recovery strategies for species at risk	Manage water levels to avoid flooding nests during the nesting period. Implement the mitigation and prevention actions identified during environmental assessments of projects. Continue to implement the Management Plan for the Harlequin Duck, Eastern Population, in Atlantic Canada and Quebec (Environment Canada 2007).	5.3 Private sector standards and codes 3.2 Species recovery	Harlequin Duck (Eastern population), Semipalmated Sandpiper, Solitary Sandpiper
Collisions with power lines and other human-made structures	4.2 Utilities & service lines	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Bald Eagle provincial recovery strategy (Comité de rétablissement du pygargue à tête blanche au Québec 2002).	3.2 Species recovery	Bald Eagle
Deliberate hunting or accidental trapping.	5.1 Hunting & collecting terrestrial animals	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Bald Eagle provincial recovery strategy (Comité de rétablissement du pygargue à tête blanche au Québec 2002).	3.2 Species recovery	Bald Eagle
Lack of knowledge about the extent of subsistence hunting and its impact on bird populations.	5.1 Hunting & collecting terrestrial animals	Ensure adequate levels of subsistence harvest Recovery of species at risk.	7.2. Improve harvest monitoring 3.4. Implement recovery strategies for species at risk	Monitor the collection of migratory birds and eggs by Aboriginals in order to assess the impact on the species. Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	8.2 Monitoring 3.2 Species recovery	Solitary Sandpiper, Common Goldeneye, Hooded Merganser, Barrow's Goldeneye (Eastern population)

Table 24 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Loss of wooded riparian strips.	5.3 Logging & wood harvesting	Conserve and restore the quantity and quality of riparian habitats on the landscape.	1.1. Ensure land and resource-use policies and practices maintain or improve bird habitat.	Promote the maintenance of large wooded riparian strips as part of forest management.	5.3 Private sector standards and codes	Common Goldeneye, Hooded Merganser, Bonaparte's Gull, Rusty Blackbird
Habitat loss (scarcity of snags for cavity-nesting birds).	5.3 Logging & wood harvesting	Restore features in riparian habitats that are important for birds. Recovery of species at risk.	1.4. Maintain important bird habitat features on the landscape 3.4. Implement recovery strategies for species at risk	Promote silvicultural treatments that maintain key habitat features (large diameter trees, snags with cavities, dead trees and irregular structure). Install nest boxes. Continue to implement the Barrow's Goldeneye management plan for the Eastern population in Canada (Environment Canada 2013).	5.3 Private sector standards and codes 3.2 Species recovery	Common Goldeneye, Hooded Merganser, Barrow's Goldeneye (Eastern population)
Habitat loss (scarcity of large-diameter trees).	5.3 Logging & wood harvesting	Recovery of species at risk.	3.4. Implement recovery strategies for species at risk	Continue to implement the Bald Eagle provincial recovery strategy (Comité de rétablissement du pygargue à tête blanche au Québec 2002).	3.2 Species recovery	Bald Eagle
Habitat loss and degradation (climate change could alter the number, size, and location of wetlands).	11.1 Habitat shifting & alteration	Reduce potential impact of climate change on riparian habitats.	6.2. Manage for habitat resilience as climate changes	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Bonaparte's Gull

Table 24 continued

Threats addressed	Threat category	Objectives	Objective category	Recommended actions	Action category	Priority species affected[1]
Higher frequency of adverse weather events due to climate change that may affect migration, reproductive success, availability of prey or nesting phenology.	11.5 Other impacts	Reduce potential impact of climate change on riparian habitats.	6.2. Manage for habitat resilience as climate changes	Promote the reduction of greenhouse gas emissions.	6.2 Substitution	Olive-sided Flycatcher

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.

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 25 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, 5.9 birds are killed per turbine per year. Scaling up to a national level, an estimated 16 700 birds (range 13 300–21 600) die from collisions with wind turbines each year (Zimmerling et al. 2013).

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

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 25 for conservation objectives and actions.

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).

Neotropical migrants in the families *Parulidae* (wood-warblers) and *Vireonidae* (vireos) are the species most commonly killed by communication towers. These families include threatened species and many that are of conservation concern in Canada and/or the United States. When considered in concert with mortality at towers in the United States (which is 20 times higher due to the larger number and greater height of towers in the United States), and the mortality from other stationary structures, mortality from collisions with communications towers may negatively affect the population trends of some birds. See Table 25 for conservation objectives and actions.

Power Lines

Birds may be killed by colliding with power lines, or they may be electrocuted. Species with high wing-loading and thus low maneuverability, such as waterfowl, appear particularly at risk for collisions (Bevanger 1998). Electrocutions are most likely for large birds such as raptors and herons, whose bodies are large enough to span the distances between wires and create a short circuit. Raptors' habit of using power poles as perches further increases their risk. However, estimates of total mortality due to collisions and electrocutions can vary widely (Manville 2005) and population-level impacts are difficult to determine. Canadian estimates are that 161 000–802 000 birds are killed annually by electrocution and another 5.3–20.6 million birds are killed each year by colliding with electrical transmission lines (Calvert et al. 2013). See Table 25 for conservation objectives and actions.

Vehicles

There are over 1.4 million km of roads and hundreds of airports in Canada (World Bank Indicators 2012) that are often bordered by fences and vegetation that provide convenient places for birds to perch, forage, and nest. The paved surfaces can attract birds through the heat they emit, the puddles that form beside roads, and the salt and grit used for de-icing. 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 25 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. See Table 25 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. See Table 25 for conservation objectives and actions.

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). See Table 25 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. See Table 25 for conservation objectives and actions.

Oil Pollution

Oil may enter the environment either accidentally, through deliberate dumping, or in contained tailings ponds. It may be a single large event, as occurred in the Gulf of Mexico in 2010, or numerous smaller events. Annual estimates are that between 217 800 and 458 600 birds are killed by ship-source oil spills annually (Calvert et al. 2013). Typically, diving birds are most at risk of oiling; however, any birds that come into contact with oil are vulnerable. Oil can impact birds through direct effects such as hypothermia (resulting from lost 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 25 for conservation objectives and actions.

Table 25. Conservation objectives and actions associated with bird mortality from collisions, cats and contaminants.

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example 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	All species

Table 25 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
Collisions with communication 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 guidelines as possible.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with power lines and accidental electrocution cause bird mortality.	4.2 Utility and service lines	Reduce mortality from collisions with utility lines/transmission towers	2.7 Reduce incidental mortality from collisions.	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	Golden Eagle, Peregrine Falcon (*anatum/tundrius*), Bald Eagle
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.	2.1 Site/area management	Bald Eagle, Barn Swallow, Common Nighthawk, Short-eared Owl, Killdeer

Table 25 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
				Plant trees and larger bushes along roads to force birds to fly higher. Encourage the use of salt management plans to avoid unnecessary use of particulate salt (a bird attractant) on roads. Avoid locating roads in valuable bird habitat.	1.1 Site/area protection	
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
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	8.1 Research 8.2 Monitoring	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas

Table 25 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
				reflect these changes. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.		
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:** Bobolink, Sora, Leach's Storm-Petrel, Killdeer, Virginia Rail, Eastern Meadowlark **Reductions in prey due to pesticide use:** Barn Swallow, Black Tern, Common Nighthawk, Chimney Swift
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, Blue-winged Teal, Common Loon,
Mortality from heavy metals and other contaminants.	9.2 Industrial & military effluents	Reduce mortality from heavy metals and other contaminants	2.2 Reduce mortality and/or sub-lethal effects from exposure to contaminants.	Work with industry and policy makers to reduce the quantity of heavy metals and other contaminants released into the environment.	5.3 Private sector standards and codes 5.2 Policies and regulations	**Heavy metals:** Barrow's Goldeneye (eastern population), Common Goldeneye, Common Loon, Surf Scoter **PCBs:** Barrow's Goldeneye (eastern population),

Table 25 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
						Common Goldeneye, Caspian Tern, Common Tern, Leach's Storm-Petrel **Other contaminants:** Common Murre, Peregrine Falcon (*anatum/tundrius*)
Mortality of waterbirds from oil pollution.	9.2 Industrial & military effluents	Reduce mortality from oil pollution	2.3 Reduce mortality and/or sublethal effects of oil pollution. 5.1 Maintain natural food webs and prey sources.	Improve monitoring and enforcement capacity to reduce chronic oil pollution from illegal dumping of bilge waste and cleaning of oil tanks. Improve education/outreach to make 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.	5.4 Compliance and enforcement 4.3 Awareness and communications	**Lethal and sublethal effect of oil exposure:** Atlantic Puffin, Barrow's Goldeneye (eastern population), Black-bellied Plover, Bonaparte's Gull, Common Eider (*dresseri*), Common Murre, Dunlin, Harlequin Duck (eastern population), Hudsonian Godwit, Leach's Storm-Petrel, Red Knot (*rufa*), Ruddy Turnstone, Sanderling, Semipalmated Sandpiper, Whimbrel
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, which alter habitat structure and community composition (North American Bird Conservation Initiative, U.S. Committee 2009, Faaborg et al. 2010). See Tables 26 and 27 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. For the 169 species studied in BCR 8-QC, the model predicts a gain of 40 species, a loss of 19 species for a total turnover (percent of species gained + percent of species lost) of 30%.

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 26. Examples of the current and anticipated effects of climate change on bird populations in Canada and some affected bird species.

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	Examples of Species Affected
Mismatch between peak hatch and peak food abundance	Olive-sided Flycatcher, Rusty Blackbird
Extended breeding season	Canada Goose
Habitat loss as a result of ecosystem changes	American Bittern, Solitary Sandpiper, Sora, Bonaparte's Gull, Virginia Rail, Yellow Rail
Range shifts to the north and from coastal to inland sites	Tennessee Warbler, Spruce Grouse
Increase in severe weather events	Canada Goose, Red Knot (*rufa*), Common Nighthawk, Barn Swallow, Chimney Swift, Olive-sided Flycatcher

Table 27. Proposed conservation objectives and actions to address climate change.

Threats addressed	Threat sub-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 11.4 Storms and flooding 11. 5 Other impacts	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 2.1 Site/area management 1.1 Site/area protection	All species, but especially: American Bittern, Solitary Sandpiper, Common Nighthawk, Barn Swallow, Sora, Chimney Swift, Olive-sided Flycatcher, Bonaparte's Gull, Virginia Rail, Yellow Rail
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.	8.1 Research	All

Table 27 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Priority species affected
				Investigate behavioural responses to climate change (such as range shifts, changes in demographic rates, and changes in timing of breeding and migration) through long-term studies. 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. 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.

The lack of information remains a major concern for effective management of priority species in BCR 8-QC. Although there are many standard monitoring programs, they do not provide a complete picture of the status and trends of all species in this subregion that are contending with many bird conservation issues.

The lack of biological or demographic data was considered a significant conservation issue for 90 of the 97 priority species (93%) in BCR 8-QC. Examples of the species concerned are listed in Table 28, which also contains recommended actions for improving population status monitoring.

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

- develop options for on-the-ground monitoring across boreal Canada;
- 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

Seabirds:

- develop a nationally-coordinated seabird colony monitoring strategy to ensure that the highest priority colonies are regularly monitored through appropriate allocation of resources among regions and colonies;
- evaluate improved techniques for counting seabirds, such as use of digital photography to count colonies of conspicuous species; and
- evaluate the extent to which pelagic surveys should emphasize repeated sampling at the same locations to estimate trends versus sampling different areas each year to expand geographic coverage.

Inland 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 prairie and eastern waterfowl breeding surveys, while retaining acceptable precision in population estimates;
- review the information needs and expenditures for duck banding programs;
- realign resources for eider and scoter monitoring to a more efficient suite of surveys.

Table 28. Categories of poorly monitored species, possible monitoring approaches, and example priority species in BCR 8-QC for which there are currently insufficient data to reliably estimate population trend at the BCR scale.

Category	Possible monitoring approaches	Example priority species
Landbirds	Increase the coverage of the Breeding Bird Survey (BBS) or perform specific surveys of rare, discrete, or cryptic birds whose populations are not well-known (e.g.: high altitude birds, breeding birds in the boreal forest, aerial insectivores). Increase the coverage of the Christmas Bird Count. Support the current migration monitoring program at the Tadoussac bird observatory and set up additional migration monitoring stations in the BCR. Conduct or extend twilight surveys for the Common Nighthawk and the Eastern Whip-poor-will. These surveys could be based on the United States Nightjar Survey Network model (ccb-wm.org/nightjars.htm).	White-throated Sparrow, Swamp Sparrow, Pine Grosbeak, Eastern Whip-poor-will, Common Nighthawk, Bobolink, Bicknell's Thrush, Belted Kingfisher, Boreal Chickadee, Gray Jay, Olive-sided Flycatcher, Yellow-bellied Flycatcher, Alder Flycatcher, Magnolia Warbler, Cape May Warbler, Orange-crowned Warbler, Northern Flicker, Rusty Blackbird, Ruby-crowned Kinglet, Purple Finch, Spruce Grouse, Winter Wren, Philadelphia Vireo
Diurnal raptors	Conduct targeted surveys for low-density raptors that are poorly represented by regular programs such as the Breeding Bird Survey. Develop and implement a nesting monitoring program for the Peregrine Falcon (*anatum/tundrius*) on cliffs.	Northern Hawk Owl, Peregrine Falcon (*anatum/tundrius*), Short-eared Owl
Nocturnal raptors	Support surveys of hawks and owls and extend their scope. Conduct targeted surveys for species that are poorly represented by traditional survey methods as well as rare species and endemic sub-species.	Northern Saw-whet Owl, Boreal Owl, Long-eared Owl
Shorebirds	Conduct banding activities and track bands on adults and juveniles in staging areas. Monitor the abundance and distribution of adults and juveniles at staging sites. Develop and conduct specific surveys, e.g. (1) surveys at staging sites between October and late November, a period of the year that is not well covered by regular surveys; (2) aerial surveys of potential and known staging sites in the coastal areas; (3) aerial surveys to identify the Purple Sandpiper's wintering area in the St. Lawrence corridor as well as monitoring of the species' abundance at known sites; and (4) aerial surveys of the Mingan	Hudsonian Godwit, Red Knot (*rufa*), Sanderling, Semipalmated Sandpiper, Dunlin, Purple Sandpiper, Short-billed Dowitcher (*griseus*), Black-bellied Plover, Ruddy Turnstone

Table 28 continued

Category	Possible monitoring approaches	Example priority species
	Archipelago and Anticosti Island. Develop and conduct a program similar to the Atlantic Canada Shorebird Survey in order to monitor the abundance and distribution of most coastal birds during the fall migration.	
Inland waterbirds	Support the Marsh Monitoring Program, extend it for better spatial coverage and consider hiring birders to cover remote sites. Develop and implement specific surveys (particularly for the Yellow Rail and Black Tern).	American Bittern, Black Tern, Sora, Yellow Rail, Virginia Rail
Colonial waterbirds	Continue to monitor seabirds along the St. Lawrence Estuary and at migratory bird sanctuaries in the Gulf of St. Lawrence. Maintain the species monitoring program under the St. Lawrence Action Plan in order to assess the bioindicators of the St. Lawrence marine ecosystem. Develop census techniques for assessing the population trends of alcids at migratory bird sanctuaries along the North Shore. Develop and implement monitoring of the Herring Gull and Great Black-backed Gull at the Mingan Archipelago National Park Reserve. Develop and implement monitoring of large colonies of the Great Cormorant and Common Tern (located outside the migratory bird sanctuaries) in the North Shore region. Increase surveys of the Atlantic Puffin, particularly at the Îles Sainte-Marie and Bradore Bay bird sanctuaries. Resume monitoring of the Razorbill at the Îles Sainte-Marie Bird Sanctuary. Conduct a supplemental survey of the Black Guillemot in the Îles Galibois archipelago. Develop a monitoring program for the Leach's Storm-Petrel at the Île du Corossol bird sanctuary and conduct surveys at the historical nesting sites in the migratory bird sanctuaries of Baie-des-Loups and Îles Sainte-Marie.	Herring Gull, Great Black-backed Gull, Great Cormorant, Black Guillemot, Common Murre, Atlantic Puffin, Bonaparte's Gull, Black-legged Kittiwake, Leach's Storm-Petrel, Razorbill, Common Tern
Waterfowl	Maintain the banding program to monitor the effects of hunting pressure on priority species, document movements and acquire demographic data (survival rate,	Canada Goose (North Atlantic population), Canada Goose (Atlantic population),

Table 28 continued

Category	Possible monitoring approaches	Example priority species
	reproductive success). Update the three waterfowl monitoring programs to maximize information/expenditures ratio: St. Lawrence shoreline waterfowl monitoring program, Southern Quebec lowlands waterfowl monitoring program, and Southern Quebec highlands waterfowl monitoring program. Maintain and expand the Common Eider banding program and continue to annually monitor colonies in the St. Lawrence Estuary. Set up a long-term monitoring program for sea ducks that winter in the ice-free areas of the St. Lawrence. Maintain the three-year winter survey of the Common Eider (*borealis*).	American Black Duck, Common Eider (*borealis*), Common Eider (*dresseri*), Common Goldeneye, Long-tailed Duck, Hooded Merganser, Red-breasted Merganser, Surf Scoter, Blue-winged Teal

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 29). 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 29. General research objectives in BCR 8-QC.

Objective	Priority species affected
Determine primary drivers of population decline (e.g. adult or juvenile survival, productivity, habitat quality) in priority bird species exhibiting declining trends, or that are known to be declining nationally or continentally.	**Examples of declining species in BCR 8-QC:** Red Knot (*rufa*), Semipalmated Sandpiper, Herring Gull, Great Cormorant, Barn Swallow, Chimney Swift, Boreal Chickadee, Olive-sided Flycatcher, Canada Warbler, Black-legged Kittiwake, Leach's Storm-Petrel, Purple Finch, Caspian Tern
Develop research projects to fill gaps in knowledge about survival rates and wintering site fidelity.	Purple Sandpiper
Develop research projects to fill gaps in knowledge about the relationship between the breeding, moulting and wintering sites of ducks in order to distinguish between their different populations.	Common Eider (*dresseri*), Long-tailed Duck, Red-breasted Merganser
Develop research projects to study avian cholera and factors driving epidemics.	Common Eider (*dresseri*)
Map land cover changes that have occurred across the BCR between the baseline time periods established in BCR strategies and the current day in order to correlate habitat loss with species declines and assess the main types of habitat transitions that have occurred (wetland to urban development, old growth to managed forest, tidal flats and flood plains to agriculture, etc.).	All species for which habitat-related declines have occurred or are suspected.
Combine up-to-date land cover information, additional data on bird densities, and detailed bird-habitat relationships for all priority species to allow for the calculation of quantitative habitat targets and to directly link conservation and population objectives.	All priority species.
Identify priority areas for implementation of recommendations in BCR strategies.	All priority species.

Table 29 continued

Objective	Priority species affected
Determine specific population connectivity and migration routes between breeding and wintering areas, using techniques such as genetic analysis, stable isotopes and geolocators.	All non-resident species.
Where they do not already exist, conduct research to develop sector-specific beneficial management practices documents, with an emphasis on bird and biodiversity conservation. Increase compliance with these and existing BMPs via policy/legislation, bylaws, and public outreach/awareness. Monitor adherence to these BMPs and assess their effectiveness at preserving and/or increasing priority bird populations.	All priority species.
Determine the population-level significance of bird mortality from collisions with anthropogenic structures of all types and predation by domestic cats. Identify particularly vulnerable species.	All priority species.
Continue to engage in and support climate change research with respect to: -links between climate, forage species, and priority seabirds; and model potential responses to changes in climatic conditions. - alteration and loss of coastal habitat with predicted sea-level rise, particularly estuaries, saltmarsh, beach/dunes and mud/sand flats; and effects on priority species. - alteration and loss of terrestrial habitats, particularly shifting forest types and loss of alpine habitats. - range expansion or contraction of priority bird species. - identification of vulnerable species.	All priority species.
Conduct research to determine the effects of disturbance on birds at sea and assess the resiliency of birds to disturbance, both during and outside the breeding season. Increase survey efforts to accurately map the seasonal distribution and abundance of seaducks, coastal seabirds and pelagic seabirds to identify potential areas of high conflict.	All seabirds and seaducks.
Monitor compliance and assess the effectiveness of current bycatch mitigation measures in commercial longline fisheries. Monitor bycatch in commercial net fisheries, and develop, implement, and assess effectiveness of bycatch mitigation measures for gillnet fisheries. Identify particularly vulnerable species to gillnet and longline bycatch.	All seabirds and seaducks.
Assess and quantify direct and indirect impacts of commercial fisheries on priority seabirds (e.g. commercial harvest of forage fish, fishery-induced changes in marine food webs).	All seabirds.

Table 29 continued

Objective	Priority species affected
Assess the potential effects of coastal and offshore wind developments on birds, including both direct (collision mortality) and indirect (habitat loss due to avoidance of turbine installations) effects. Identify particularly vulnerable species.	All birds found in coastal and offshore areas, including migrating individuals/flocks.
Investigate the potential effects of finfish aquaculture on priority bird species. Quantify and assess the population-level significance of direct mortality (e.g. shooting, net entanglement) and habitat loss/degradation (installation footprint, algal blooms due to nutrient input, etc.).	All waterbirds and seaducks that use nearshore habitats (e.g. Common Eider, Harlequin Duck)
Engage in interdisciplinary research to identify additive and interactive effects of multiple invasive species on ecosystem structure and function, in both terrestrial (introduced Sitka black-tailed deer, rabbits, raccoons, cats and rats; European Starling, House Sparrow, Scotch broom, etc.), freshwater (purple loosestrife, yellow flag iris, etc.) and marine habitats (*Spartina spp*., green crab, etc.). Identify impacts to priority bird species.	All priority species.

Threats Outside Canada

Many bird species found in Canada spend a large portion of their life cycle outside of the country (Fig. 27). 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 97 priority species in BCR 8-QC, 83 (85%) are migratory and spend part of their annual cycle—up to half the year or more—outside Canada.

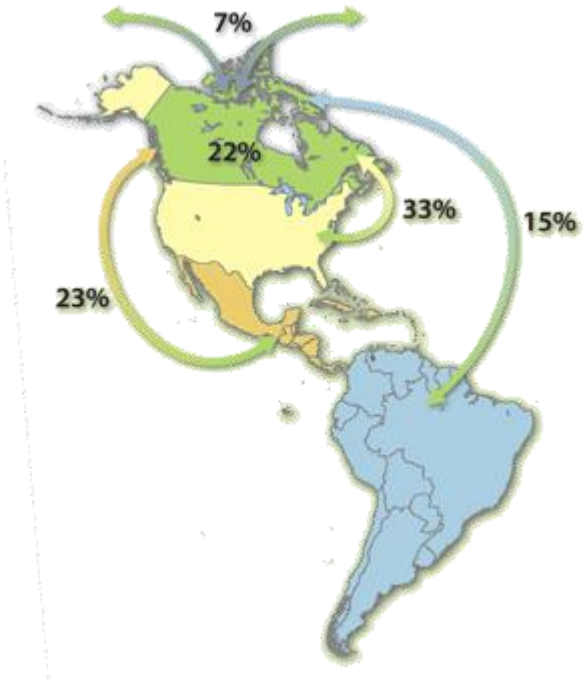

Figure 27. Percent of Canadian breeding birds that migrate to regions outside of Canada for part of their life cycle (North American Bird Conservation Initiative 2012).

Similar to the assessment of threats facing priority species within Canada, we conducted a literature review to identify threats facing priority species while they are outside Canada. A lack of data was a pervasive issue for this exercise. For many species, little is known about threats they face during migration or while on their wintering grounds. Indeed, for some species, their wintering ranges and habitat use are only poorly known, if at all. There is also little information linking specific wintering areas to particular breeding populations, making it difficult to connect declines in breeding populations to potential problems on the wintering grounds. In addition, what data exist on wintering migrant species are heavily biased towards work done in the United States, and little research is available from Mexico, Central and South America. While many of the threats identified in the United States likely affect species throughout their range, unique issues outside of the United States may have been missed. An absence of threats in a region may reflect that the necessary research has not yet been conducted (or may not be published in English). Because information on bird distributions during the non-breeding season is limited, we were unable to assess the scope and severity of threats to priority species while they are outside of Canada.

Nevertheless, some information is available to guide conservation stakeholders outside Canada. Figure 28 indicates that several priority bird species in BCR 8-QC are threatened by the loss or degradation of key migration and wintering habitats. The primary causes of habitat loss or degradation are the conversion of grassland and wetlands for agricultural purposes (threat sub-category 2.1), logging and wood harvesting (IUCN threat sub-category 5.3), and residential development (threat sub-category 1.1). Loss and degradation of wintering habitat is a greater threat to species with relatively small and concentrated wintering areas, such as the Bicknell's Thrush. The Red Knot (*rufa*), Semipalmated Sandpiper and Short-billed Dowitcher (*griseus*) are also particularly vulnerable when large numbers of individuals are concentrated in a handful of roosting sites. The loss or degradation of these areas could have devastating effects on such species.

In addition to habitat loss, priority birds in BCR 8-QC suffer increased mortality due to human-induced threats during migration and wintering. Collisions with human-made structures such as buildings and communication towers pose a significant threat during migration (threat sub-categories 1.1 and 1.2). Exposure to industrial contaminants such as hydrocarbons and heavy metals (threat sub-category 9.2) and to agricultural pesticides (threat sub-category 9.3) has lethal and sub-lethal effects on priority species. Another important cause of mortality among priority species outside Canada is hunting (threat sub-category 5.1), including lead poisoning (ingestion of hunting pellets), legal or illegal hunting, and accidental mortality.

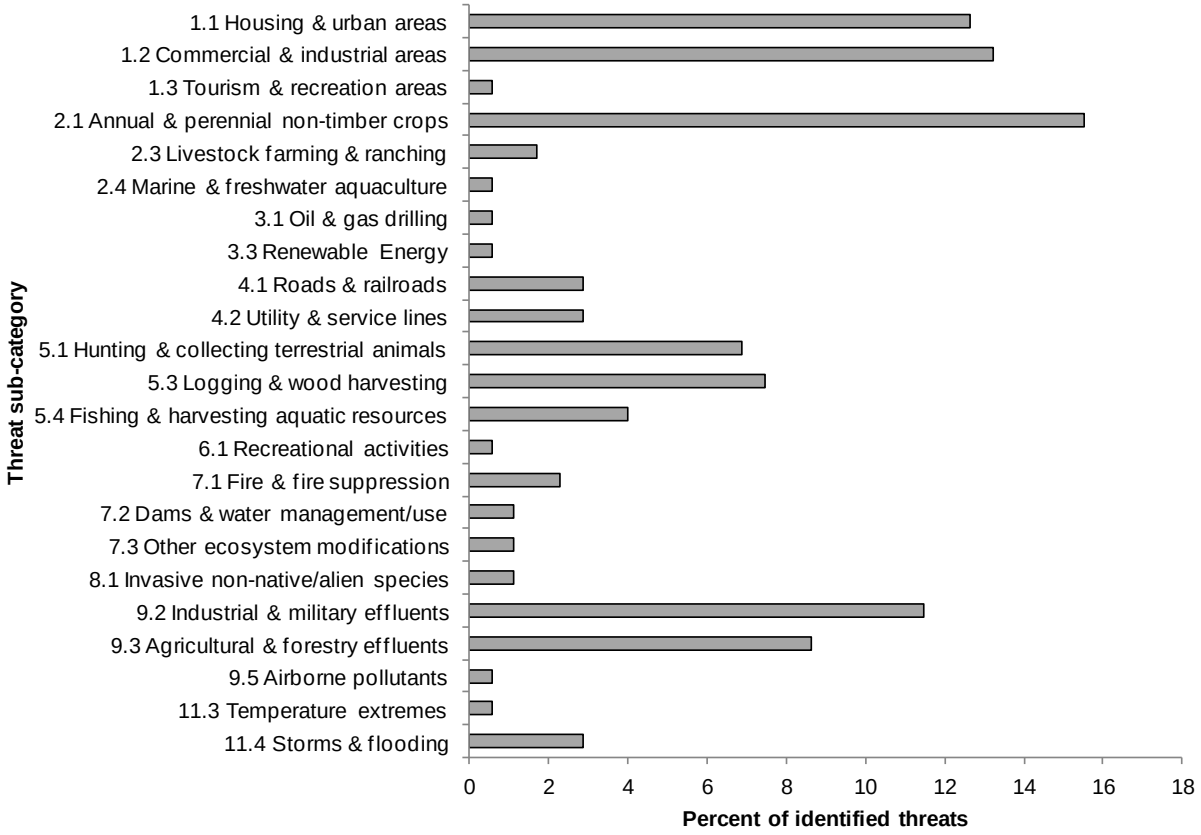

Figure 28. Percent of identified threats to priority species (by threat sub-category) in BCR 8-QC when they are outside Canada.

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

Next Steps

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

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

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Appendix 1

List of All Bird Species in BCR 8-QC

Table A1. Complete list of species in BCR 8-QC, when they are in the BCR (breeding, migrant, winter, seasonal) and their priority status.

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Empidonax alnorum	Alder Flycatcher	Landbirds	X				X
Corvus brachyrhynchos	American Crow	Landbirds	X		X		
Spinus tristis	American Goldfinch	Landbirds	X				
Falco sparverius	American Kestrel	Landbirds	X				
Anthus rubescens	American Pipit	Landbirds	X				
Setophaga ruticilla	American Redstart	Landbirds	X				
Turdus migratorius	American Robin	Landbirds	X				
Picoides dorsalis	American Three-toed Woodpecker	Landbirds	X		X		X
Spizella arborea	American Tree Sparrow	Landbirds	X				
Haliaeetus leucocephalus	Bald Eagle	Landbirds	X				X
Icterus galbula	Baltimore Oriole	Landbirds	X				
Riparia riparia	Bank Swallow	Landbirds	X				
Hirundo rustica	Barn Swallow	Landbirds	X				X
Strix varia	Barred Owl	Landbirds	X		X		
Setophaga castanea	Bay-breasted Warbler	Landbirds	X				X
Megaceryle alcyon	Belted Kingfisher	Landbirds	X				X
Catharus bicknelli	Bicknell's Thrush	Landbirds	X				X
Mniotilta varia	Black-and-white Warbler	Landbirds	X				X
Picoides arcticus	Black-backed Woodpecker	Landbirds	X		X		X
Coccyzus erythropthalmus	Black-billed Cuckoo	Landbirds	X				X
Setophaga fusca	Blackburnian Warbler	Landbirds	X				X
Poecile atricapillus	Black-capped Chickadee	Landbirds	X		X		
Setophaga striata	Blackpool Warbler	Landbirds	X				

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Setophaga caerulescens	Black-throated Blue Warbler	Landbirds	X				
Setophaga virens	Black-throated Green Warbler	Landbirds	X				X
Cyanocitta cristata	Blue Jay	Landbirds	X		X		
Dolichonyx oryzivorus	Bobolink	Landbirds	X				X
Bombycilla garrulus	Bohemian Waxwing	Landbirds	X		X		
Poecile hudsonicus	Boreal Chickadee	Landbirds	X		X		X
Aegolius funereus	Boreal Owl	Landbirds	X		X		X
Buteo platypterus	Broad-winged Hawk	Landbirds	X				
Certhia americana	Brown Creeper	Landbirds	X		X		X
Toxostoma rufum	Brown Thrasher	Landbirds	X				
Molothrus ater	Brown-headed Cowbird	Landbirds	X				
Cardellina canadensis	Canada Warbler	Landbirds	X				X
Setophaga tigrina	Cape May Warbler	Landbirds	X				X
Bombycilla cedrorum	Cedar Waxwing	Landbirds	X				
Setophaga pensylvanica	Chestnut-sided Warbler	Landbirds	X				X
Chaetura pelagica	Chimney Swift	Landbirds	X				X
Spizella passerina	Chipping Sparrow	Landbirds	X				
Spizella pallida	Clay-colored Sparrow	Landbirds	X				
Petrochelidon pyrrhonota	Cliff Swallow	Landbirds	X				
Sialia sialis	Common Bluebird	Landbirds	X				
Quiscalus quiscula	Common Grackle	Landbirds	X				
Chordeiles minor	Common Nighthawk	Landbirds	X				X
Corvus corax	Common Raven	Landbirds	X		X		
Acanthis flammea	Common Redpoll	Landbirds	X		X		
Sturnus vulgaris	Common Starling	Landbirds	X		X		
Geothlypis trichas	Common Yellowthroat	Landbirds	X				
Oporornis agilis	Connecticut Warbler	Landbirds	X				X
Junco hyemalis	Dark-eyed Junco	Landbirds	X				
Picoides pubescens	Downy Woodpecker	Landbirds	X		X		

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Tyrannus tyrannus	Eastern Kingbird	Landbirds	X				
Sturnella magna	Eastern Meadowlark	Landbirds	X				X
Sayornis phoebe	Eastern Phoebe	Landbirds	X				
Antrostomus vociferus	Eastern Whip-poor-will	Landbirds	X				X
Contopus virens	Eastern Wood-Pewee	Landbirds	X				
Coccothraustes vespertinus	Evening Grosbeak	Landbirds	X		X		X
Passerella iliaca	Fox Sparrow	Landbirds	X				X
Aquila chrysaetos	Golden Eagle	Landbirds	X				X
Regulus satrapa	Golden-crowned Kinglet	Landbirds	X				
Dumetella carolinensis	Gray Catbird	Landbirds	X				
Perisoreus canadensis	Gray Jay	Landbirds	X		X		X
Catharus minimus	Gray-cheeked Thrush	Landbirds	X				
Myiarchus crinitus	Great Crested Flycatcher	Landbirds	X				
Strix nebulosa	Great Gray Owl	Landbirds	X		X		
Bubo virginianus	Great Horned Owl	Landbirds	X		X		
Picoides villosus	Hairy Woodpecker	Landbirds	X		X		
Catharus guttatus	Hermit Thrush	Landbirds	X				
Eremophila alpestris	Horned Lark	Landbirds	X				
Passer domesticus	House Sparrow	Landbirds	X		X		
Troglodytes aedon	House Wren	Landbirds	X				
Passerina cyanea	Indigo Bunting	Landbirds	X				
Ammodramus leconteii	Le Conte's Sparrow	Landbirds	X				
Empidonax minimus	Least Flycatcher	Landbirds	X				
Melospiza lincolnii	Lincoln's Sparrow	Landbirds	X				
Asio otus	Long-eared Owl	Landbirds	X		X		X
Setophaga magnolia	Magnolia Warbler	Landbirds	X				X
Falco columbarius	Merlin	Landbirds	X				
Zenaida macroura	Mourning Dove	Landbirds	X		X		
Geothlypis philadelphia	Mourning Warbler	Landbirds	X				X

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Oreothlypis ruficapilla	Nashville Warbler	Landbirds	X				X
Ammodramus nelsoni	Nelson's Sparrow	Landbirds	X				
Colaptes auratus	Northern Flicker	Landbirds	X				X
Accipiter gentilis	Northern Goshawk (laingi)	Landbirds	X		X		
Circus cyaneus	Northern Harrier	Landbirds	X				
Surnia ulula	Northern Hawk Owl	Landbirds	X		X		X
Mimus polyglottos	Northern Mockingbird	Landbirds	X				
Setophaga americana	Northern Parula	Landbirds	X				
Aegolius acadicus	Northern Saw-whet Owl	Landbirds	X		X		X
Parkesia noveboracensis	Northern Waterthrush	Landbirds	X				
Contopus cooperi	Olive-sided Flycatcher	Landbirds	X				X
Oreothlypis celata	Orange-crowned Warbler	Landbirds	X				X
Pandion haliaetus	Osprey	Landbirds	X				
Seiurus aurocapilla	Ovenbird	Landbirds	X				X
Setophaga palmarum	Palm Warbler	Landbirds	X				
Falco peregrinus anatum/tundrius	Peregrine Falcon (*anatum/tundrius*)	Landbirds	X				X
Vireo philadelphicus	Philadelphia Vireo	Landbirds	X				X
Dryocopus pileatus	Pileated Woodpecker	Landbirds	X		X		
Pinicola enucleator	Pine Grosbeak	Landbirds	X		X		X
Spinus pinus	Pine Siskin	Landbirds	X		X		
Haemorhous purpureus	Purple Finch	Landbirds	X				X
Loxia curvirostra	Red Crossbill	Landbirds	X		X		
Sitta canadensis	Red-breasted Nuthatch	Landbirds	X		X		
Vireo olivaceus	Red-eyed Vireo	Landbirds	X				
Buteo lineatus	Red-shouldered Hawk	Landbirds	X				
Buteo jamaicensis	Red-tailed Hawk	Landbirds	X				
Agelaius phoeniceus	Red-winged Blackbird	Landbirds	X				
Columba livia	Rock Dove	Landbirds	X		X		

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Pheucticus ludovicianus	Rose-breasted Grosbeak	Landbirds	X				
Buteo lagopus	Rough-legged Hawk	Landbirds	X				
Regulus calendula	Ruby-crowned Kinglet	Landbirds	X				X
Archilochus colubris	Ruby-throated Hummingbird	Landbirds	X				
Bonasa umbellus	Ruffed Grouse	Landbirds	X		X		
Euphagus carolinus	Rusty Blackbird	Landbirds	X				X
Passerculus sandwichensis	Savannah Sparrow	Landbirds	X				
Piranga olivacea	Scarlet Tanager	Landbirds	X				
Cistothorus platensis	Sedge Wren	Landbirds	X				X
Accipiter striatus	Sharp-shinned Hawk	Landbirds	X				X
Tympanuchus phasianellus	Sharp-tailed Grouse	Landbirds	X		X		
Asio flammeus	Short-eared Owl	Landbirds	X				X
Vireo solitarius	Solitary Vireo	Landbirds	X				
Melospiza melodia	Song Sparrow	Landbirds	X				
Falcipennis canadensis	Spruce Grouse	Landbirds	X		X		X
Catharus ustulatus	Swainson's Thrush	Landbirds	X				
Melospiza georgiana	Swamp Sparrow	Landbirds	X				X
Oreothlypis peregrina	Tennessee Warbler	Landbirds	X				X
Tachycineta bicolor	Tree Swallow	Landbirds	X				
Cathartes aura	Turkey Vulture	Landbirds	X				
Catharus fuscescens	Veery	Landbirds	X				
Pooecetes gramineus	Vesper Sparrow	Landbirds	X				
Vireo gilvus	Warbling Vireo	Landbirds	X				
Sitta carolinensis	White-breasted Nuthatch	Landbirds	X		X		
Zonotrichia leucophrys	White-crowned Sparrow	Landbirds	X				
Zonotrichia albicollis	White-throated Sparrow	Landbirds	X				X
Loxia leucoptera	White-winged Crossbill	Landbirds	X		X		
Lagopus lagopus	Willow Ptarmigan	Landbirds	X		X		
Cardellina pusilla	Wilson's Warbler	Landbirds	X				

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Troglodytes hiemalis	Winter Wren	Landbirds	X				X
Hylocichla mustelina	Wood Thrush	Landbirds	X				
Setophaga petechia	Yellow Warbler	Landbirds	X				
Empidonax flaviventris	Yellow-bellied Flycatcher	Landbirds	X				X
Sphyrapicus varius	Yellow-bellied Sapsucker	Landbirds	X				X
Setophaga coronata	Yellow-rumped Warbler	Landbirds	X				
Pluvialis dominica	American Golden Plover	Shorebirds		X			
Scolopax minor	American Woodcock	Shorebirds	X	X			
Calidris bairdii	Baird's Sandpiper	Shorebirds		X			
Pluvialis squatarola	Black-bellied Plover	Shorebirds		X			X
Tryngites subruficollis	Buff-breasted Sandpiper	Shorebirds		X			
Calidris alpina	Dunlin	Shorebirds		X			X
Tringa melanoleuca	Greater Yellowlegs	Shorebirds	X	X			
Limosa haemastica	Hudsonian Godwit	Shorebirds		X			X
Charadrius vociferus	Killdeer	Shorebirds	X	X			X
Calidris minutilla	Least Sandpiper	Shorebirds	X	X			
Tringa flavipes	Lesser Yellowlegs	Shorebirds		X			
Limnodromus scolopaceus	Long-billed Dowitcher	Shorebirds		X			
Limosa fedoa	Marbled Godwit	Shorebirds		X			
Calidris melanotos	Pectoral Sandpiper	Shorebirds		X			
Charadrius melodus melodus	Piping Plover (*melodus*)	Shorebirds		X			
Calidris maritima	Purple Sandpiper	Shorebirds		X	X		X
Calidris canutus rufa	Red Knot (*rufa*)	Shorebirds		X			X
Phalaropus fulicarius	Red Phalarope	Shorebirds		X			
Phalaropus lobatus	Red-necked Phalarope	Shorebirds		X			
Arenaria interpres	Ruddy Turnstone	Shorebirds		X			X
Calidris alba	Sanderling	Shorebirds		X			X
Charadrius semipalmatus	Semipalmated Plover	Shorebirds	X	X			
Calidris pusilla	Semipalmated Sandpiper	Shorebirds		X			X

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Limnodromus griseus griseus	Short-billed Dowitcher (*griseus*)	Shorebirds	X	X			X
Tringa solitaria	Solitary Sandpiper	Shorebirds	X	X			X
Actitis macularius	Spotted Sandpiper	Shorebirds	X	X			
Calidris himantopus	Stilt Sandpiper	Shorebirds		X			
Bartramia longicauda	Upland Sandpiper	Shorebirds		X			
Calidris mauri	Western Sandpiper	Shorebirds		X			
Numenius phaeopus	Whimbrel	Shorebirds		X			X
Calidris fuscicollis	White-rumped Sandpiper	Shorebirds		X			
Tringa semipalmata	Willet	Shorebirds		X			
Phalaropus tricolor	Wilson's Phalarope	Shorebirds	X	X			
Gallinago delicata	Wilson's Snipe	Shorebirds	X	X			
Botaurus lentiginosus	American Bittern	Waterbirds	X				X
Fulica americana	American Coot	Waterbirds	X				
Sterna paradisaea	Arctic Tern	Waterbirds	X				
Fratercula arctica	Atlantic Puffin	Waterbirds	X				X
Cepphus grylle	Black Guillemot	Waterbirds	X		X		X
Chlidonias niger	Black Tern	Waterbirds	X				X
Nycticorax nycticorax	Black-crowned Night-Heron	Waterbirds	X				
Rissa tridactyla	Black-legged Kittiwake	Waterbirds	X		X		X
Chroicocephalus philadelphia	Bonaparte's Gull	Waterbirds	X				X
Hydroprogne caspia	Caspian Tern	Waterbirds	X				X
Gavia immer	Common Loon	Waterbirds	X				X
Uria aalge	Common Murre	Waterbirds	X		X		X
Sterna hirundo	Common Tern	Waterbirds	X				X
Phalacrocorax auritus	Double-crested Cormorant	Waterbirds	X				
Larus marinus	Great Black-backed Gull	Waterbirds	X		X		X
Ardea herodias	Great Blue Heron (fannini)	Waterbirds	X				
Phalacrocorax carbo	Great Cormorant	Waterbirds	X		X		X

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Larus argentatus	Herring Gull	Waterbirds	X		X		X
Oceanodroma leucorhoa	Leach's Storm-Petrel	Waterbirds	X				X
Ixobrychus exilis	Least Bittern	Waterbirds	X				
Morus bassanus	Northern Gannet	Waterbirds	X				
Podilymbus podiceps	Pied-billed Grebe	Waterbirds	X				
Alca torda	Razorbill	Waterbirds	X				X
Podiceps grisegena	Red-necked Grebe	Waterbirds	X				
Gavia stellata	Red-throated Loon	Waterbirds	X				
Larus delawarensis	Ring-billed Gull	Waterbirds	X				
Grus canadensis	Sandhill Crane	Waterbirds	X				
Porzana carolina	Sora	Waterbirds	X				X
Rallus limicola	Virginia Rail	Waterbirds	X				X
Coturnicops noveboracensis	Yellow Rail	Waterbirds	X				X
Anas rubripes	American Black Duck	Waterfowl	X	X			X
Melanitta americana	American Scoter	Waterfowl		X			
Anas americana	American Wigeon	Waterfowl	X	X			
Bucephala islandica	Barrow's Goldeneye (Eastern population)	Waterfowl	X	X	X		X
Anas discors	Blue-winged Teal	Waterfowl	X	X			X
Branta bernicla	Brant (Black)	Waterfowl		X			
Bucephala albeola	Bufflehead	Waterfowl	X	X	X		
Branta hutchinsii	Cackling Goose	Waterfowl		X			
Branta canadensis	Canada Goose (North Atlantic population)	Waterfowl	X	X			X
Branta canadensis	Canada Goose (Atlantic population)	Waterfowl	X	X			X
Branta canadensis	Canada Goose (resident population)	Waterfowl	X	X			
Aythya valisineria	Canvasback	Waterfowl		X			
Somateria mollissima borealis	Common Eider (*borealis*)	Waterfowl		X	X		X

Table A1 continued

Scientific Name	Common Name	Bird Group	Breeding	Migrant	Wintering	Seasonal	Priority
Somateria mollissima dresseri	Common Eider (*dresseri*)	Waterfowl	X	X			X
Bucephala clangula	Common Goldeneye	Waterfowl	X	X	X		X
Mergus merganser	Common Merganser	Waterfowl	X	X	X		
Anas penelope	Eurasian Wigeon	Waterfowl		X			
Anas strepera	Gadwall	Waterfowl	X	X			
Aythya marila	Greater Scaup	Waterfowl	X	X			
Anser albifrons	Greater White-fronted Goose	Waterfowl		X			
Anas crecca	Green-winged Teal	Waterfowl	X	X			
Histrionicus histrionicus	Harlequin Duck (Eastern population)	Waterfowl	X	X			X
Lophodytes cucullatus	Hooded Merganser	Waterfowl	X	X			X
Somateria spectabilis	King Eider	Waterfowl		X	X		
Aythya affinis	Lesser Scaup	Waterfowl	X	X			
Clangula hyemalis	Long-tailed Duck	Waterfowl		X	X		X
Anas platyrhynchos	Mallard	Waterfowl	X	X			
Anas acuta	Northern Pintail	Waterfowl	X	X			
Anas clypeata	Northern Shoveler	Waterfowl	X	X			
Mergus serrator	Red-breasted Merganser	Waterfowl		X	X		X
Aythya americana	Redhead	Waterfowl	X	X			
Aythya collaris	Ring-necked Duck	Waterfowl	X	X			
Oxyura jamaicensis	Ruddy Duck	Waterfowl	X	X			
Chen caerulescens	Snow Goose	Waterfowl		X			
Melanitta perspicillata	Surf Scoter	Waterfowl	X	X			X
Cygnus columbianus	Tundra Swan	Waterfowl		X			
Melanitta fusca	White-winged Scoter	Waterfowl		X			
Aix sponsa	Wood Duck	Waterfowl	X	X			

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[8].

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

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

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

- 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 subregional (i.e., provincial section of a BCR), regional (BCR) and continental conservation priorities among birds.

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 (Food and Agriculture Organization 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 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.

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 using a standardized classification scheme (Salafsky et al. 2008).
2. Ranking the magnitude of threats for priority species following a standardized protocol (Kennedy et al. 2012).
3. Preparing a set of threat profiles for the BCR subregion, for broad habitat categories.

Each threat was categorized following the IUCN-CMP threat classification scheme (Salafsky et al. 2008) 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, high or very high. These magnitudes were then rolled up by threat categories and sub-categories across habitat types (see Kennedy et al. 2012 for details on this process). The threats roll-up allows for comparison of the relative magnitude of the threats among threat categories and habitat types. The scoring and ranking of threats not only helps to determine which threats contribute most to population declines in individual species, but also allows us to focus attention on the threats with the greatest effects on suites of species or in broad habitat classes.

Table A2. IUCN-CMP standard threat classification system (adapted from Salafsky et al, 2008).

Threat number	Threat Description
1	**Residential & commercial development**
1.1	Housing & urban areas
1.2	Commercial & industrial areas
1.3	Tourism & recreation areas
2	**Agriculture & aquaculture**
2.1	Annual & perennial non-timber crops
2.2	Wood & pulp plantations
2.3	Livestock farming & ranching
2.4	Marine & freshwater aquaculture
3	**Energy production & mining**
3.1	Oil & gas drilling
3.2	Mining & quarrying
3.3	Renewable energy
4	**Transportation & service corridors**
4.1	Roads & railroads
4.2	Utility & service lines
4.3	Shipping lanes
4.4	Flight paths
5	**Biological resource use**
5.1	Hunting & collecting terrestrial animals
5.2	Gathering terrestrial plants
5.3	Logging & wood harvesting
5.4	Fishing & harvesting aquatic resources
6	**Human intrusions & disturbance**
6.1	Recreational activities
6.2	War, civil unrest & military exercises
6.3	Work & other activities
7	**Natural system modifications**
7.1	Fire & fire suppression
7.2	Dams & water management/use
7.3	Other ecosystem modifications

Table A2 continued

Threat number	Threat Description
8	**Invasive & other problematic species & genes**
8.1	Invasive non-native/alien species
8.2	Problematic native species
8.3	Introduced genetic material
9	**Pollution**
9.1	Household sewage & urban waste water
9.2	Industrial & military effluents
9.3	Agricultural & forestry effluents
9.4	Garbage & solid waste
9.5	Air-borne pollutants
9.6	Excess energy
10	**Geological events**
10.1	Volcanoes
10.2	Earthquakes/tsunamis
10.3	Avalanches/landslides
11	**Climate change & severe weather**
11.1	Habitat shifting & alteration
11.2	Droughts
11.3	Temperature extremes
11.4	Storms & flooding
11.5	Other impacts
12	**Other direct threats**
12.1	Information lacking

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 knowledge of ecosystem management strategies within broad habitat types.

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

Species Added or Removed from the BCR 8-QC Priority List

Table A3. List of species added or removed from the BCR 8-QC priority list and their assessment characteristics.

Species[1]	Presence[2]	Standardized Assessment Legal Status[3] Fed.	Prov.	Bird Group Score[4]	Reason for which regional experts have added or removed a species (after a standardized assessment)
ADDED					
LANDBIRDS					
American Three-toed Woodpecker	Br				Precautionary principle (significant habitat loss in BCR 8-QC)
Black-billed Cuckoo	Obr				Precautionary principle (significant habitat loss in BCR 8-QC)
Brown Creeper	Br				Precautionary principle (significant habitat loss in BCR 8-QC)
Long-eared Owl	Obr				Conservation species in other BCRs of Quebec and is present in BCR 8-QC
Northern Hawk Owl	Obr				Conservation species in other BCRs of Quebec and is present in BCR 8-QC

[1] Species listed in alphabetical order by bird group. Species names based on the AOU's checklist of North American birds, 7th edition and supplements up to the 51st supplement.
[2] Wi = wintering, Mi = migratory, Mo = moulting, Br = breeding, Obr = occasional breeding (every year).
[3] Federal: Schedule 1 of SARA, E = Endangered; T = Threatened. Provincial: *Loi sur les espèces menacées ou vulnérables*, T = Threatened, V = Vulnerable.
[4] Landbirds: CC = continental concern, RC = regional concern (all BCR 8), CS = continental stewardship, RS = regional stewardship (all BCR 8). Information taken from the database downloaded from www.partnersinflight.org (see Panjabi et al. 2005 for the analytical method). Shorebirds: Conservation concern in the United States of America and Canada, as identified in the Canadian Shorebird Conservation Plan (Donaldson et al. 2000). A score of 5 means "Highly imperiled" and a score of 1 means "Species not at risk." Consult Donaldson et al. (2000) for the complete description of conservation categories. Waterbirds: National priority level as identified in Canada's Waterbird Conservation Plan (Milko et al. 2003). Waterfowl: Conservation needs for breeding and nonbreeding birds as identified in the North American Waterfowl Management Plan (2004). Consult Kennedy et al. (2012) for the thresholds used to classify the species of the various groups for the priority list.

Table A3 continued

Species[1]	Presence[2]	Standardized Assessment Legal Status[3] Fed.	Prov.	Bird Group Score[4]	Reason for which regional experts have added or removed a species (after a standardized assessment)
Northern Saw-whet Owl	Obr				Conservation species in other BCRs of Quebec and is present in BCR 8-QC
Orange-crowned Warbler	Obr				Conservation species in other BCRs of Quebec and is present in BCR 8-QC
SHOREBIRDS					
Purple Sandpiper	Mi			2b	A large proportion of the species' wintering area is in BCR 8-QC
Solitary Sandpiper	Br/Mi			3b	Precautionary principle (potentially high habitat loss in BCR 8-QC)
WATERBIRDS					
Atlantic Puffin	Br			Tier 3	Bird group score raised by regional experts
Black Guillemot	Br			Tier 3	Bird group score raised by regional experts
Black-legged Kittiwake	Br			Tier 3	Bird group score raised by regional experts
Common Murre	Br			Tier 3	Bird group score raised by regional experts
Great Black-backed Gull	Br			Tier 3	Bird group score raised by regional experts
Great Cormorant	Br			Tier 3	Bird group score raised by regional experts
Razorbill	Br			Tier 3	Bird group score raised by regional experts
WATERFOWL					
Blue-winged Teal	Br/Mi			Moderately low	Severe decline of the species in BCR 8-QC
Canada Goose (Atlantic population)	Br/Mi			Moderate	BCR 8-QC accounts for a large percentage of the observations of the species in Quebec
Hooded Merganser	Br/Mi			Moderate	BCR 8-QC accounts for a large percentage of the observations of the species in Quebec
Red-breasted Merganser	Wi/Mi			Moderate	BCR 8-QC accounts for a large percentage of the observations of the species in Quebec
REMOVED					
LANDBIRDS					
Blue-headed Vireo	Br			CS	Bird group score lowered by regional experts
Nelson's Sharp-tailed Sparrow	Obr		V		Number of breeding pairs in BCR 8-QC is too low

Table A3 continued

Species[1]	Presence[2]	Standardized Assessment Legal Status[3] Fed.	Prov.	Bird Group Score[4]	Reason for which regional experts have added or removed a species (after a standardized assessment)
Ruffed Grouse	Br			RS	Bird group score lowered by regional experts
SHOREBIRDS					
American Golden Plover	Mi			4a, b	No known staging sites of significance in BCR 8-QC
American Woodcock	Br/Mi			4a	Logging provides habitat for this species in BCR 8-QC
Buff-breasted Sandpiper	Mi			4a, b	Number of individuals in BCR 8-QC is too low
Marbled Godwit	Mi			4a, b	No known staging sites of significance in BCR 8-QC
Piping Plover (*melodus*)	Mi	E	T	5a	Number of individuals in BCR 8-QC is too low
Red Phalarope	Mi			3a	No known staging sites of significance in BCR 8-QC
Red-necked Phalarope	Mi			3a	No known staging sites of significance in BCR 8-QC
Wilson's Phalarope	Br/Mi			4a	Number of individuals in BCR 8-QC is too low
WATERBIRDS					
Arctic Tern	Br			Tier 2	Number of breeding pairs in BCR 8-QC is too low
Least Bittern	Br	T	V	Tier 2	Number of breeding pairs in BCR 8-QC is too low
WATERFOWL					
American Scoter	Mi/Mo			Moderately high	Number of individuals in BCR 8-QC is too low
Common Merganser	Br/Wi/Mi			High	Bird group score lowered by regional experts
King Eider	Wi/Mi			Moderately high	Number of individuals in BCR 8-QC is too low
Ring-necked Duck	Br/Mi			Moderately high	Bird group score lowered by regional experts

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Additional information can be obtained at:
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