Environment Canada Environnement Canada

Bird Conservation Strategy for Bird Conservation Region 7
Prairie and Northern Region: Taiga Shield and Hudson Plains

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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.

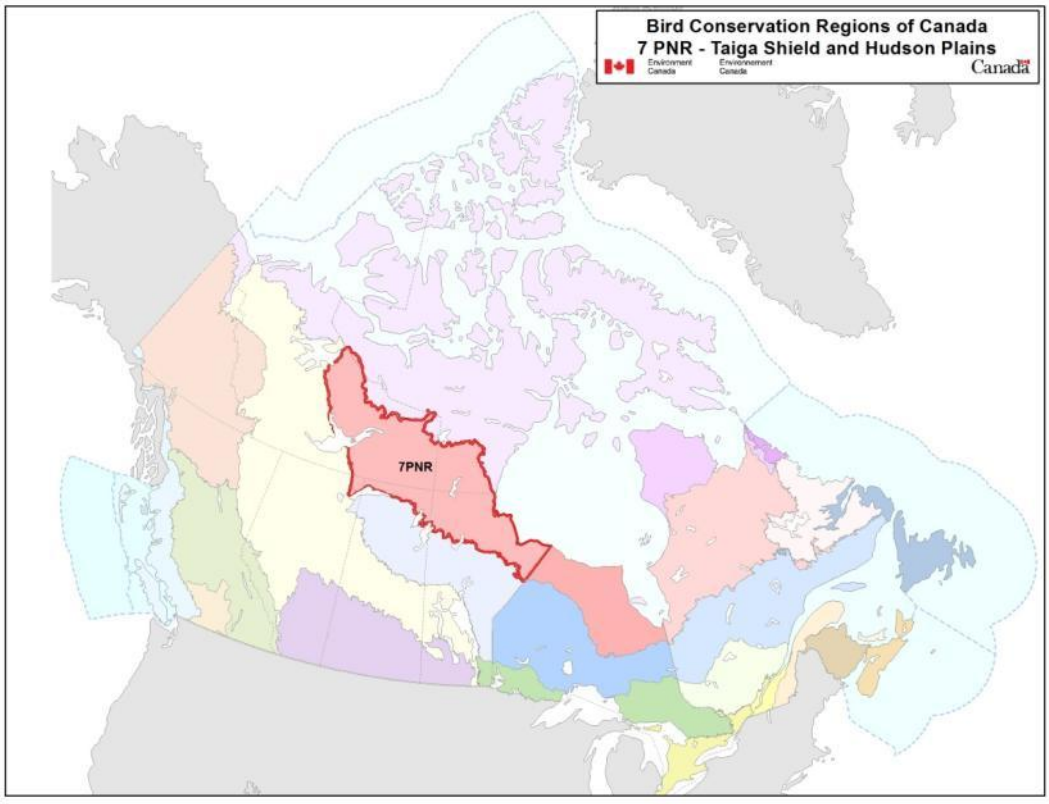
Environment Canada has developed national standards for strategies to ensure consistency of approach across BCRs. Bird Conservation Strategies will provide the context from which specific implementation plans can be developed for each BCR, building on the programs currently in place through Joint Ventures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

Craig S. Machtans was the primary author of this document, following templates developed by Alaine Camfield, Judith Kennedy and Elsie Krebs with the help of the BCR planners in each of the Canadian Wildlife Service regions throughout Canada. K. Calon, W. Fleming, T.J. Habib, K.C. Hannah, E. Kuczynski, C.L. Mahon and K. St. Laurent did all of the initial work to refine species priority lists, assess objectives and threats, research habitat associations as well as producing the first draft of the strategy and populating the database. However, our thanks are extended to everyone who helped with this strategy, as work of this scope cannot be accomplished without the contribution of other colleagues who provided or validated technical information, commented on earlier draft versions of the strategy, and supported the planning process.

Conservation Strategy for Bird Conservation Region 7, Prairie and Northern Region: Taiga Shield and Hudson Plains



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Executive Summary

The Prairie and Northern Region (PNR) portion of BCR 7 consists of the western portion of two Ecozones: the Taiga Shield and the Hudson Plains. This subregion of the Bird Conservation Region (BCR) stretches northwest from the Hudson Bay coast of Manitoba, through the Northwest Territories (N.W.T.) as far west as Great Bear Lake. Nearly half (49%) of the BCR area of about 700,000 km^2 is in the N.W.T., with 28% in Manitoba, 15% in Nunavut, 7% in Saskatchewan, and 1% of the strategy area in the extreme northeast corner of Alberta.

This conservation strategy for BCR 7-PNR builds on existing bird conservation strategies and complements those created for the other BCRs across Canada. BCR strategies will serve as a framework for implementing bird conservation nationally, and also identify international conservation issues for Canada's priority birds. This strategy is not intended to be highly prescriptive, but rather is intended to guide future implementation efforts undertaken by various partners and stakeholders.

The vast majority of BCR 7-PNR is Crown land, although the western portion of the BCR lies within the Tłicho land claim. This land claim area includes private lands where the Tłicho exercise self-government status and a larger area that has a regime of co-management for wildlife issues. The northern margin of the BCR runs along the Arctic Plains, mostly following the treeline and with the southern fringes bordering much of the Boreal Shield and Boreal Plains Ecozones. Northern continental portions of the BCR mainly have stunted conifer forests with interspersed ponds and peatlands overlaying the granite bedrock of the Canadian Shield. Numerous lakes and ponds dot the landscape. Within the Hudson Bay Plains, coastal flood plains and marshland become dominant, as does a milder climate that plays a large role in flora and fauna composition. The principal river and drainage systems include the North Hudson Bay (Thelon) and the Mackenzie River catchment, with linkages to the Peace and Athabasca rivers.

Human disturbance is very limited in BCR 7-PNR. Nearly all settlements are on or near the boundary of the BCR, and industrial development is local and restricted in nature. The area with by far the most anthropogenic activity is near Yellowknife in the N.W.T. The main economic activity in the BCR is mining, but currently there is only one operating mine of any kind – the Snap Lake Diamond Mine of DeBeers Canada. There are many small, abandoned mines, several locations with potential mines in some stage of development, and mineral potential is high throughout the Taiga Shield. There is no forestry activity and fire suppression is usually limited to protecting "values at risk" such as industrial areas and settlements. Fires regularly burn large areas in the southern two-thirds of the BCR.

Sixty-two of the 195 species (32%) in BCR 7-PNR were assigned a priority ranking. Landbirds had the most priority species (22 of 106 species), followed by waterbirds (15 of 30), waterfowl (13 of 30) and shorebirds (12 of 29). Nine species are priorities because they were assessed as "at risk" by COSEWIC, 7 are listed on Schedule 1 of the federal *Species at Risk Act*, while 5 are listed provincially. Wetlands and waterbodies were the most often-used habitats when considering all priority species.

There is one significant conservation issue in BCR 7-PNR, the overabundance of the Lesser Snow Goose and rapidly growing populations of Ross's Goose. These birds have become extremely numerous in the past few decades, primarily as a result of agricultural practices along migration routes and in wintering areas, which provides a limitless food source for them. Massive flocks of these birds are having devastating effects on natural coastal grass and tundra habitat during the breeding season and migration, which in turn affects large numbers of other birds. This effect is limited in BCR 7-PNR to the coastal areas along Hudson Bay, in and near the white goose colonies, and in their nearby staging areas. While severe, it is a localized effect at the scale of the BCR. Because this and other threats to priority species are of low magnitude, conservation objectives and recommended actions have not been developed in this strategy.

The only widespread issue that clearly applies to BCR 7-PNR is climate change. The impact of pollution, bird-structure collisions and predation by cats were considered minor threats. Additional threats may be located outside the BCR, particularly for long-distance migrants that may be impacted in their wintering habitat or important staging areas in the United States, Central/South America or the Caribbean islands. Major international threats include coastal development, deforestation, and agricultural expansion and intensification.

Population objectives and conservation needs are difficult to determine accurately because there is very little bird monitoring in BCR 7-PNR. Monitoring is restricted to two localized surveys for landbirds, a local, long-term waterfowl productivity study and annual spring waterfowl aerial transects. All this monitoring is in the western edge of BCR 7-PNR. Therefore, no good BCR-wide breeding season data exist for any species. The net result of this lack of comprehensive monitoring is that many population objectives are set as assess or maintain because the BCR population trend is not known.

Overall the key messages for bird conservation in BCR 7-PNR are:

- Development pressure is currently low, is mostly at the margins of the BCR, and, for the foreseeable future, is expected to remain best managed as site-specific concerns that are dealt with through the existing environmental assessment regulatory system.
- The existing conservation concern is related to overabundant white geese near Hudson Bay; this concern has international attention for management approaches.
- Monitoring data are so limited that BCR subregion-specific information on population trends cannot be generated; this is a primary need for determining the regional status of populations.

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 needs to support the implementation of Canada's migratory birds program, both domestically and internationally. This suite of strategies builds on existing conservation plans for the four "bird groups" (waterfowl,[1] waterbirds,[2] shorebirds,[3] and landbirds[4]) in most regions of Canada, as well as on national and continental plans, and includes birds under provincial/territorial jurisdiction. These new strategies also establish standard conservation planning methods across Canada, and fill gaps, as previous regional plans do not cover all areas of Canada or all bird groups.

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

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

[1] NAWMP Plan Committee 2004
[2] Milko et al. 2003
[3] Donaldson et al. 2000
[4] Rich et al. 2004

Strategy Structure

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

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

Characteristics of Bird Conservation Region 7 Prairie and Northern Region

The Prairie and Northern Region (PNR) portion of BCR 7 is comprised of portions of two Canadian Ecozones: the western half of the Taiga Shield, and the western portion of the Hudson Plains. The PNR subregion of BCR 7 is approximately 700,710 km^2, or 40% of the total BCR 7 area in Canada. It borders the waters of Hudson Bay and the Arctic Plains of Nunavut and Northwest Territories to the north, by the Boreal Softwood Shield to the south, and on the west by the Boreal Taiga Plains in Alberta and the Northwest Territories (Figure 1). The portion of BCR 7-PNR that consists of Coastal Hudson Bay Lowland is primarily salt marsh containing eel grass and other salt-tolerant species that follow along coastal regions. These ocean-influenced habitats transition into fens, bogs and areas of tundra farther inland. The continental inland portion of BCR 7-PNR is in the Taiga Shield Ecozone. The western portion of the BCR subregion stretches through southern Nunavut (15% of the subregion) and then into the Northwest Territories (49% of the subregion), bordering the Arctic Ecozone near Great Bear Lake. The remaining 36% of the subregion is in the northern Prairie provinces, with Manitoba having the second-largest portion of the area (28%), followed by Saskatchewan (7%), and a tiny portion of Alberta (1% of the subregion).

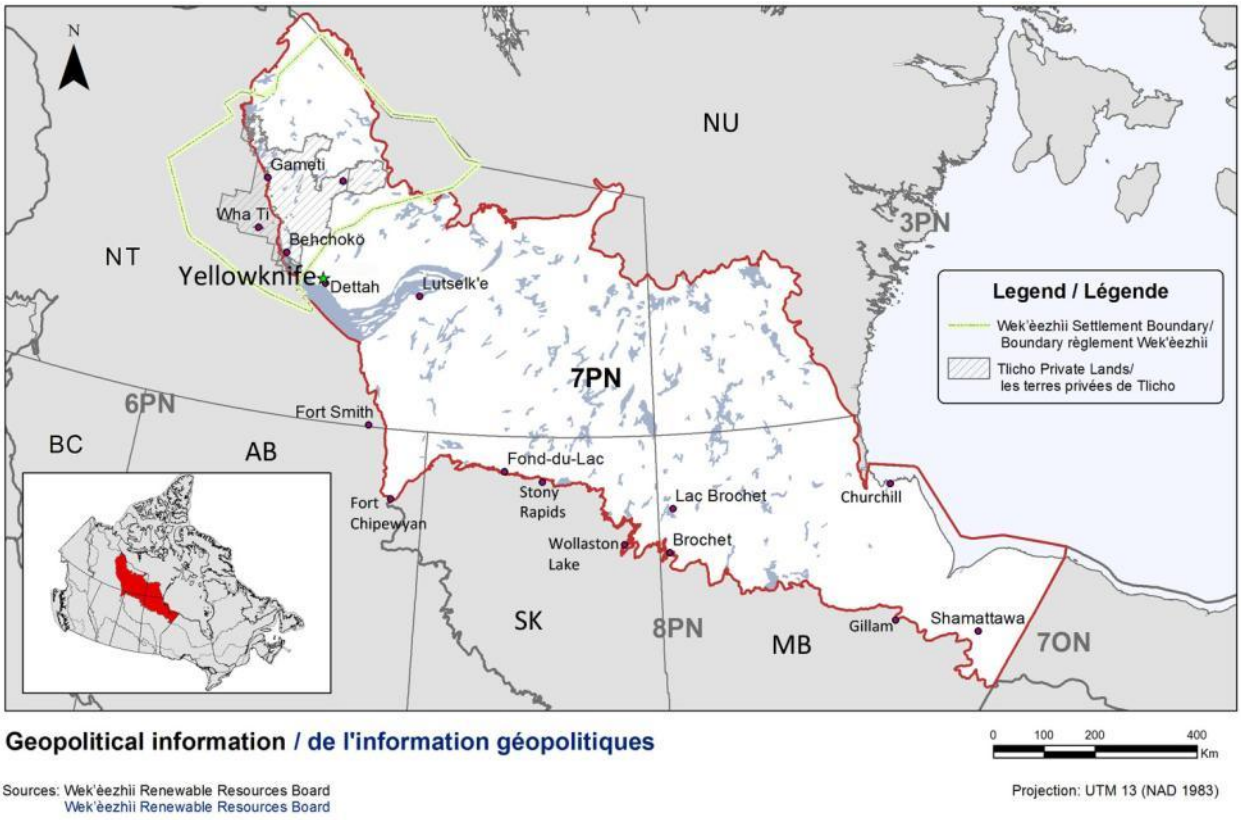

Figure 1. Map of BCR 7 showing the location of First Nations settled land claims, communities and provincial/territorial boundaries relative to the BCR boundary.

Habitat in BCR 7-PNR is dominated by black spruce or jack pine forests of the Taiga Shield, which is interwoven with a network of peatlands, rivers, and innumerable ponds and lakes

(Figure 2). General land cover is summarized in Figure 3 & Figure 4, while individual cover classes are shown in Section 2. Interested readers should consult Ecosystem Classification Group (2008) for detailed descriptions and images of all aspects of the geography, vegetation and other features of the Taiga Shield ecozone in the Northwest Territories. Willow and birch are important deciduous habitats in many shoreline and low-lying areas with soil development. Lowland areas have organic soils laid upon a foundation of Canadian Shield granite bedrock established during the Precambrian period. These saturated lowlands transition into shrublands as elevation increases, then into exposed upland areas that consist of tundra barrens colonized by small vascular plants, lichen and moss. Substantial areas have no continuous soil covering the exposed bedrock. The cold inland climate warms and transitions into a temperate coastal climate moving eastward toward Hudson Bay. This diverse landscape of the western extent of the Hudson Plains Ecozone is influenced greatly by oceanic influences from the east transitioning to freshwater ponds, tundra, and stunted forest from the west, and is important for many bird species that inhabit this large zone both seasonally and throughout the year.

Natural disturbances in BCR 7-PNR are similar to those in the boreal region to the south but often without the restrictions imposed by humans such as fire suppression. Fire, insect outbreaks and extreme weather events (e.g., windstorms, heavy snow) impact regional vegetation as does grazing and browsing from mammals (e.g., caribou herds). Fires regularly burn extensive portions of the southern two-thirds of the BCR (Figure 5). Global climate change will impact these natural disturbance regimes (IPCC 2007).

Figure 2. An aerial view of habitat typical of BCR 7 in the Northwest Territories.
© Environment Canada – Photo: Craig Machtans

The human population of all settlements in BCR 7-PNR is about 28,000, with the vast majority in the N.W.T. and Yellowknife in particular (20,000). The largest settlements in the provinces in the southern portion of the BCR contain a thousand or fewer inhabitants each. Nearly all settlements are actually on or near the border of the BCR (Figure 1), making it one of the more sparsely populated BCRs in Canada. There are numerous protected areas in the BCR (Figure 6). Most are in the three provinces and are protected under provincial laws. Proposals for two new federally protected areas exist for areas over parts of Great Slave Lake.

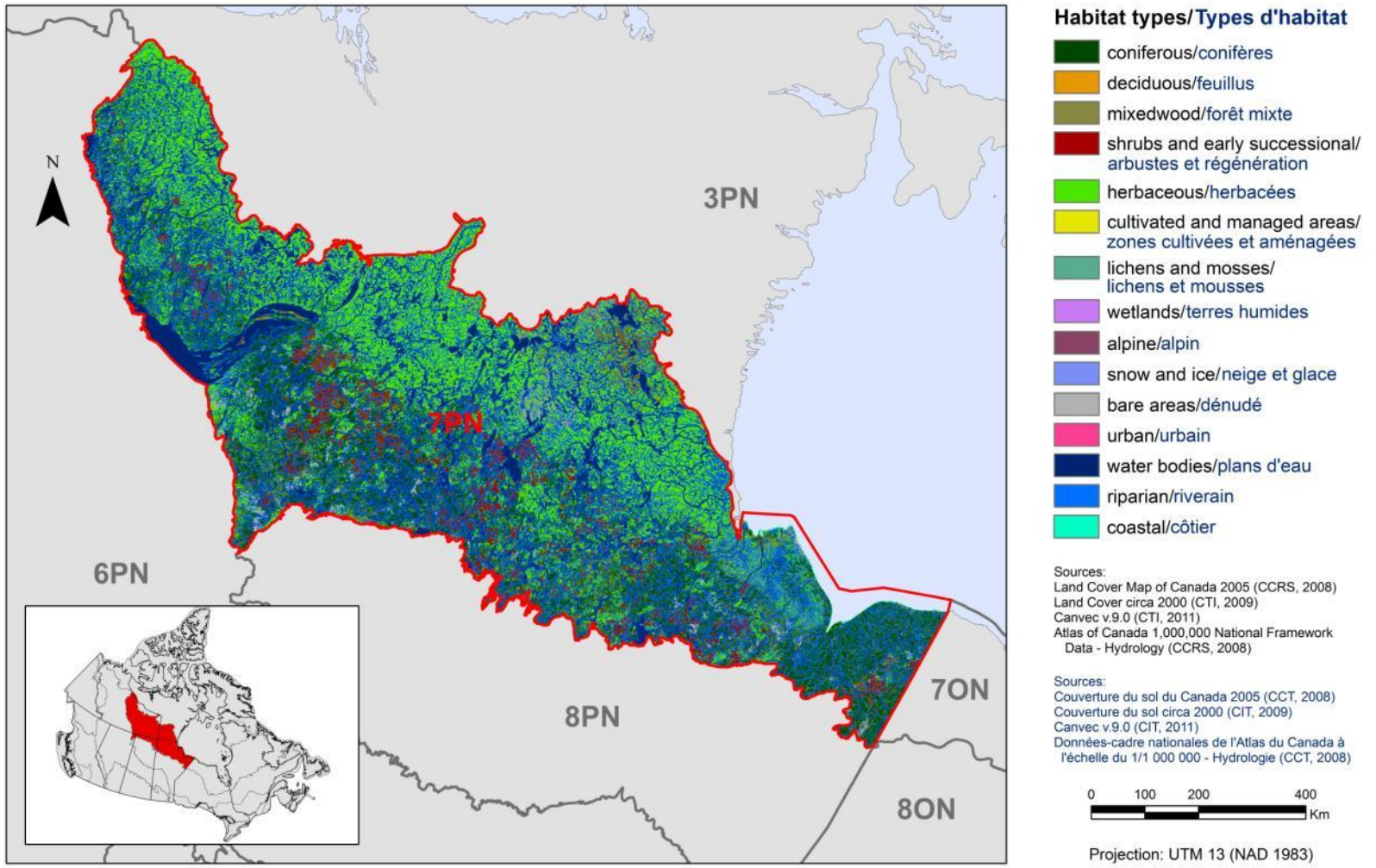

Figure 3. Landcover in BCR 7 Prairie and Northern Region.
Wetlands are difficult to separate without dominating the image; Figure 4 displays them preferentially.

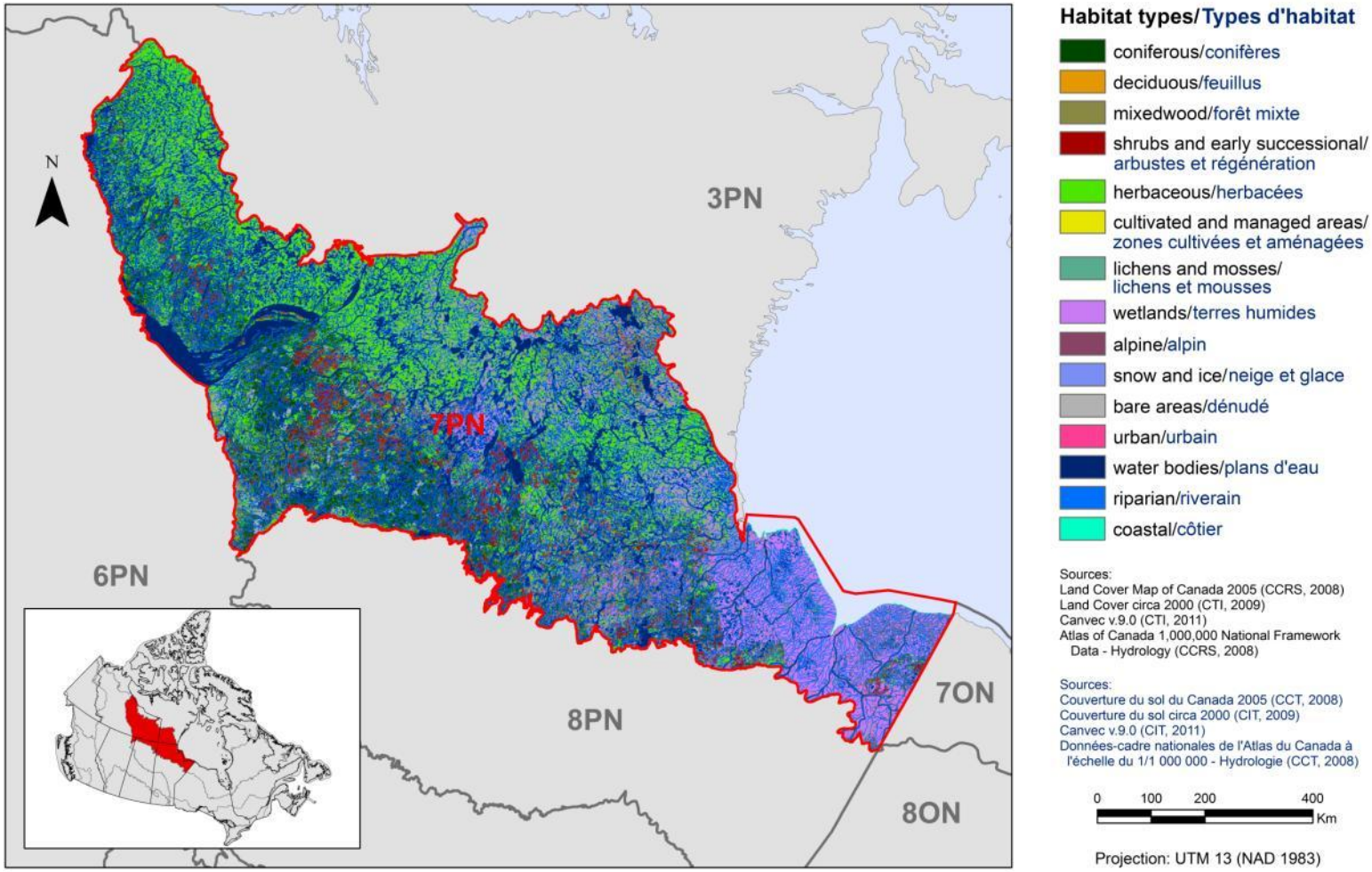

Figure 4. Landcover in BCR 7 Prairie and Northern Region with wetlands displayed preferentially.

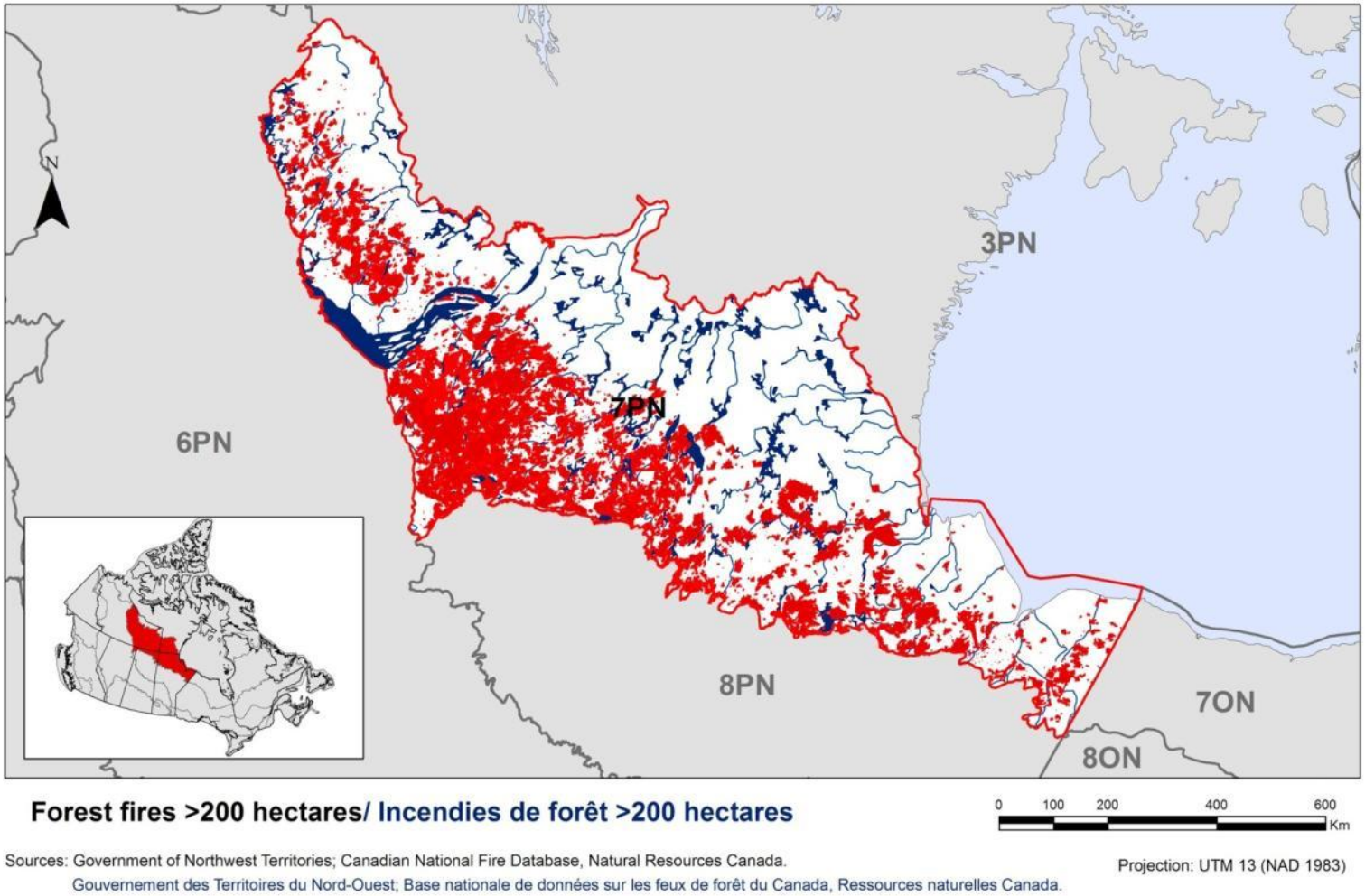

Figure 5. The area of BCR 7 Prairie and Northern Region burned by forest fires (red areas) in the past 30–80 years.
Coverage is from 1965-2010 for Northwest Territories, 1931–2009 for Alberta, 1945–2010 for Saskatchewan, 1980–2008 for Manitoba.

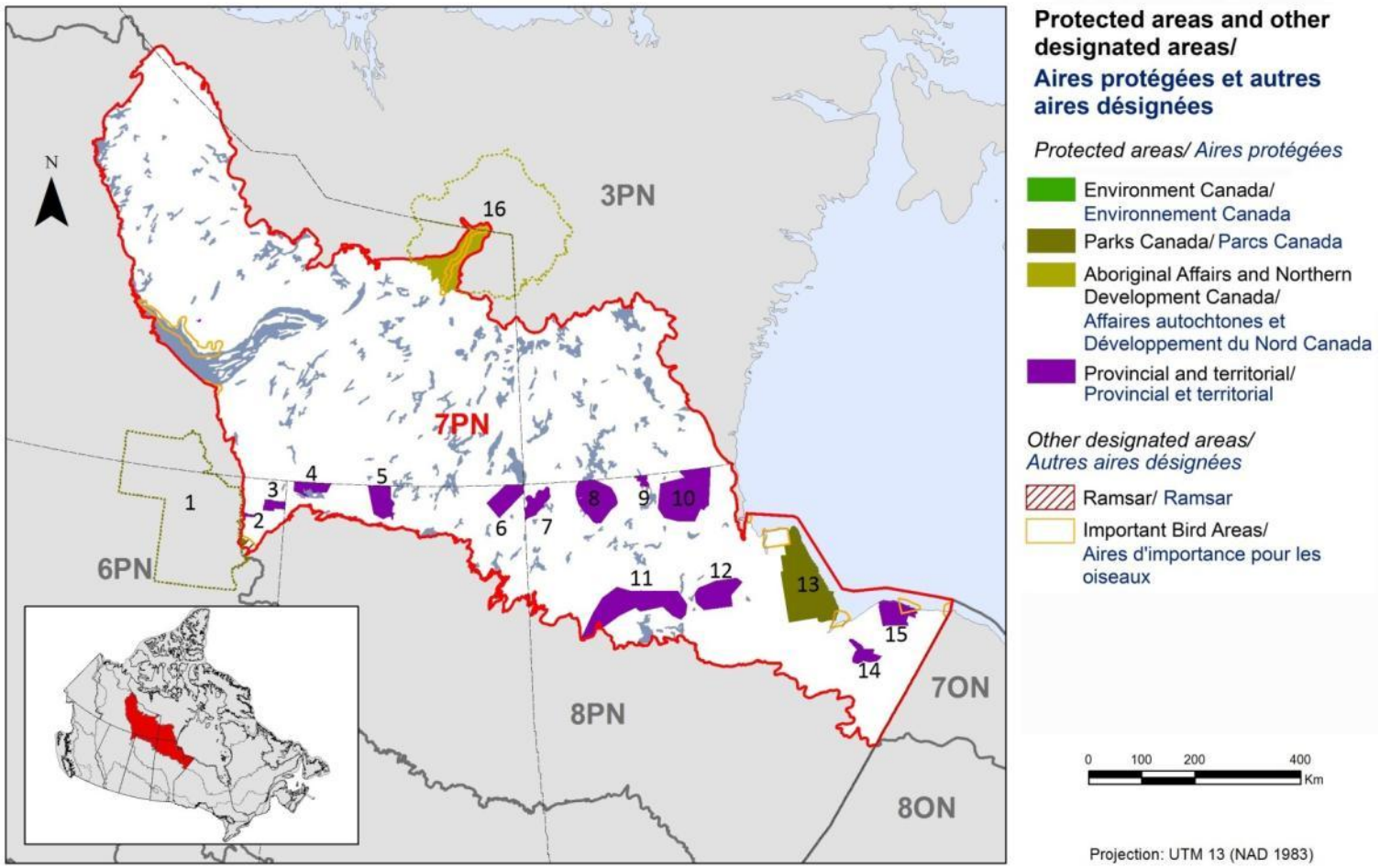

Figure 6. Protected and designated areas in and adjacent to BCR 7 Prairie and Northern Region.
The Ramsar site is the Peace-Athabasca Delta at the southwest tip of the BCR. Information on Important Bird Areas is available at www.ibacanada.ca. The numbered protected areas are: 1. Wood Buffalo National Park, 2. La Butte Creed Wildland Provincial Park, 3. Colin-Cornwall Lakes Wildland Provincial Park, 4. Tazin Lake Special Management Area, 5. Chappuis-Fontaine Lakes Special Management Area, 6. Misaw Lake Special Management Area, 7. Colvin Lake Provincial Park, 8. Nueltin Lake Provincial Park , 9. Baralzon Lake Ecological Reserve, 10. Caribou River Provincial Park, 11. Sand Lakes Provincial Park Reserve, 12. Numaykoos Lake Provincial Park, 13. Wapusk National Park, 14. Kaskatamagan Sipi Wildlife Management Area, 15. Kaskatamagan Wildlife Management Area, 16. Thelon Game Sanctuary. Not shown: Three territorial parks near Yellowknife, a proposal for Thaidene Nene National Park Reserve that covers part of the east arm of Great Slave Lake, and a candidate National Wildlife Area in the north arm of Great Slave Lake.

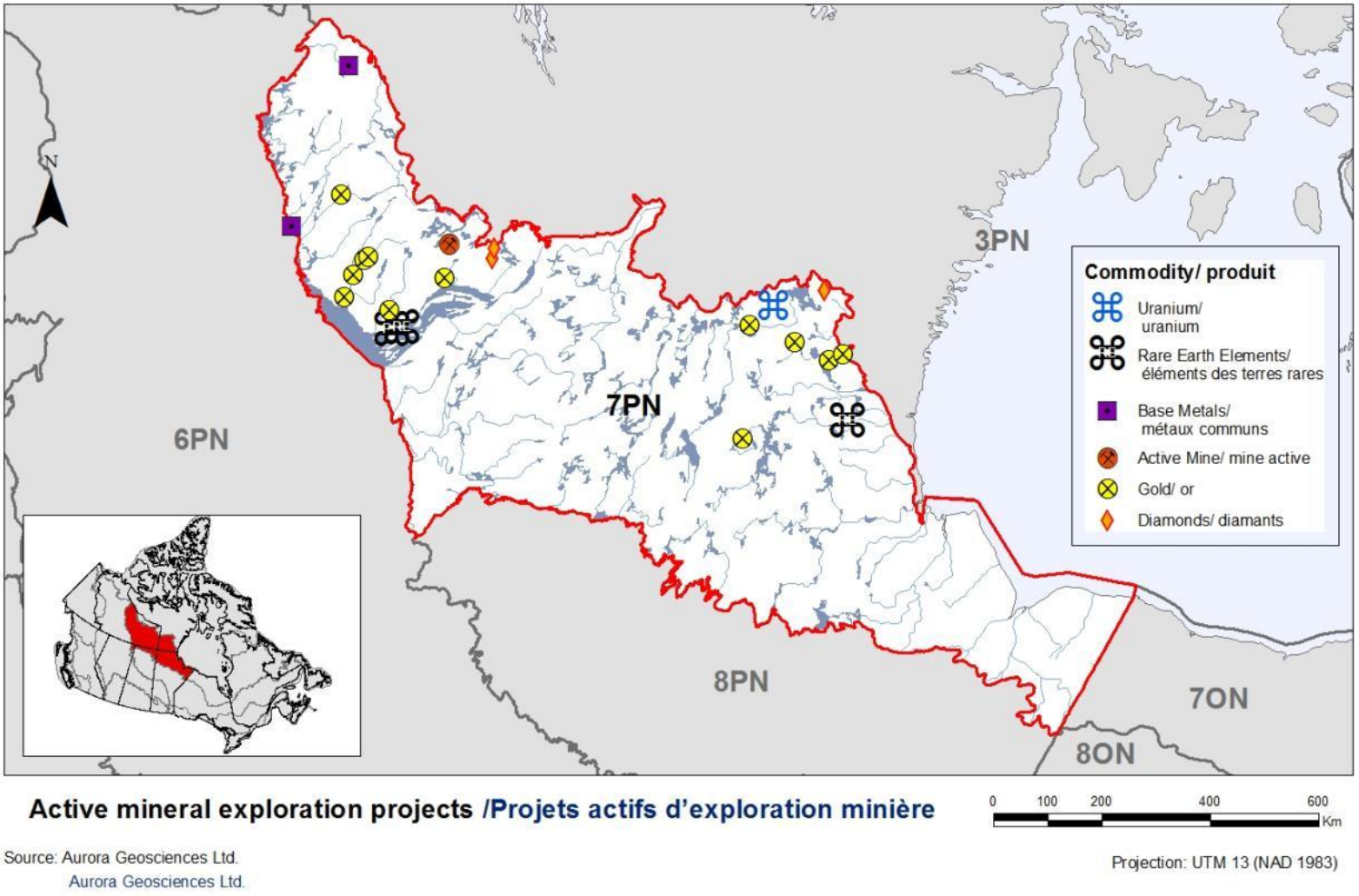

Figure 7. Active mineral exploration projects in the northern part of BCR 7 Prairie and Northern Region as of 2012.
The Snap Lake Diamond mine owned by DeBeers Canada is the only active mine. Several mines are in the environmental assessment phase while other active properties are not as advanced.

The one settled land claim in the BCR is the Tłicho, found at the western end (see Figure 1). The significance of this land claim for bird conservation can be summarized as:

- The Tłjcho have a self-government claim, so they have the same status and management responsibilities as a province on their private lands.
- In the larger settlement boundary, there is a formal wildlife co-management regime with the Wek'éezhìi Renewable Resources Board. The board has legal jurisdiction to set a total harvest limit for species in its management area (if ever an upper cap was needed on harvest, as opposed to individual bag limits). The Canadian Wildlife Service has one member on the board and consults them on issues of wildlife management, including BCR strategies.
- The Wek'éezhìi board must be consulted on proposed listings under the *Species at Risk Act* and makes a recommendation to the Minister of the Environment.

In both the Taiga Shield and Hudson Plains portions of BCR 7-PNR, direct human impact on the surrounding landscape is still low compared to southern regions of the country where industry and human population exists at a much larger scale. Mining developments have been a part of the landscape for decades in the mineral rich Taiga Shield, where the mining of gold, nickel, and iron ore deposits used to lead the economy. More recently, there is one operating diamond mine, the Snap Lake Diamond Mine, and potential for various new mines as rare earth elements and uranium deposits are sought by developers (Figure 7). The Snap Lake Diamond Mine is an underground mine, and its entire infrastructure, including an airstrip, covers less than 500 ha of land. This is in contrast to the larger, combined open-pit and underground operations at the other two diamond mines nearby in BCR 3.

Three mines are currently in or entering the environmental assessment phase, all in the N.W.T. portion of the BCR. These industrial-scale mining activities typically have local impacts on the northern landscape, through mineral leaching and other toxic by-products of mining, habitat destruction while the mine is operating, and the creation of tailings ponds by some types of mines. Reclamation and financial deposits for that purpose are held by the federal government after project approval and are a requirement for modern mines.

Some portions of BCR 7-PNR, particularly in the coastal regions, but more recently in the tundra areas of the Hudson Plains, are under high pressure from overabundant Lesser Snow Geese and rapidly growing populations of Ross's Geese. The term "overabundant" is legally defined in the *Migratory Bird Regulations* (S. 23.1) as *"…a species of migratory game bird that, as a result of the rate of increase of the population of that species or its overabundance, is injurious to or threatens agricultural, environmental or other similar interests"*. The populations of geese have become extremely large due primarily to the vast agricultural areas along their migration routes which offer a virtually limitless food

supply. This food supply dramatically increases over-winter survival and also allows geese to arrive on the breeding grounds in excellent physical condition. Impacts to the delicate ecosystems where these geese breed and stage can be devastating. At present this is the only pressing conservation issue involving birds directly within the BCR subregion.

Figure 8. Greater Yellowlegs is a priority species in BCR 7 Prairie and Northern Region because of national and regional concern. It is found in the western and southwestern portions of the BCR where it can easily be confused with the similar and more common Lesser Yellowlegs (also a priority species).
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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 7 Prairie and Northern Region by bird group and by the reason for priority status.

Table 1. Priority species in BCR 7, Prairie and Northern Region, population objective, and the reason for priority status.

Priority species	Bird group	Population objective	COSEWIC[1]	SARA[2]	Provincial listing[3]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP[4] priority (waterfowl only)	NAWMP rank[5] (waterfowl only)	General Status Rank[6]	Expert review[7] (changes to priority list)
American Pipit	Landbird	Assess/Maintain										Yes	
American Tree Sparrow	Landbird	Increase 50%				Yes		Yes				Yes	
Barn Swallow	Landbird	Increase 50%	T										
Belted Kingfisher	Landbird	Assess/Maintain							Yes				
Black-backed Woodpecker	Landbird	Assess/Maintain						Yes	Yes			Yes	
Blackpoll Warbler	Landbird	Assess/Maintain							Yes				
Boreal Chickadee	Landbird	Assess/Maintain						Yes				Yes	
Common Nighthawk	Landbird	Recovery Objective	T	T	T (MB)	Yes							
Eastern Phoebe	Landbird	Assess/Maintain										Yes	
Harris's Sparrow	Landbird	Increase 100%				Yes						Yes	
Merlin	Landbird	Assess/Maintain							Yes				

[1] Assessed by COSEWIC (Committee on the Status of Endangered Wildlife in Canada) as: E, Endangered; T, Threatened; SC, Special Concern

[2] Species listed on Schedule 1 of the *Species at Risk Act* as E, Endangered; T, Threatened; SC, Special Concern (Species at Risk Public Registry).

[3] *Provincially Listed* indicates species listed by:
Alberta's *Wildlife Act* www.srd.alberta.ca/fishwildlife/speciesatrisk/SpeciesSummaries/SpeciesAtRiskFactSheets.aspx,
Saskatchewan's *The Wildlife Act* www.environment.gov.sk.ca/wildspeciesatrisk,
Manitoba's *The Endangered Species Act* www.gov.mb.ca/conservation/wildlife/sar/sarlist.html, or the
Northwest Territories' *Species at Risk (N.W.T.) Act* http://N.W.T.speciesatrisk.ca/tiki/tiki-index.php?page=SpeciesAtRisk#birds.

[4] NAWMP: North American Waterfowl Management Plan (North American Waterfowl Management Plan, Plan Committee, 2004)

[5] From Waterfowl Conservation Region 7.1 and 7.2 in Table B-2 of the North American Waterfowl Management Plan 2004 Implementation Framework (where multiple values are available, the highest is noted in the table here).

[6] General Status Rank of ≤3 in any province or territory overlapping with the BCR. See Appendix 2 text for more detail.

[7] Expert review indicates that a species was added to the priority list as a result of expert opinion. Species removed are in Appendix 1, table A2-1.

Table 1 continued

Priority species	Bird group	Population objective	COSEWIC[1]	SARA[2]	Provincial listing[3]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP[4] priority (waterfowl only)	NAWMP rank[5] (waterfowl only)	General Status Rank[6]	Expert review[7] (changes to priority list)
Northern Shrike	Landbird	Assess/Maintain						Yes	Yes				
Olive-sided Flycatcher	Landbird	Recovery Objective	T	T		Yes							
Palm Warbler	Landbird	Assess/Maintain				Yes		Yes	Yes				
Peregrine Falcon *anatum/tundrius*	Landbird	Assess/Maintain	SC	SC	E (MB); T (AB)			Yes					
Pine Grosbeak	Landbird	Assess/Maintain				Yes		Yes	Yes			Yes	
Rusty Blackbird	Landbird	Increase 100%	SC	SC		Yes			Yes			Yes	
Short-eared Owl	Landbird	Increase 100%	SC	SC	T (MB)	Yes						Yes	
Smith's Longspur	Landbird	Assess/Maintain				Yes			Yes				
Swamp Sparrow	Landbird	Assess/Maintain				Yes		Yes	Yes				
White-crowned Sparrow	Landbird	Assess/Maintain										Yes	
White-throated Sparrow	Landbird	Assess/Maintain				Yes		Yes				Yes	
American Golden-Plover	Shorebird	Assess/Maintain				Yes	Yes		Yes				
Dunlin	Shorebird	Assess/Maintain				Yes	Yes						
Greater Yellowlegs	Shorebird	Assess/Maintain				Yes	Yes						
Hudsonian Godwit	Shorebird	Assess/Maintain				Yes	Yes		Yes				
Killdeer	Shorebird	Increase 50%				Yes	Yes						
Lesser Yellowlegs	Shorebird	Assess/Maintain					Yes		Yes				
Red-necked Phalarope	Shorebird	Increase 50%				Yes	Yes						
Semipalmated Sandpiper	Shorebird	Increase 100%				Yes	Yes		Yes				
Short-billed Dowitcher	Shorebird	Assess/Maintain				Yes	Yes		Yes				
Solitary Sandpiper	Shorebird	Assess/Maintain				Yes	Yes						

Table 1 continued

Priority species	Bird group	Population objective	COSEWIC[1]	SARA[2]	Provincial listing[3]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP[4] priority (waterfowl only)	NAWMP rank[5] (waterfowl only)	General Status Rank[6]	Expert review[7] (changes to priority list)
Whimbrel	Shorebird	Assess/Maintain				Yes	Yes		Yes				
Wilson's Snipe	Shorebird	Assess/Maintain					Yes						
American Bittern	Waterbird	Assess/Maintain				Yes	Yes						
Arctic Tern	Waterbird	Increase 50%				Yes	Yes		Yes				
Bonaparte's Gull	Waterbird	Assess/Maintain				Yes	Yes		Yes				
California Gull	Waterbird	Assess/Maintain				Yes	Yes						
Caspian Tern	Waterbird	Assess/Maintain					Yes					Yes	
Common Loon	Waterbird	Assess/Maintain				Yes	Yes		Yes				
Common Tern	Waterbird	Assess/Maintain				Yes	Yes						
Herring Gull	Waterbird	Assess/Maintain				Yes	Yes		Yes				
Horned Grebe (western)	Waterbird	Increase 50%	SC			Yes	Yes		Yes				
Little Gull	Waterbird	Assess/Maintain				Yes	Yes					Yes	
Pacific Loon	Waterbird	Assess/Maintain				Yes	Yes		Yes				
Red-throated Loon	Waterbird	Assess/Maintain										Yes	
Ross's Gull	Waterbird	Recovery Objective	T	T	E (MB)	Yes	Yes						
Sora	Waterbird	Assess/Maintain				Yes	Yes		Yes				
Yellow Rail	Waterbird	Maintain Current	SC	SC		Yes	Yes						
American Black Duck	Waterfowl	Assess/Maintain				Yes	Yes			Mod-High	High		
American Wigeon	Waterfowl	Assess/Maintain				Yes				Mod-High			Yes
Black Scoter	Waterfowl	Increase 50%				Yes	Yes		Yes	Mod-	High		

Table 1 continued

Priority species	Bird group	Population objective	COSEWIC[1]	SARA[2]	Provincial listing[3]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern	Continental stewardship (landbirds only)	Regional stewardship (landbirds, shorebirds, waterbirds)	NAWMP[4] priority (waterfowl only)	NAWMP rank[5] (waterfowl only)	General Status Rank[6]	Expert review[7] (changes to priority list)
										High			
Bufflehead	Waterfowl	Assess/Maintain					Yes		Yes	Mod	Mod-High		
Canada Goose	Waterfowl	Assess/Maintain					Yes				High		
Common Eider	Waterfowl	Increase 50%				Yes	Yes		Yes	High	Highest		
Greater Scaup	Waterfowl	Assess/Maintain											Yes
Lesser Scaup	Waterfowl	Increase 50%				Yes	Yes		Yes	High	High		
Lesser Snow Goose	Waterfowl	Decrease					Yes			Above Object-ive	High		
Long-tailed Duck	Waterfowl	Increase 50%				Yes	Yes		Yes	Mod-High	Mod-High		
Northern Pintail	Waterfowl	Increase 50%				Yes			Yes	High	Mod	Yes	Yes
Surf Scoter	Waterfowl	Assess/Maintain				Yes	Yes		Yes	Mod-High	High		
White-winged Scoter	Waterfowl	Increase 50%			SC (AB)	Yes	Yes		Yes	Mod-High	Mod-High		

Table 2. Summary of priority species, by bird group, in BCR 7, Prairie and Northern Region.

Bird group	Total species	Total priority species	Percent listed as priority	Percent of priority list
Landbirds	106	22	21%	36%
Shorebirds	29	12	41%	19%
Waterbirds	30	15	50%	24%
Waterfowl	30	13	43%	21%
Total	**195**	**62**	**32%**	**100%**

Table 3. Number of priority species in BCR 7, Prairie and Northern Region, by reason for priority status.

Priority listing[1]	Landbirds	Shorebirds	Waterbirds	Waterfowl
COSEWIC[2]	6	0	3	0
Federal SARA listed[3]	5	0	2	0
Provincially Listed[4]	3	0	1	1
NAWMP[5]	-	-	-	12
National/Continental Concern	11	10	13	9
Regional Concern	0	12	14	10
National/Continental Stewardship	9	-	-	-
Regional Stewardship	10	6	7	8
Management Concern[6]	0	0	0	1

[1] A single species can be on the priority list for more than one reason. Note that not all reasons for inclusion apply to every bird group (indicated by "-").
[2] *COSEWIC* indicates species assessed by the Committee on the Status of Endangered Wildlife in Canada as Endangered, Threatened, or Special Concern.
[3] Species listed on Schedule 1 of the *Species at Risk Act* as Endangered, Threatened, or Special Concern.
[4] *Provincially Listed* indicates species listed by Alberta's *Wildlife Act*, Saskatchewan's *The Wildlife Act*, Manitoba's *The Endangered Species Act*, or the Northwest Territories' *Species at Risk (N.W.T.) Act* "Threatened" or higher.
[5] 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 need in the BCR.
[6] Management concern applies to species that are at or above their stated population objective and require ongoing management due to their economic importance as harvested species or to reduce overabundant populations.

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.

Figure 9 provides a summary of habitats used by the priority species. Habitat use for each species was not ranked, so the figure does not represent a corresponding overall importance of particular habitats in the BCR. It only shows, for example, that many priority species use wetlands or waterbodies as one of their main habitat choices.

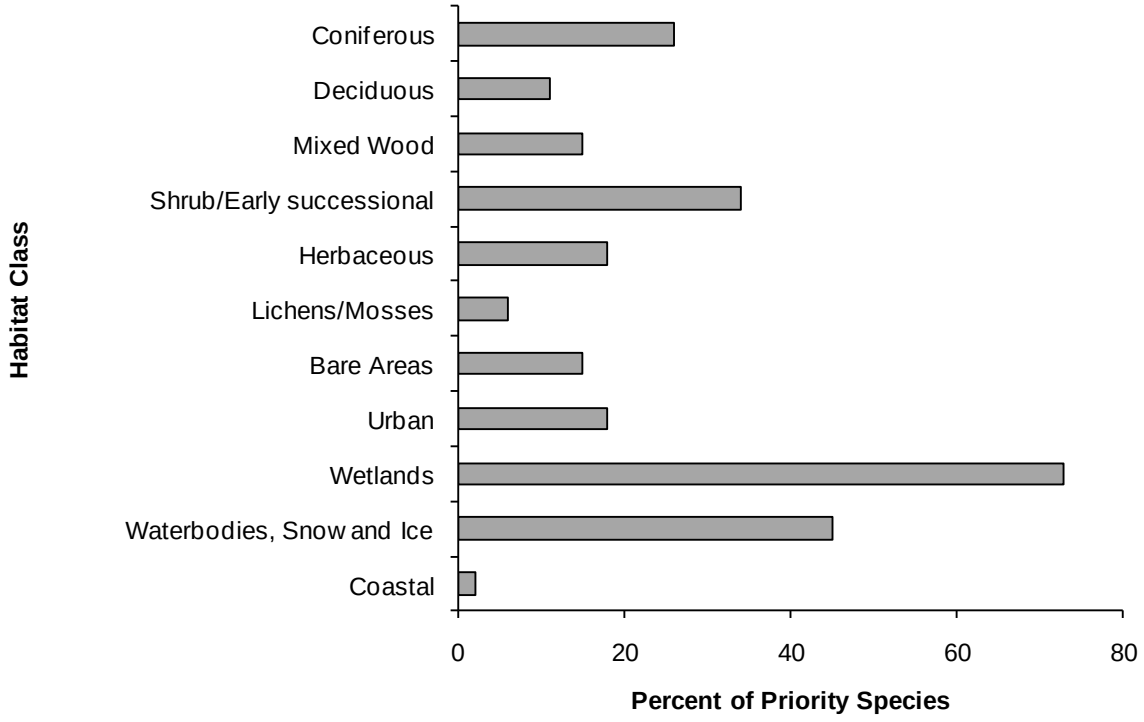

Figure 9. Percent of priority species that are associated with each habitat type in BCR 7 Prairie and Northern Region. The full habitat class name for Urban is "Urban (Artificial Surfaces and Bare Areas)".
Note: The total exceeds 100% because each species may be assigned to more than one habitat.

Element 3: Population Objectives

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

Figure 10 summarizes the proportion of population objectives for priority species in BCR 7-PNR. The vast majority of the species were data deficient for regional trend information. Where no defendable alternative could be found (as described in more detail in Appendix 2), assess/maintain as assigned as the population objective. Although consistency with adjacent BCRs (especially BCR 7 - Ontario region and BCR 3 - PNR) was desirable, there are exceptions where species do not have identical objectives. For instance, Harris's Sparrow has an objective of "Increase 100%" in BCR 7 - PNR where the vast majority of its breeding range occurs. Data on trend come from Christmas Bird Counts, likely a valid representation given the high overlap of this species' range with the BCR boundaries. By contrast, BCR 7 - Ontario Region overlaps very little of the range of this species and has set "assess/maintain" as the appropriate target. Notes on these differences and the underlying reasoning are contained in the national database.

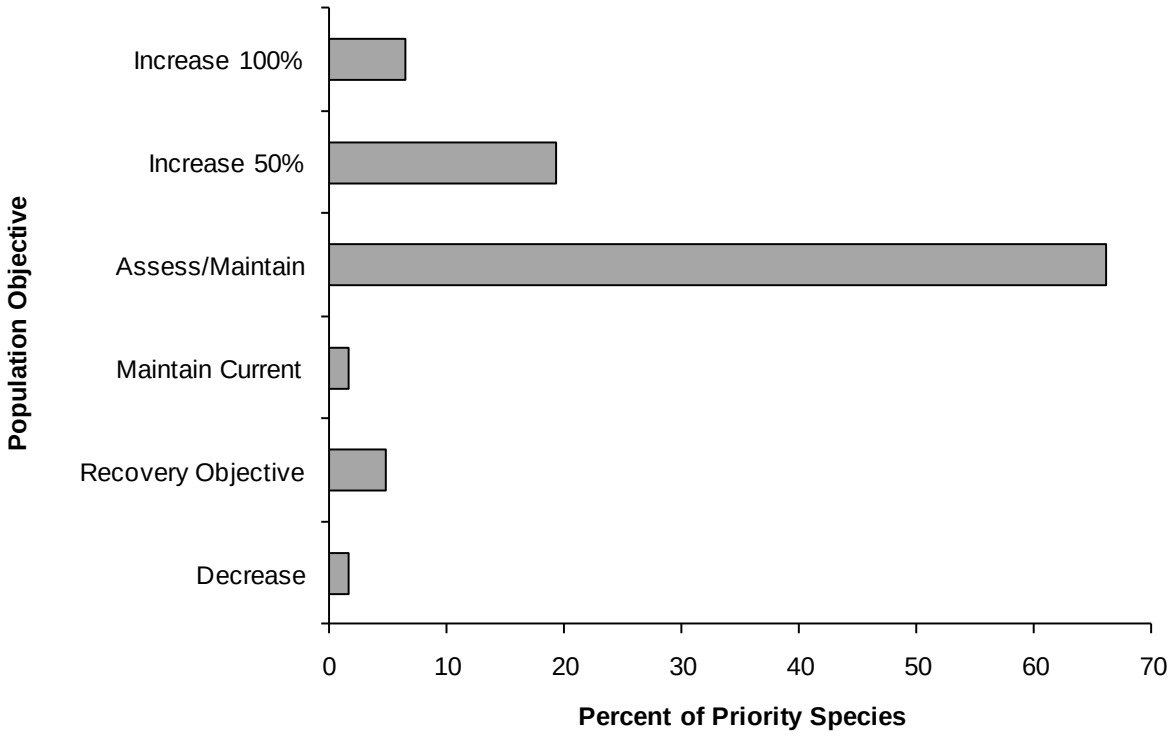

Figure 10. Percent of priority species that are associated with each population objective category in BCR 7, Prairie and Northern Region.
Many species have "Assess/Maintain" because of the paucity of monitoring data from within the BCR.

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.

Because development is so limited in BCR 7-PNR, no threats were identified as operating at a level that affects populations of priority species. However, the following threats were initially identified and considered:

- Urban expansion of the communities in the BCR subregion
- Mining and quarrying
- Overabundant native species

- Dams/hydro development
- Roads

Forest harvesting, salvage logging, and peat mining do not occur in the BCR so are not listed as threats. Fire suppression is mostly limited to protecting communities and industry sites or some localized timber resources. Most fires are allowed to burn extensive areas under natural conditions (Figure 5), unless coming close to human property, so no human-caused effect on bird populations from fire suppression could be identified. As per the methodology in Kennedy et al. (2012), threats identified as “Low” are not considered further for Conservation Objectives or Recommended Actions. Since all threats in BCR 7 were deemed to be “Low,” this strategy has no Element 5 or 6 results. However, there are two conservation issues in the BCR, both relatively local in scale: overpopulation of two species of goose, the Lesser Snow Goose and Ross’s Goose, and overpopulation of Common Ravens around Yellowknife and nearby settlements.

Overabundant White Geese

Ecosystems within BCR 7-PNR, particularly in the coastal regions, but more recently in the tundra areas of the Hudson Plains, are under high pressure from a large overabundance of Lesser Snow Geese (Figure 11) and rapidly growing populations of Ross's Geese. A special publication from the Arctic Goose Joint Venture (Leafloor et al. 2012) is a current and expansive review of the situation and conservation options for dealing with this issue. Lesser Snow Goose populations have increased at a remarkable rate, up to 7% per year from the early 1960s to the mid-1990s, due primarily to the agricultural food resources available throughout their migratory routes and on their wintering grounds (Abraham et al. 2005). The abundance of these herbivores on breeding areas in BCR 7-PNR is causing loss or degradation of habitat for a variety of other bird species, and may, over time, cause changes in bird communities in the affected habitats. For example, Savannah Sparrows and their grass/shrub habitat showed large declines, up to 77%, over a 25-year period from 1976 to 2001 in an area adjacent to coastal salt marshes in northern Manitoba (Rockwell et al. 2003). This is attributed to destructive foraging by snow geese causing changes in the properties of the soil, and erosion of the unvegetated soils resulting in potentially irreversible changes (Jefferies et al. 2006). Decreasing Snow and Ross's Goose numbers will likely require large-scale, intensive management efforts since recent evidence suggests that increased bag limits and the special conservation season (spring hunt) are not curtailing population growth as much as expected (Leafloor et al. 2012).

Figure 11. Lesser Snow Geese are overabundant and are severely damaging their breeding habitats.
© Environment Canada – Photo: Craig Machtans

The issue of overabundant Lesser Snow Geese and similarly destructive increasing populations of Ross's Geese is a serious, but local problem in the BCR (restricted to the area near Churchill, MB). BCR 3-PNR contains many more white-goose colonies, and that strategy has both Conservation Objectives and Recommended Actions for these species that would also apply to the white geese in BCR 7-PNR.

Overabundant Ravens

Yellowknife has the highest count of Common Ravens (Figure 12) in North American on the Christmas Bird Count, with 2,613 and 2,221 individuals found in the 2010 and 2011 counts respectively. This local overpopulation has been linked to decreased nesting success in several waterbird and waterfowl species in the area, likely due to increased nest predation (Fournier and Hines 1999, 2001, Canadian Wildlife Service unpublished data). For example, scaup nesting success averages 58% where ravens are excluded, but is 18–21% on land or islands accessible to

ravens (although the latter are free of terrestrial predators). Similar effects were noted on waterfowl and waterbirds nesting in the Yellowknife area.

Figure 12. Common Ravens have become very numerous in the Yellowknife area, resulting in negative effects on local waterfowl nesting success.
© Environment Canada – Photo: Craig Machtans

Mining

Mining is the main industry in the BCR subregion, as mentioned earlier. Though the threat from mining to birds in BCR 7-PNR is likely below the threshold for consideration at this regional scale, mining has historically been more active and is likely to increase with three potential new mines coming into operation. Impacts will still remain local in scope and can be dealt with by participation in the environmental assessment process and compliance with regulatory conditions of licenses and authorizations.

Figure 13 summarizes the six sub-threats that affect priority species in BCR 7-PNR. “Mining and quarrying” usually refers to the direct loss of habitat and any indirect effects from the mines on habitat such as dust and noise. “Recreational activities” are primarily those involving use of lakes and wetlands and the associated boat wakes, noise or pollution. “Problematic native species” is mostly a threat from white goose overpopulation, but it does include unusually high numbers of Common Ravens around Yellowknife and the associated depredation of nests mentioned above. The “Industrial and military effluents” sub-category covers mercury, selenium and other metals, as well as complex chemicals such as PCBs or flame retardants. They are deposited locally from industry or by long-range atmospheric transport and bioaccumulate in birds. “Garbage and solid waste” is self-explanatory and was assessed for gulls. Finally, “Air-borne pollutants” was used for aerial deposition of compounds that acidify the environment.

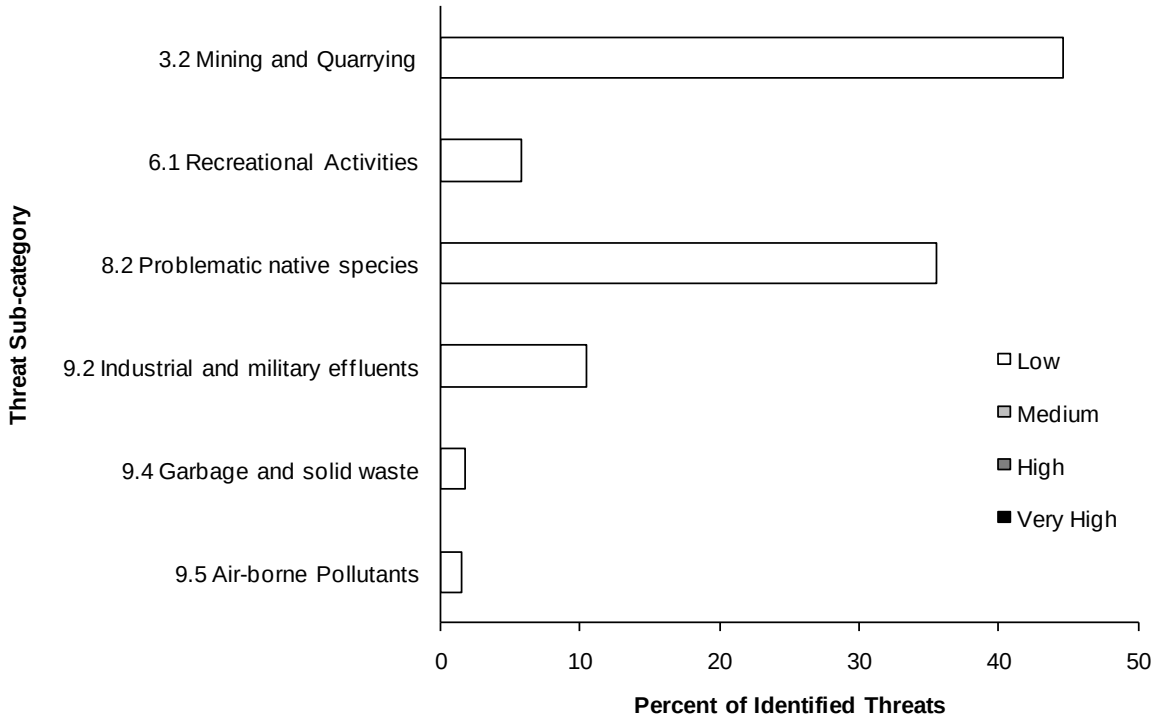

Figure 13. Percent of identified threats to priority species within BCR 7, Prairie and Northern Region, by threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR X (for example, if 100 threats were identified in total for all priority species in BCR 7, 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 rolled up magnitude of all threats in each threat subcategory in the BCR. (See Element 4: Threat Assessment for Priority Species for details on how magnitude was assessed).

Overall threats were summarized for the strategy subregion in Table 4. Like the data presented above, sub-categories 2. Energy Production and Mining and 8. Invasive & Other Problematic Species & Genes are the two main threats. However, the table demonstrates that both of these low ranked threats were assessed to occur in most habitat classes. The overall threat ranking in each habitat is in the top row, while the overall threat ranking for each threat is in the last column.

Table 4. Relative magnitude of identified threats to priority species within BCR 7, Prairie and Northern Region, by threat category and broad habitat class.

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

Threat Category	Habitat Class											
	Coniferous	Deciduous	Mixed Wood	Shrub/Early Successional	Herbaceous	Lichens/Mosses	Bare Areas	Urban (Artificial Sur. & Bare Areas)	Wetlands	Waterbodies, Snow and Ice	Coastal	Overall
Overall	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	
1. Residential & Commercial Development												
2. Agriculture & Aquaculture												
3. Energy Production & Mining	L	L	L	L	L	L	L		L	L	L	**L**
4. Transportation & Service Corridors												
5. Biological Resource Use												
6. Human Intrusions & Disturbance				L	L		L		L	L		**L**
7. Natural System Modifications												
8. Invasive & Other Problematic Species & Genes	L	L	L	L	L	L	L		L	L	L	**L**
9. Pollution	L	L		L	L		L	L	L	L		**L**
11. Climate Change & Severe Weather												

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

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.

For BCR 7-PNR no threats identified for individual species were assessed at a magnitude of "medium" or greater. Therefore no specific conservation objectives or associated actions were developed as per Kennedy et al. (2012). See the BCR 3-PNR strategy for conservation objectives and recommended actions for overabundant white geese.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives. Actions are strategic rather than highly detailed and prescriptive. 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.

For BCR 7-PNR no threats identified for individual species were assessed at a magnitude of "medium" or greater. Therefore no specific conservation objectives or associated actions were developed as per Kennedy et al. (2012). Many of the threats facing priority bird species in BCR 7-PNR are not well understood; this may be due to inadequate monitoring for most species that leads to uncertainty in BCR population trends, or a lack of evidence establishing causative relationships between human activities and population declines. These knowledge gaps will often be best addressed using an adaptive management approach which iteratively employs management actions as scientific experiments to test specific hypotheses to inform future management decisions (Walters et al. 1992).

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 7 Prairie and Northern Region. 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

A large part of BCR 7-PNR consists of coniferous forest (Figure 14) dominated by stunted black spruce interspersed with white spruce and jack pine that are largely limited by topography and hydrology. Peatlands occur frequently throughout black spruce-dominated stands, forming a mosaic of forested bogs and fens across the landscape. Floodplain and upland areas near lakes and rivers that have substantial soil depth are sometimes colonized by mixed or deciduous forest. A combination of insect disturbance, harsh weather and fire disturbance has maintained a forested landscape with differing stand ages and vegetation communities.

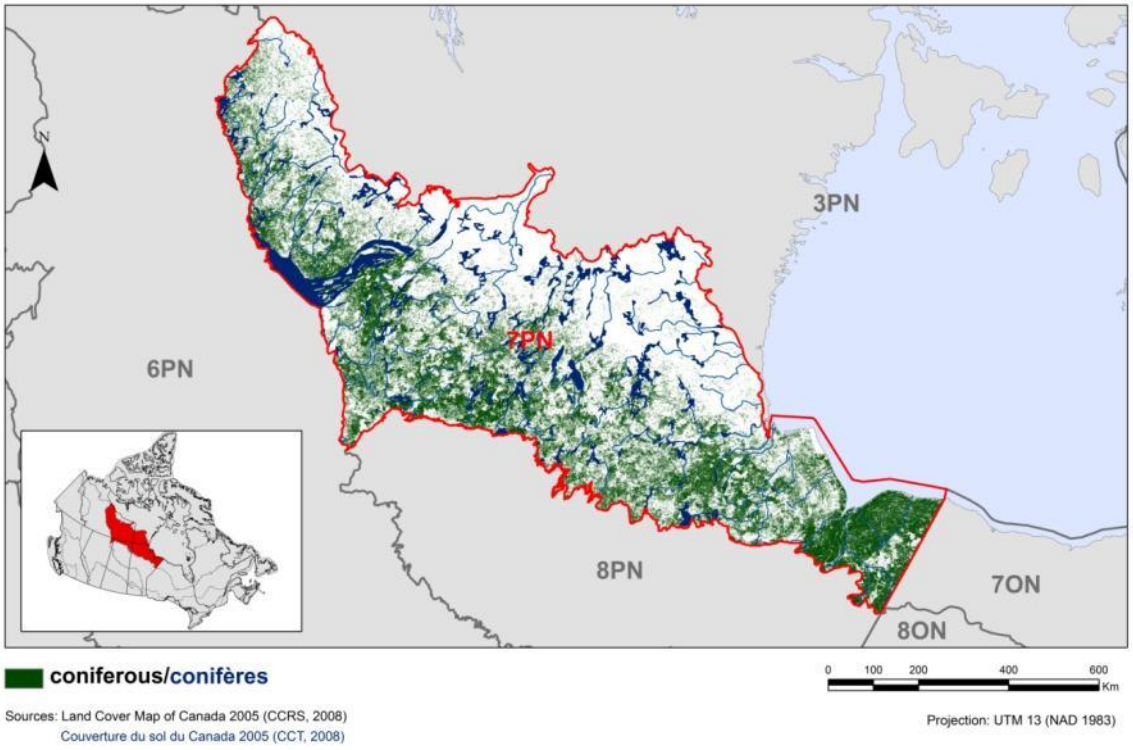

Figure 14. Coniferous land cover in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.

There are 16 priority species that use coniferous forests in BCR 7-PNR. Fourteen of these species, which are primarily landbirds, meet the criteria for provincial general status rank (Table 5).

Pollution and habitat alteration from the mining industry has a localized impact on coniferous habitats (Figure 16, 3.2 Mining and quarrying). Hydrology can be impacted by roads as well, which can have a direct effect on adjacent forests. Some fire suppression occurs near settlements or other human-valued features, but this is not likely to have a significant impact on the natural disturbance regime given the sparse population and infrastructure in the BCR. Local habitat effects from overabundant Lesser Snow Geese have the potential to impact some priority bird species in the subregion (8.2 Problematic native species). Contaminants from mines are also potential threats in this area (9.2 Industrial and military effluents). The indirect impacts of climate change may result in increased severity or frequency of natural disturbances (e.g., forest fires, insects). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

The primary threat to birds that utilize coniferous forest habitat is not directly linked to habitat loss within this BCR; rather, it has much to do with large scale factors (e.g., habitat supply outside the BCR, migration mortality, pesticide use, air-borne pollutants originating outside the BCR [9.5 Air-borne pollutants], and climate change) that are not fully understood. These are discussed in Section 3: Additional Issues.

Figure 15. Fire is an important and very active part of the landscape in BCR 7. This coniferous habitat at the western edge of the BCR was burnt in 2008 and would have quickly become preferred habitat for Black-backed Woodpeckers, a priority species that preferentially uses recent burns.

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

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Tree Sparrow	Taiga	Near bogs/lakes	Increase 50%		Yes	Yes		Yes
Black-backed Woodpecker	Old to old-growth; Recently disturbed	Dead/dying trees; Snags	Assess/Maintain			Yes		Yes
Blackpoll Warbler	Taiga		Assess/Maintain			Yes		
Bonaparte's Gull	Taiga	Islands	Assess/Maintain		Yes	Yes		
Boreal Chickadee	Boreal	Dead/dying trees; Snags	Assess/Maintain		Yes			Yes
Common Nighthawk	All types	Interspersed with bare ground	Recovery Objective	Yes	Yes			
Harris's Sparrow	Black/white spruce, tamarack		Increase 100%		Yes			Yes
Lesser Yellowlegs	All types near water		Assess/Maintain		Yes	Yes		
Northern Shrike	Taiga		Assess/Maintain			Yes		
Olive-sided Flycatcher	All types	Tall trees/snags	Recovery Objective	Yes	Yes			
Palm Warbler	Black spruce; tamarack		Assess/Maintain		Yes	Yes		
Pine Grosbeak	All types		Assess/Maintain		Yes	Yes		Yes
Rusty Blackbird	All types	Wetlands	Increase 100%	Yes	Yes	Yes		Yes
Short-billed Dowitcher	Boreal-tundra transition; black spruce		Assess/Maintain		Yes	Yes		
White-crowned Sparrow	All types		Assess/Maintain					Yes
White-throated Sparrow	All types		Assess/Maintain		Yes	Yes		Yes

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

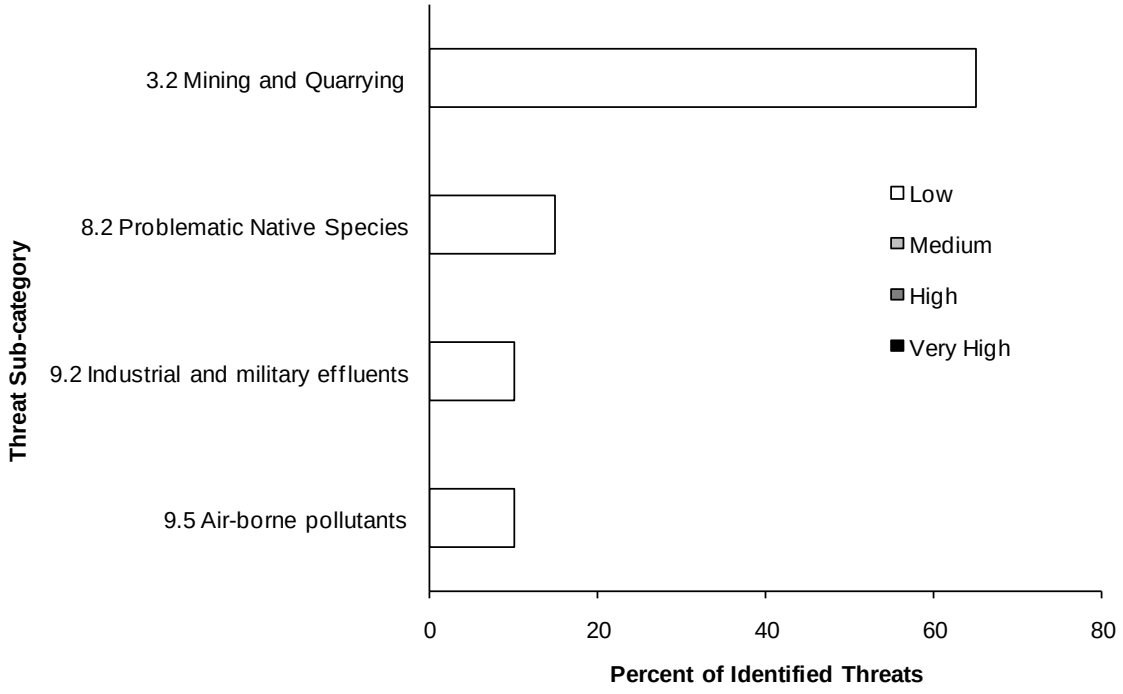

Figure 16. Percent of identified threats to priority species in coniferous forest in each threat sub-category.

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 (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Deciduous

Deciduous trees occur infrequently, although deciduous forest is sometimes found in small stands along coastal areas and at the southern edge of the Taiga Shield Ecozone. The areal extent of these forests is too small to be mapped from the 250 m resolution data used for figures for other habitats. Deciduous forests include pure balsam poplar stands associated with medium and large river flood plains along inland river systems, birch stands, and some limited aspen stands.

Seven priority species have associations with deciduous habitat, and of these most are landbirds, with the exception of one tree-nesting waterfowl species (Bufflehead). The primary reason for many of the birds being considered priority species is their provincial general status ranks (Table 6). The species listed utilize a range of deciduous forest sub-types based primarily on stand age. Early, mid-, and old-growth stands are all important stand types and should be maintained through the entire range in which deciduous stands are present. The lone waterfowl species listed requires medium-aged or old stands to produce trees large enough for woodpeckers that provide the nest holes and in close proximity to water bodies.

Similar to other habitats, pollution and habitat alteration from the mining industry has a localized impact (Figure 17; 3.2 Mining and quarrying). Hydrology can be impacted by roads as well, which can have a direct effect on adjacent forests. Some fire suppression occurs near settlements or other human-valued features, but this is not likely to have a significant impact on the natural disturbance regime given the sparse population and infrastructure in the BCR subregion. Overabundant ravens may be affecting the reproductive success of Bufflehead (8.2 Problematic native species), which is also susceptible to accumulation of heavy metals like selenium (9.2 Industrial and military effluents). The indirect impacts of climate change may result in increased severity or frequency of natural disturbances (e.g., forest fires, insects). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

The primary threat to birds that utilize deciduous forest habitat is not directly linked to habitat loss within BCR 7-PNR; rather, it has much to do with large-scale factors (e.g., habitat supply outside the BCR, migration mortality, pesticide use, air-borne pollutants originating outside the BCR, and climate change) that are not fully understood. These are discussed in Section 3: Additional Issues.

Table 6. Priority species that use deciduous habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
Bufflehead	Aspen/poplar; medium-aged or old	Abandoned Northern Flicker cavities	Assess/Maintain		Yes	Yes	Yes	
Eastern Phoebe	Young	Natural/man-made overhang for nest site	Assess/Maintain					Yes
Greater Yellowlegs	Young; burned over areas	Wetland nearby	Assess/Maintain		Yes			
Harris's Sparrow	All types	Streams/ravines nearby	Increase 100%		Yes			Yes
Lesser Yellowlegs	All types near water		Assess/Maintain		Yes	Yes		
Pine Grosbeak	Mountain ash; ash; maple		Assess/Maintain		Yes	Yes		Yes
White-throated Sparrow	All types		Assess/Maintain		Yes	Yes		Yes

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

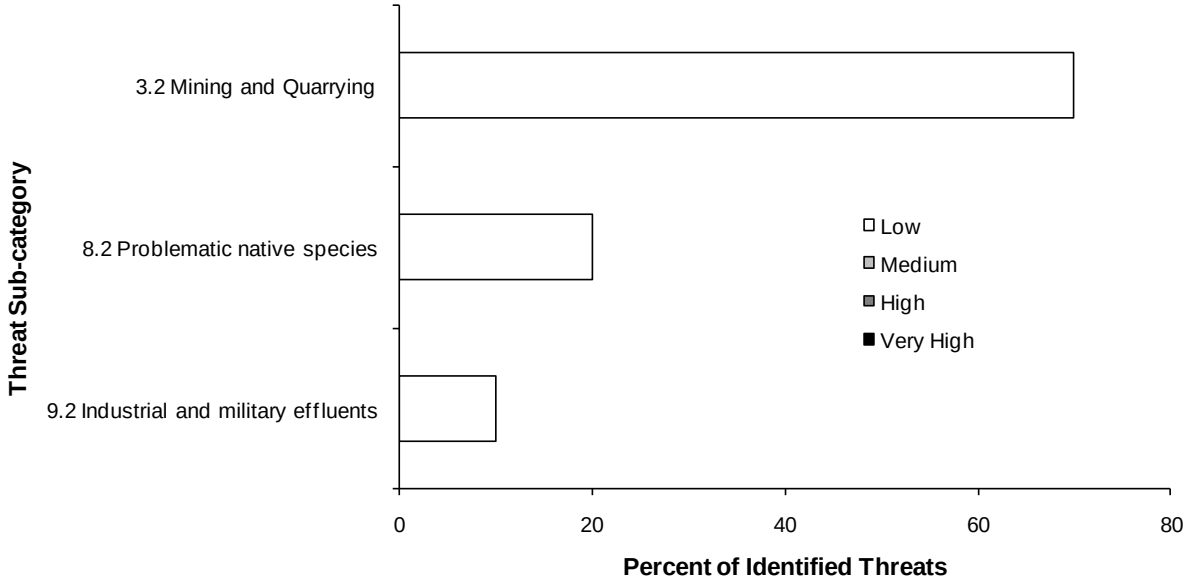

Figure 17. Percent of identified threats to priority species in deciduous forest in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in deciduous habitat (for example, if 137 threats were identified in total for all priority species in deciduous habitat, and 14 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 deciduous habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Mixed Wood

Mixed wood habitats occur throughout BCR 7-PNR, typically dispersed within more extensive coniferous forest wherever disturbance, climate, or soils have allowed a deciduous component to develop. These forests primarily occur in the southern part of the BCR subregion (Figure 18). Nine priority species have been identified as using mixed wood habitats (Table 7).

Pollution and habitat alteration from the mining industry has a localized impact on mixed wood habitats (Figure 19; 3.2 Mining and quarrying). Hydrology can be impacted by roads as well, which can have a direct effect on adjacent forests. Overabundant Snow Goose populations are a potential threat to habitat used by American Black Ducks nesting in the same area (8.2 Problematic native species). As these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

The primary threat to birds that utilize mixed forest habitat is not directly linked to habitat loss within this BCR subregion; rather, it has much to do with large-scale factors (e.g., habitat supply outside the BCR, migration mortality, pesticide use, air-borne pollutants originating outside the BCR, and climate change) that are not fully understood. These are discussed in Section 3: Additional Issues.

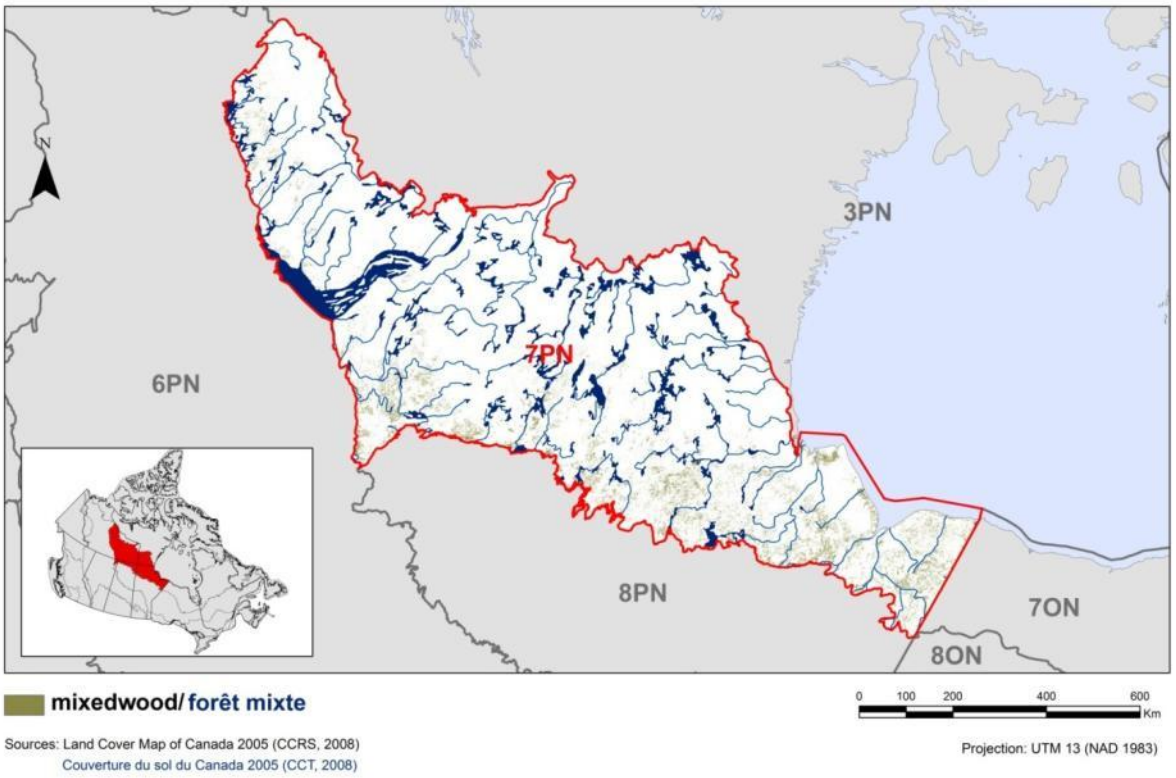

Figure 18. Mixed wood forest land cover in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.

Table 7. Priority species that use mixed wood habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Black Duck	All types	Islands	Assess/Maintain		Yes		Yes	
Blackpoll Warbler	Conifer-dominated		Assess/Maintain			Yes		
Boreal Chickadee	Old-growth	Dead/dying trees; Snags	Assess/Maintain			Yes		Yes
Lesser Yellowlegs	All types near water		Assess/Maintain		Yes	Yes		
Merlin	All types	Abandoned nests of other species	Assess/Maintain			Yes		
Olive-sided Flycatcher	Old-growth conifer-dominated	Tall prominent trees/snags; openings	Recovery Objective	Yes	Yes			
Smith's Longspur	Tundra-forest transition		Assess/Maintain		Yes	Yes		
White-crowned Sparrow	All types		Assess/Maintain					Yes
White-throated Sparrow	All types		Assess/Maintain		Yes	Yes		Yes

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

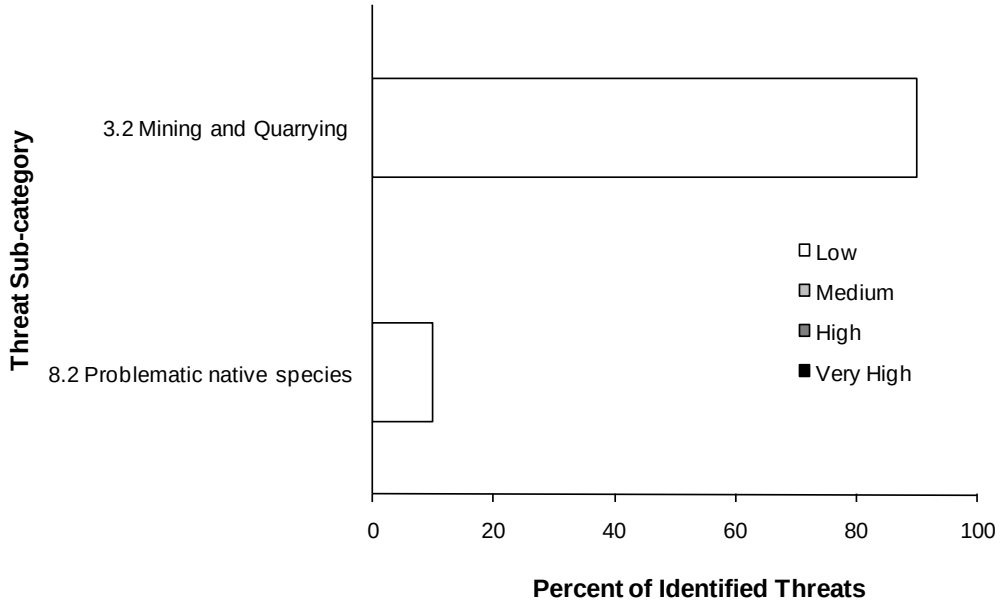

Figure 19. Percent of identified threats to priority species in mixed wood forest in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in mixed wood habitat (for example, if 100 threats were identified in total for all priority species in mixed wood habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (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 mixed wood habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Shrub/Early Successional

The shrub and early successional habitat class covers areas where vegetation is shrubby due to successional stage, such as patches of forest where disturbance has removed the tree cover (Figure 20). Shrub habitat also persists in saturated areas where there is little open water. Twenty-one priority species in BCR 7-PNR are associated with this habitat class. Many of the priority species are waterbirds or shorebirds associated with shrub habitats that exist near waterbodies within riparian areas. Sixteen of these species also meet conservation criteria for their bird group (Table 8).

Early successional forest habitat is fairly common in BCR 7-PNR, primarily due to a large proportion of the land base consisting of bogs, ponds, and wetlands, which allows large riparian areas to flourish. Regular, extensive fires in the western portion of the BCR would also create this early seral stage habitat (fire return intervals are < 125 years typically). Climate change impacts upon shallow waterbodies may increase evaporation, creating opportunities for shrub encroachment into saturated soils previously occupied by wetlands (Riordan et al. 2006). The shrub and early successional habitat type is lost as young forests develop.

Habitat alteration from the mining industry has a localized impact on shrubby habitats (Figure 21; 3.2 Mining and quarrying), with impacts from heavy metal contamination also possible (9.2 Industrial and military effluents). Overabundant Snow Goose populations are a potential threat to habitat used by several priority species nesting in the same area (8.2 Problematic native species). American Wigeon is sensitive to disturbance by humans (6.1 Recreational activities). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

The primary threat to birds that utilize this habitat is not directly linked to habitat loss within this BCR; rather, it has much to do with large-scale factors (e.g., habitat supply outside the BCR, migration mortality, pesticide use, air-borne pollutants originating outside the BCR, and climate change) that are not fully understood. These are discussed in Section 3: Additional Issues.

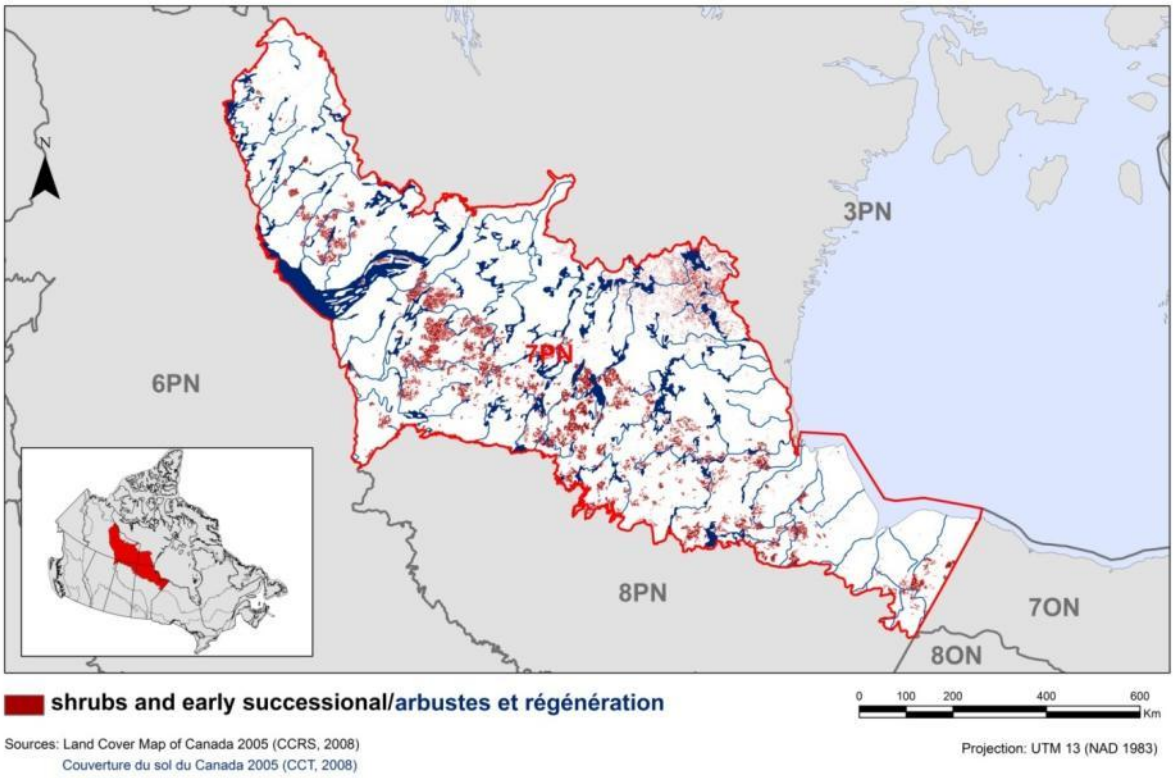

Figure 20. Shrubs and early successional land cover in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.

The fire data mapped in Figure 5 could also be used to produce a finer resolution map of early successional habitats specific to fire regeneration.

Table 8. Priority species that use shrub/early successional habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Golden-Plover	Shrubs		Assess/Maintain		Yes	Yes		
American Pipit	Shrubs		Assess/Maintain					Yes
American Tree Sparrow	Thicket		Increase 50%		Yes	Yes		Yes
American Wigeon	Shrubs		Assess/Maintain		Yes		Yes	Yes
Blackpoll Warbler	Thicket		Assess/Maintain			Yes		
Canada Goose	Thicket		Assess/Maintain		Yes		Yes	
Eastern Phoebe	Shrubland	Natural or man-made overhang for nest site	Assess/Maintain					Yes
Greater Yellowlegs	Shrubs		Assess/Maintain		Yes			Yes
Harris's Sparrow	Shrubs		Increase 100%		Yes			
Lesser Scaup	Thicket		Increase 50%		Yes	Yes	Yes	
Lesser Snow Goose	Shrubs		Decrease		Yes		Yes	
Long-tailed Duck	Shrubs		Increase 50%		Yes	Yes	Yes	
Northern Shrike	Shrubs		Assess/Maintain			Yes		
Olive-sided Flycatcher	Shrubland	Tall prominent trees/snags; openings	Recovery Objective	Yes	Yes			
Semipalmated Sandpiper	Shrubs		Increase 100%		Yes	Yes		
Solitary Sandpiper	Shrubs; shrubland		Assess/Maintain		Yes			
Surf Scoter	Thicket		Assess/Maintain		Yes	Yes	Yes	
White-crowned Sparrow	Shrubs		Assess/Maintain					Yes
White-throated Sparrow	Shrubland		Assess/Maintain		Yes	Yes		Yes
White-winged Scoter	Thicket	Islands	Increase 50%	Yes	Yes	Yes	Yes	
Wilson's Snipe	All types near water		Assess/Maintain		Yes			

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

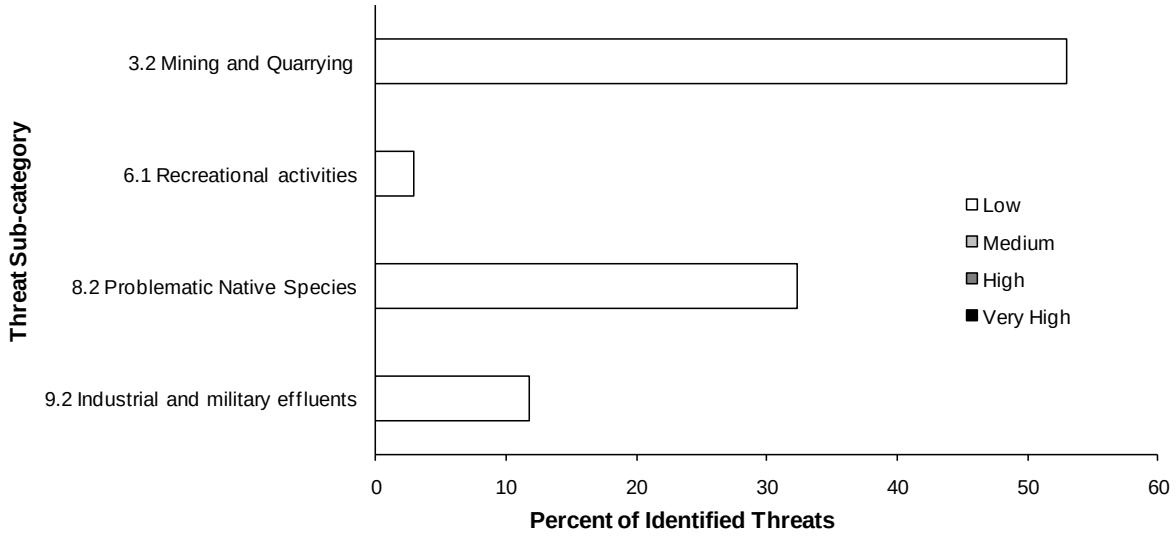

Figure 21. Percent of identified threats to priority species in shrub/early successional habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in shrub/early successional habitat (for example, if 100 threats were identified in total for all priority species in shrub/early successional habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (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 shrub/early successional habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Herbaceous

The herbaceous habitat class typically includes both native grassland and pastureland but represents tundra/treeless areas farther north. For BCR 7-PNR this habitat class predominantly shows the distribution of non- or sparsely-treed herbaceous cover in the northern third of the BCR (Ecosystem Classification Group, 2008 and Figure 22). Naturally occurring grasslands in BCR 7-PNR have historically been found only in very small portions along the Hudson Bay. The 11 priority species that use herbaceous habitats in BCR 7-PNR are associated with water (Table 9).

High populations of Lesser Snow Geese may have a large impact on food and habitat resource allocation to some priority species using the same habitats (as discussed in other sections of this strategy) (Figure 23; 8.2 Problematic native species). The population objective for Lesser Snow Geese is to decrease population size that would reduce habitat impacts and potentially allow for recovery where damage has not been irreversible. Habitat alteration from the mining industry has a localized impact on herbaceous habitats (3.2 Mining and quarrying), with impacts from heavy metal contamination also possible (9.2 Industrial and military effluents). American Wigeon and White-winged Scoter are sensitive to disturbance by humans (6.1 Recreational activities). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

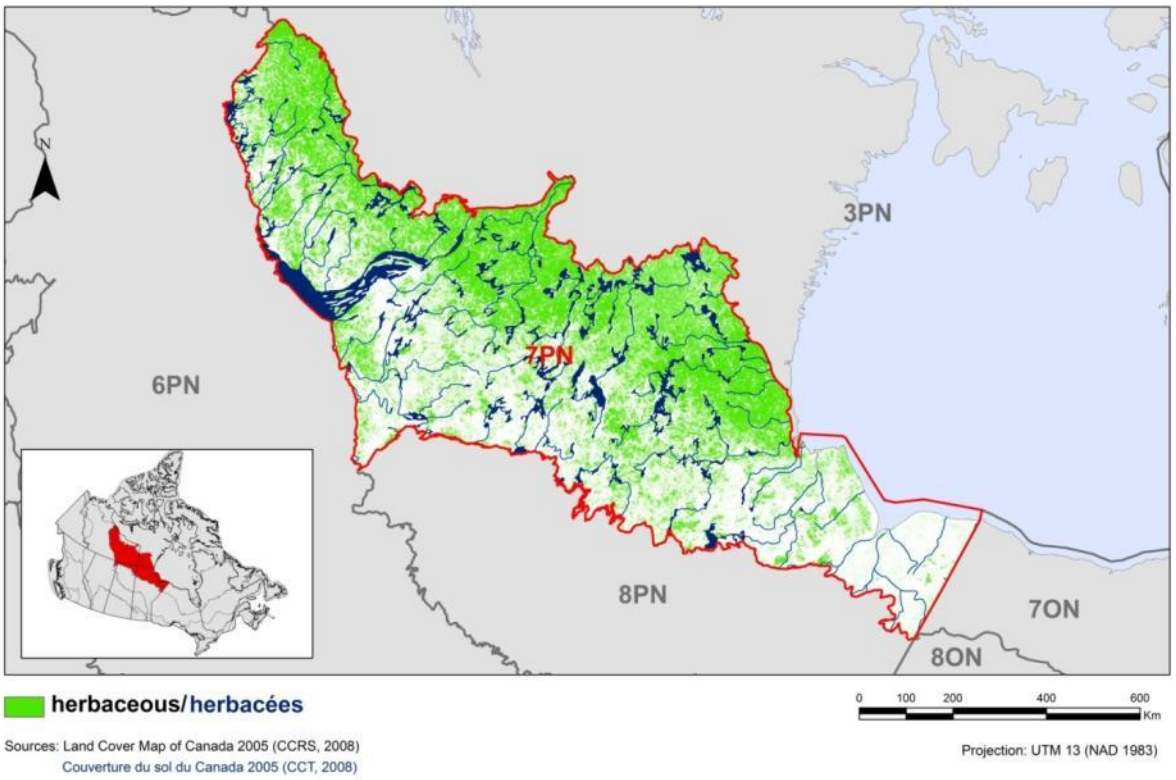

Figure 22. Herbaceous land cover in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.
Most of the mapped area represents low growing shrubs/tundra interspersed with sparse trees (compare this to Figure 14).

Table 9. Priority species that use herbaceous habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Bittern	Native grassland	Emergent vegetation	Assess/Maintain		Yes			
American Golden-Plover	Subarctic tundra		Assess/Maintain		Yes	Yes		
American Pipit	Wet and dry meadows		Assess/Maintain					Yes
American Wigeon	Wet meadow		Assess/Maintain		Yes		Yes	Yes
Canada Goose	Wet meadow		Assess/Maintain		Yes		Yes	
Killdeer	Native grassland		Increase 50%		Yes			
Lesser Snow Goose	Low tundra		Decrease		Yes		Yes	
Semipalmated Sandpiper	Tundra		Increase 100%		Yes	Yes		
Short-eared Owl	Open grasslands		Increase 100%	Yes	Yes			Yes
Surf Scoter	Wet meadow		Assess/Maintain		Yes	Yes	Yes	
White-winged Scoter	Wet meadow	Islands	Increase 50%	Yes	Yes	Yes	Yes	

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

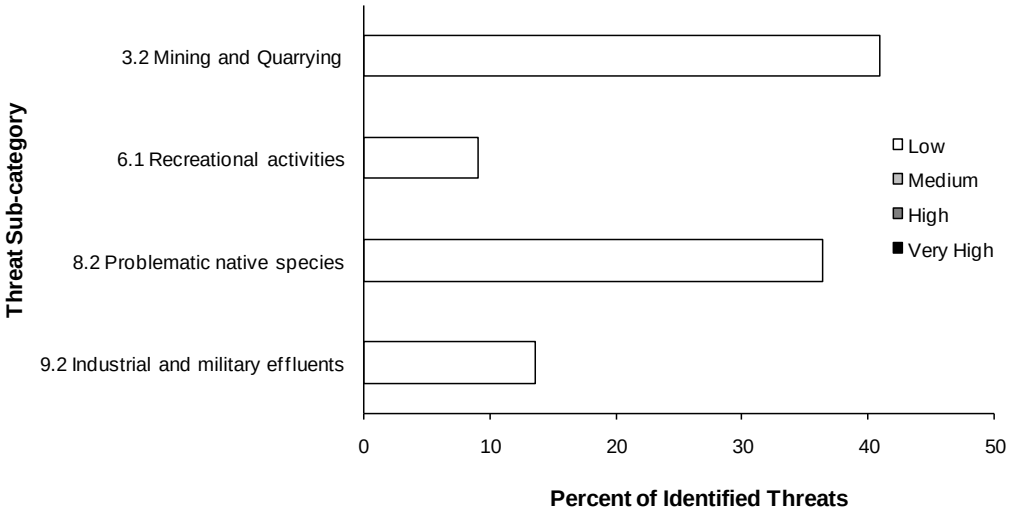

Figure 23. Percent of identified threats to priority species in herbaceous habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in herbaceous habitat (for example, if 100 threats were identified in total for all priority species in herbaceous habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (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 herbaceous habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Urban

Artificial surfaces and urban areas cover a very small area within BCR 7-PNR, given that the level of human activity is low. This habitat class is not visible on the land cover classification shown in other habitat types except for two small areas (Yellowknife and Churchill). However, this habitat is present in all communities in the BCR. Table 10 contains the list of 11 priority birds that use this habitat, including Barn Swallow (Figure 24).

Figure 24. Barn Swallows have been assessed by COSEWIC as Threatened in Canada. They benefit from nesting locations in buildings or under man-made overhangs.
© Environment Canada – Photo: Craig Machtans

Species may utilize vertical structures or bare ground created by human activity or construction, as well as parks and lawns in the handful of populated areas in the BCR. Two threats were identified for this habitat (Figure 25): contamination from chemicals and heavy metals (9.2 Industrial and military effluents) and ingestion of garbage and plastics (9.4 Garbage and solid waste). Human-wildlife conflicts regarding nesting sites in urban and industrial areas could be avoided using deterrents or creating alternate nest areas (e.g., nest boxes). Issues facing the 11 species utilizing urban and industrial structures can be managed through public education initiatives to prevent or assist in minimizing species harassment. As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

Table 10. Priority species that use urban habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
Barn Swallow	Structures with overhangs	Protected overhangs or open buildings	Increase 50%	Yes				
Belted Kingfisher	Vertical banks	Vertical earth exposures for nesting burrows	Assess/Maintain			Yes		
California Gull	Landfills/dumps	Islands	Assess/Maintain		Yes			
Canada Goose	Lawns, parks		Assess/Maintain		Yes		Yes	
Common Nighthawk	Gravel roofs, airports, mines	Open ground	Recovery Objective	Yes	Yes			
Eastern Phoebe	Structures with overhangs	Natural/man-made overhang for nest site	Assess/Maintain					Yes
Herring Gull	Dumps; parking lots; runways; rooftops	Islands	Assess/Maintain		Yes	Yes		
Killdeer	Construction sites; roads/ driveways/parking lots; rooftops		Increase 50%		Yes			
Merlin	Parks		Assess/Maintain			Yes		
Northern Shrike	Parks		Assess/Maintain			Yes		
Peregrine Falcon	Artificial cliffs such as quarries and buildings; parks	Cliffs/ledges	Assess/Maintain	Yes		Yes		

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

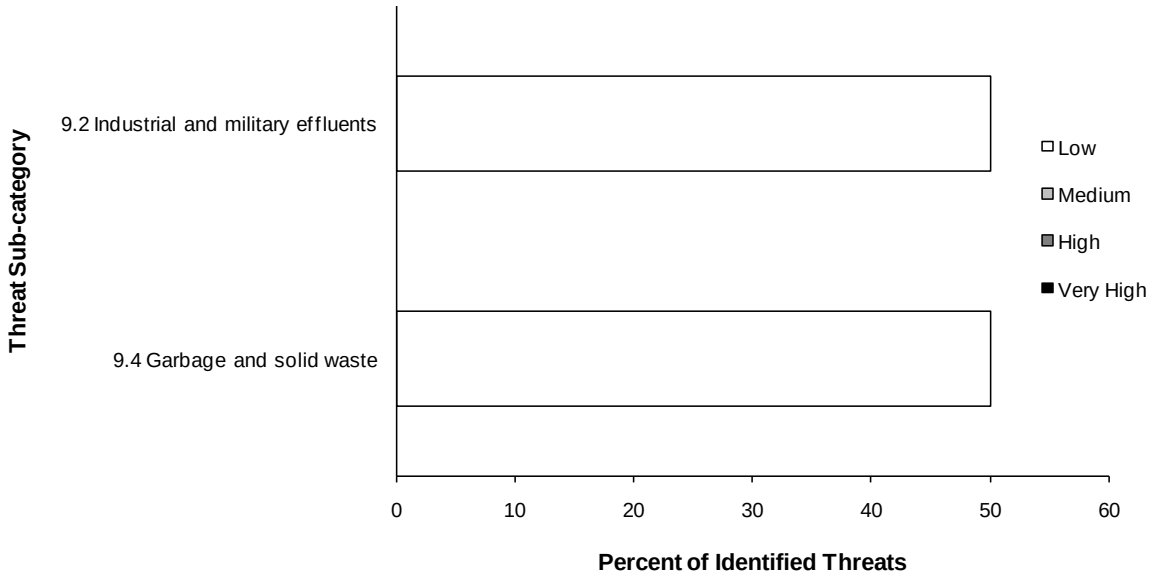

Figure 25. Percent of identified threats to priority species in urban habitat in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in urban habitat (for example, if 100 threats were identified in total for all priority species in urban habitat, and 10 of those threats were in the category 1.1 Housing & urban areas, the bar on the graph would represent this as 10%). The bars are divided to show the distribution of Low (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 urban habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Wetlands

BCR 7-PNR contains one of the largest intact wetland complexes in the world (Figure 27), the Hudson Bay Lowland (Glooschenko et al. 1994, Abraham and Keddy 2005). Peat hummocks, rocky islands and Hudson Bay coasts in the east provide a diversity of microhabitats throughout the region. The stretch of tidal flats along the coast of the Hudson Bay coupled with the inland bog peatlands and freshwater lakes create a massive saturated wetland habitat that is vital for resident and migratory species alike. Almost three-quarters of all priority species are listed as using wetland habitats in BCR 7-PNR due to the predominance of this habitat class. Most of the 45 priority species are listed due to their priority status in their bird group plans provincial and/or general status ranks (Other column, see also Table 1, footnote 6), although four are also federally listed as at risk under SARA (Table 11).

Species in these habitats face threats from climate change, which creates large variation in seasonal temperature, sea level, and precipitation. Forms of resource limitations may be impacting some of these species due to large populations of Snow Geese that inhabit these areas seasonally. Large overpopulations of geese can limit food resources for other species (Figure 29; 8.2 Problematic native species), and may be having irreversible or long-term effects on some types of wetland habitat in the region (Figure 28). Habitat alteration from the mining industry has a localized impact on wetland habitats (3.2 Mining and quarrying), with effects from heavy metal contamination also possible (9.2 Industrial and military effluents). Several wetland priority species are sensitive to disturbance by humans (6.1 Recreational activities). There are also potential threats to the Rusty Blackbird, a species at risk, from acid precipitation (9.5 Air-borne pollutants) and to California Gull from ingestion of or entanglement in plastics (9.4 Garbage and solid waste). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

Figure 26. Rusty Blackbirds use wetlands associated with black spruce forests for nesting and foraging. Reasons for their decline are still unclear.
© Environment Canada – Photo: Craig Machtans

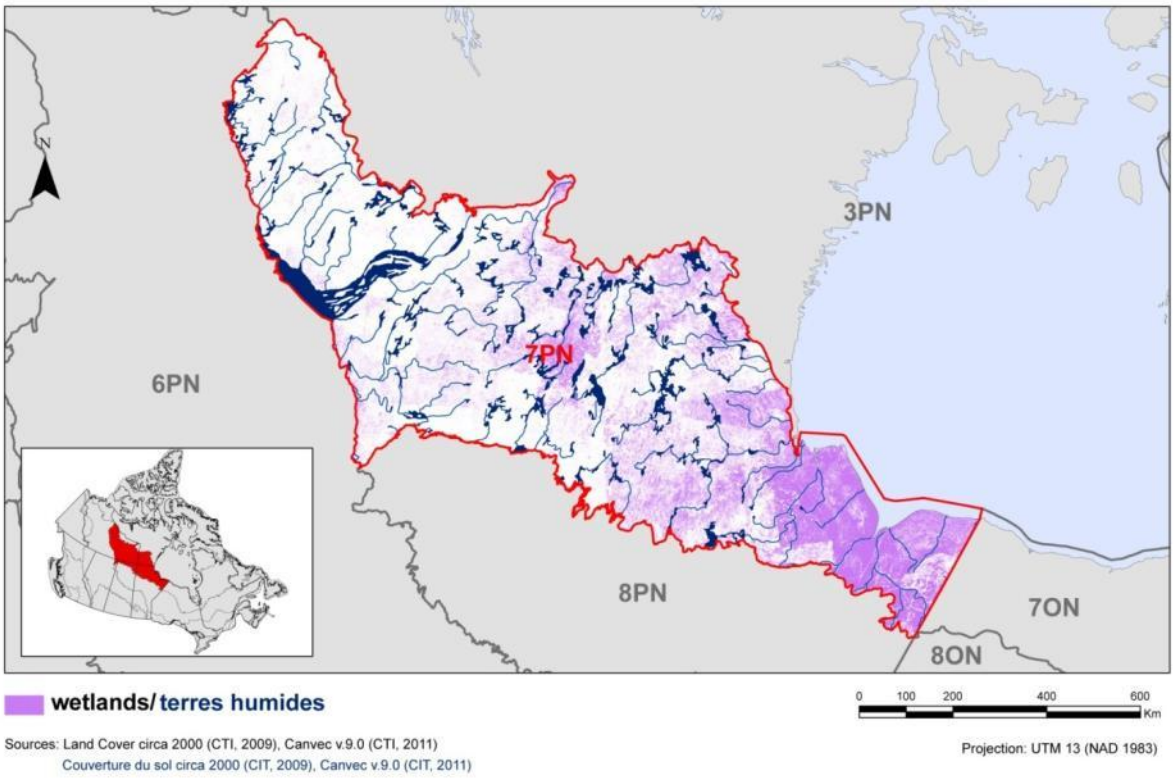

Figure 27. Wetlands in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing and other data. Many more small wetlands are present in the BCR but are not visible at this scale.

Figure 28. Vegetation that has been protected from grazing by geese in the La Perouse Bay area of Manitoba. This image provides a startling example of the severity of habitat degradation from overabundant geese. © Ken Abraham

Table 11. Priority species that use wetlands, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Bittern	Marsh; shallow water	Emergent vegetation	Assess/Maintain		Yes			
American Black Duck	Shallow Water; bog; swamp	Islands	Assess/Maintain		Yes		Yes	
American Wigeon	Marsh; shallow water		Assess/Maintain		Yes		Yes	Yes
Arctic Tern	Marsh	Islands	Increase 50%		Yes	Yes		
Barn Swallow	Open areas for feeding		Increase 50%	Yes				
Bonaparte's Gull	Bog; Marsh	Islands	Assess/Maintain		Yes	Yes		
Bufflehead	Marsh	Abandoned Northern Flicker cavities	Assess/Maintain		Yes	Yes	Yes	
California Gull	Bog	Islands	Assess/Maintain		Yes			
Canada Goose	Marsh		Assess/Maintain		Yes		Yes	
Common Loon	Bog; Marsh		Assess/Maintain		Yes	Yes		
Common Nighthawk	Bog	Open ground	Recovery Objective	Yes	Yes			
Common Tern	Marsh	Islands	Assess/Maintain		Yes			
Dunlin	Fen		Assess/Maintain		Yes			
Greater Scaup	Marsh		Assess/Maintain					Yes
Greater Yellowlegs	Bog; Marsh		Assess/Maintain		Yes			
Harris's Sparrow	Bog		Increase 100%		Yes			Yes
Horned Grebe	Shallow Water		Increase 50%	Yes	Yes	Yes		
Hudsonian Godwit	Fen; bog; marsh; shallow water		Assess/Maintain		Yes	Yes		
Lesser Scaup	Marsh; shallow water		Increase 50%		Yes	Yes	Yes	
Lesser Snow Goose	Marsh		Decrease		Yes		Yes	
Lesser Yellowlegs	Marsh		Assess/Maintain		Yes	Yes		
Little Gull	Marsh		Assess/Maintain		Yes			Yes
Long-tailed Duck	Shallow Water		Increase 50%		Yes	Yes	Yes	
Northern Pintail	Marsh; shallow water		Increase 50%		Yes	Yes	Yes	Yes
Olive-sided Flycatcher	Bog	Tall prominent trees/snags;	Recovery Objective	Yes	Yes			

Table 11 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
		openings						
Pacific Loon	Marsh; shallow water	Islands	Assess/Maintain		Yes	Yes		
Palm Warbler	Fen		Assess/Maintain		Yes	Yes		
Peregrine Falcon	All types	Cliffs/ledges	Assess/Maintain	Yes		Yes		
Red-necked Phalarope	Fen		Increase 50%		Yes			
Red-throated Loon	Bog; shallow water	Islands	Assess/Maintain					Yes
Ross's Gull	Fen; shallow water		Recovery Objective	Yes	Yes			
Rusty Blackbird	Bog		Increase 100%	Yes	Yes	Yes		
Semipalmated Sandpiper	Fen		Increase 100%		Yes	Yes		
Short-billed Dowitcher	Marsh; bog; fen		Assess/Maintain		Yes	Yes		
Short-eared Owl	Marsh; bog	Open areas; prey availability	Increase 100%	Yes	Yes			Yes
Smith's Longspur	Marsh; fen		Assess/Maintain		Yes	Yes		
Solitary Sandpiper	Bog		Assess/Maintain		Yes			
Sora	Marsh		Assess/Maintain		Yes	Yes		
Swamp Sparrow	Bog; marsh; fen		Assess/Maintain		Yes	Yes		
Whimbrel	Fen; bog		Assess/Maintain		Yes	Yes		
White-crowned Sparrow	Bog		Assess/Maintain					Yes
White-throated Sparrow			Assess/Maintain		Yes	Yes		Yes
White-winged Scoter	Shallow Water	Islands	Increase 50%	Yes	Yes	Yes	Yes	
Wilson’s Snipe	Marsh		Assess/Maintain		Yes			
Yellow Rail	Marsh; bog; shallow water		Maintain Current	Yes	Yes			

Note: Reasons for inclusion in the priority species list are as follows:
“At Risk”: the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; “CC”: the species meets conservation concern criteria for its bird group; “S”: the species meets stewardship criteria for its bird group; “NAWMP”: the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest in the BCR; “Other”: expert input or General Status rank as described in Table 1.

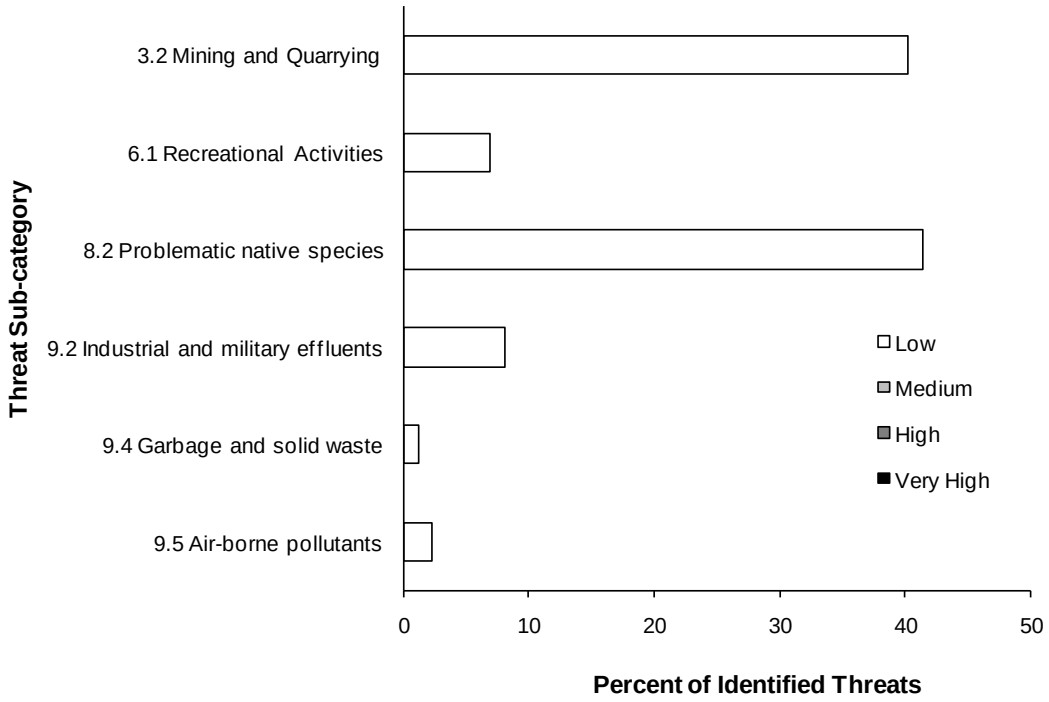

Figure 29. Percent of identified threats to priority species in wetlands in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in wetland habitat (for example, if 100 threats were identified in total for all priority species in wetland 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 wetland habitat is shown at the end of each bar (also presented in Table 5 Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Waterbodies, Snow and Ice

Waterbodies include standing and flowing water contained in rivers, lakes, man-made reservoirs, and large ponds. Waterbodies are ubiquitous in most of the BCR subregion (Figure 30). This habitat type also includes the Hudson Bay marine ecosystem and offshore coastal areas; the coastal habitat type in the next section refers to the terrestrial component of the coastal habitat, not the water component. Twenty-nine priority species in BCR 7-PNR use waterbodies (Table 12). Riparian vegetation zones that exist along the periphery of aquatic habitats are an important component of waterbodies. A diversity of waterbody types sustains differing communities of invertebrates and vegetation important to the bird species in these areas.

Large overpopulations of geese can limit food resources for other species (8.2 Problematic native species), and may be having irreversible or long-term effects on some types of wetland habitat in the region (Figure 28). Habitat alteration from the mining industry has a localized impact on wetland habitats (3.2 Mining and quarrying), with effects from heavy metal contamination also possible (9.2 Industrial and military effluents). Several priority species associated with waterbodies are sensitive to disturbance by humans (6.1 Recreational activities). There are also potential threats to California and Herring Gulls from ingestion of garbage or entanglement in plastics (9.4 Garbage and solid waste). Impacts to water bodies at this time are minimal because of the lack of industry and human population in the region. As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed. Changing climate may also have long-term impacts on a variety of waterbodies and surrounding habitat in the future as has been observed in Alaska (Klein et al. 2005, Riordan et al. 2006).

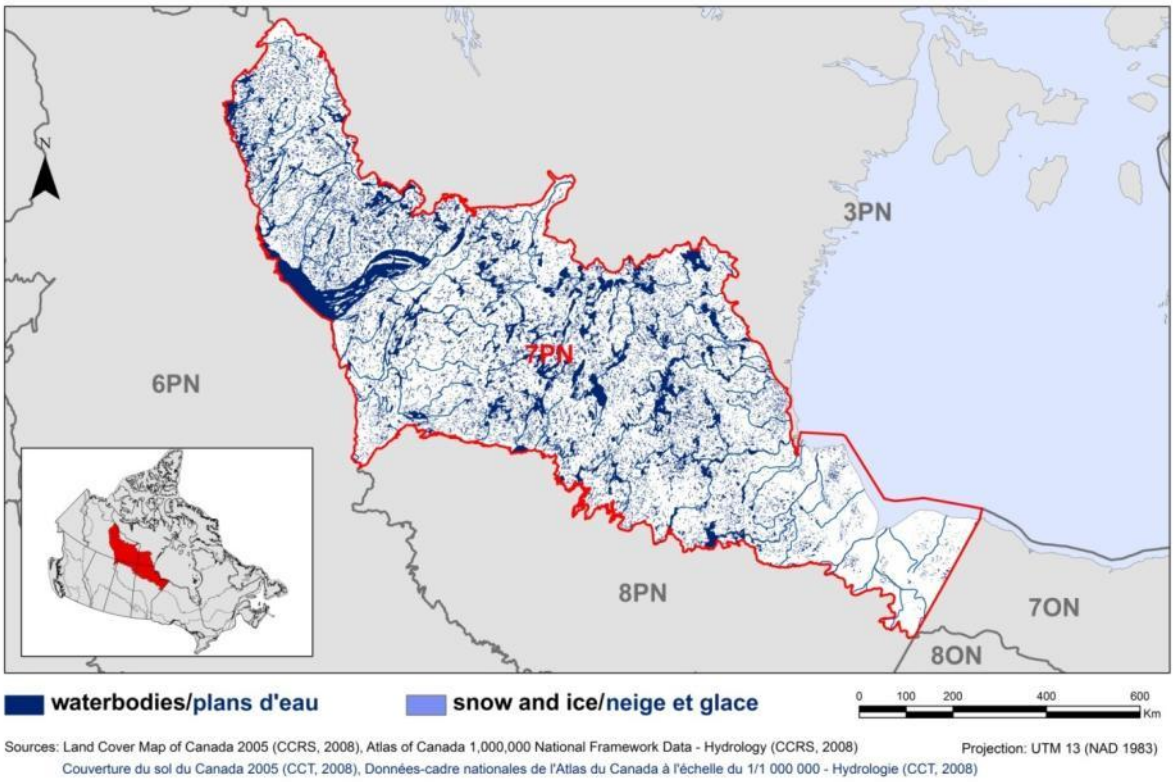

Figure 30. Waterbodies in BCR 7- Prairie and Northern Region.
Even at this coarse scale it is apparent that waterbodies are ubiquitous across most of the BCR, a common feature of landscapes of the Canadian Shield.

Table 12. Priority species that use waterbodies, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Black Duck	Perennial pond/small lake	Islands	Assess/Maintain		Yes		Yes	
American Wigeon	Pond/small lake		Assess/Maintain		Yes		Yes	Yes
Arctic Tern	Perennial river/stream	Islands	Increase 50%		Yes	Yes		
Belted Kingfisher	Perennial river/pond/small lake	Vertical earth exposures for nesting burrows	Assess/Maintain			Yes		
Black Scoter	Perennial large lake		Increase 50%		Yes	Yes	Yes	
Bonaparte's Gull	All types	Islands	Assess/Maintain		Yes	Yes		
Bufflehead	Perennial pond/small lake	Abandoned Northern Flicker cavities	Assess/Maintain		Yes	Yes	Yes	
California Gull	Perennial river/large lake	Islands	Assess/Maintain		Yes			
Canada Goose	Perennial pond/small lake; artificial waterbody		Assess/Maintain		Yes		Yes	
Caspian Tern	Perennial large lake	large lakes with small islands and/or pebbly, sandy shores	Assess/Maintain		Yes			Yes
Common Eider	Ocean	Coastal islands	Increase 50%		Yes	Yes	Yes	
Common Loon	Perennial large lake		Assess/Maintain		Yes	Yes		
Common Tern	Perennial pond/small lake	Islands	Assess/Maintain		Yes			
Dunlin	Pond/small lake		Assess/Maintain		Yes			
Greater Scaup	Perennial large lake		Assess/Maintain					Yes
Greater Yellowlegs	Perennial pond/small lake		Assess/Maintain		Yes			Yes
Herring Gull	Perennial large lake	Islands	Assess/Maintain		Yes	Yes		
Horned Grebe	Perennial pond/small lake; artificial waterbody		Increase 50%	Yes	Yes	Yes		
Lesser Scaup	Perennial large lake; non-perennial pond/small lake		Increase 50%		Yes	Yes	Yes	
Long-tailed Duck	Perennial stream		Increase 50%		Yes	Yes	Yes	
Pacific Loon	Perennial stream/large lake	Islands	Assess/Maintain		Yes	Yes		
Red-necked Phalarope	Perennial pond/small lake		Increase 50%		Yes			

Table 12 continued

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
Red-throated Loon	Perennial pond/small lake	Islands	Assess/Maintain					Yes
Semipalmated Sandpiper	Perennial pond/small lake		Increase 100%		Yes	Yes		
Solitary Sandpiper	Perennial pond/small lake	Shallow open water near conifer	Assess/Maintain		Yes			
Sora	Non-perennial pond/small lake		Assess/Maintain		Yes	Yes		
Surf Scoter	Perennial large lake		Assess/Maintain		Yes	Yes	Yes	
White-winged Scoter	Perennial large lake	Islands	Increase 50%	Yes	Yes	Yes	Yes	
Wilson's Snipe	Perennial pond/small lake		Assess/Maintain		Yes			

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

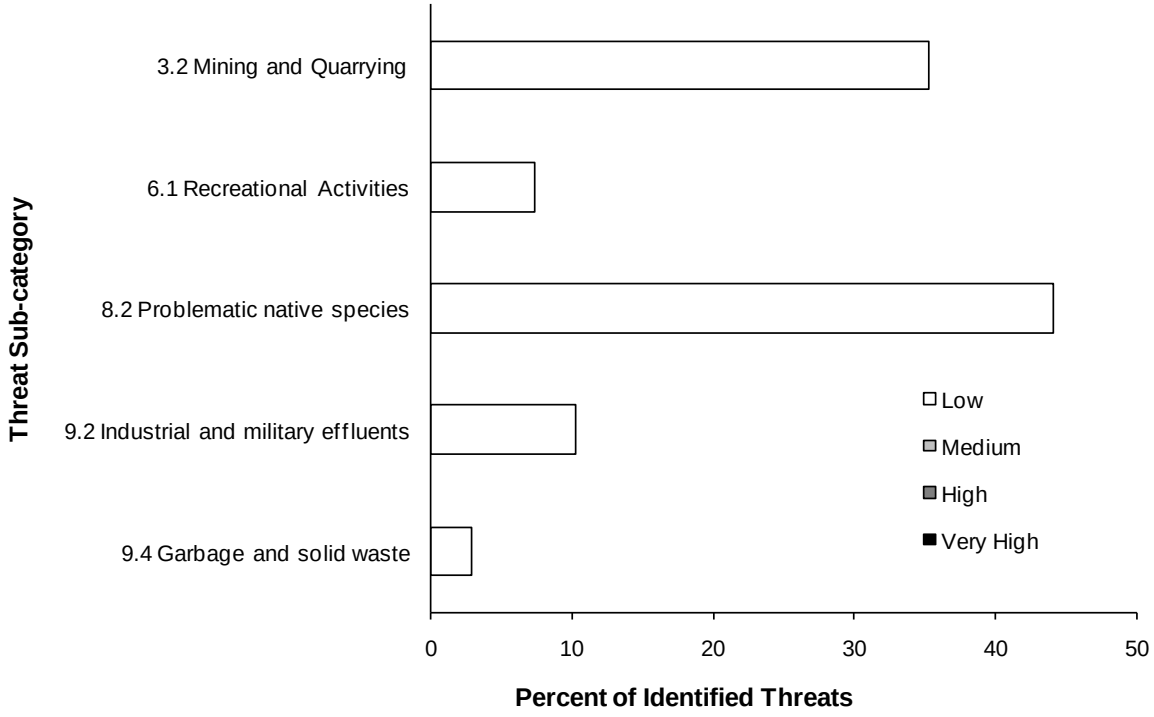

Figure 31. Percent of identified threats to priority species in waterbodies in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in waterbodies (for example, if 100 threats were identified in total for all priority species 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 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 waterbodies is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Coastal

The only coastal habitat in the BCR is along the western portion of Hudson Bay in Manitoba (no map is available). Though many species use the areas near or on the coast (see Waterbodies section above), only Common Eider was specifically classified as using coastal habitat given its specific need for marine environments for feeding coupled with terrestrial habitat for nesting. Table 13 provides its habitat requirements in this class. The only identified threat is habitat destruction from Snow Geese (no chart shown – 8.2 Problematic native species, rated as low). As discussed in previous sections and Element 4: Threat Assessment for Priority Species, large overpopulations of geese can limit food resources for other species, and may be having irreversible or long-term effects on coastal habitat in the region. Because this is a low magnitude threat, conservation objectives and recommended actions have not been developed.

Table 13. Priority species that use coastal habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
Common Eider	Islands, Bare area (rock and sand)	gravel and rocky substrates on nesting islands	Increase 50%		Yes	Yes	Yes	

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

Lichen/Moss

Moss and lichen are an integral part of the vegetative community within BCR 7-PNR. Wetland bog complexes, dominated by sphagnum moss and stunted black spruce, exist throughout BCR 7-PNR, particularly in the Hudson Plains Ecozone but extending outwards into the permafrost peatland soils of the north (Figure 32). Such habitats may be important to species within BCR 7-PNR as nesting substrate adjacent to water, as well as in open areas. Four priority species use this habitat (Table 14).

Threats to this habitat are relatively small given the low density of both human settlements and industrial activity, but two were identified (Figure 33). Large overpopulations of geese can limit food resources for other species (8.2 Problematic native species), and may be having irreversible or long-term effects on some types of wetland habitat in the region. Habitat alteration from the mining industry has a localized impact on lichen and moss habitats (3.2 Mining and quarrying). As these are both low magnitude threats, conservation objectives and recommended actions have not been developed. Climate warming is likely the principal threat to habitat modification at this time (see Section 3: Additional Issues).

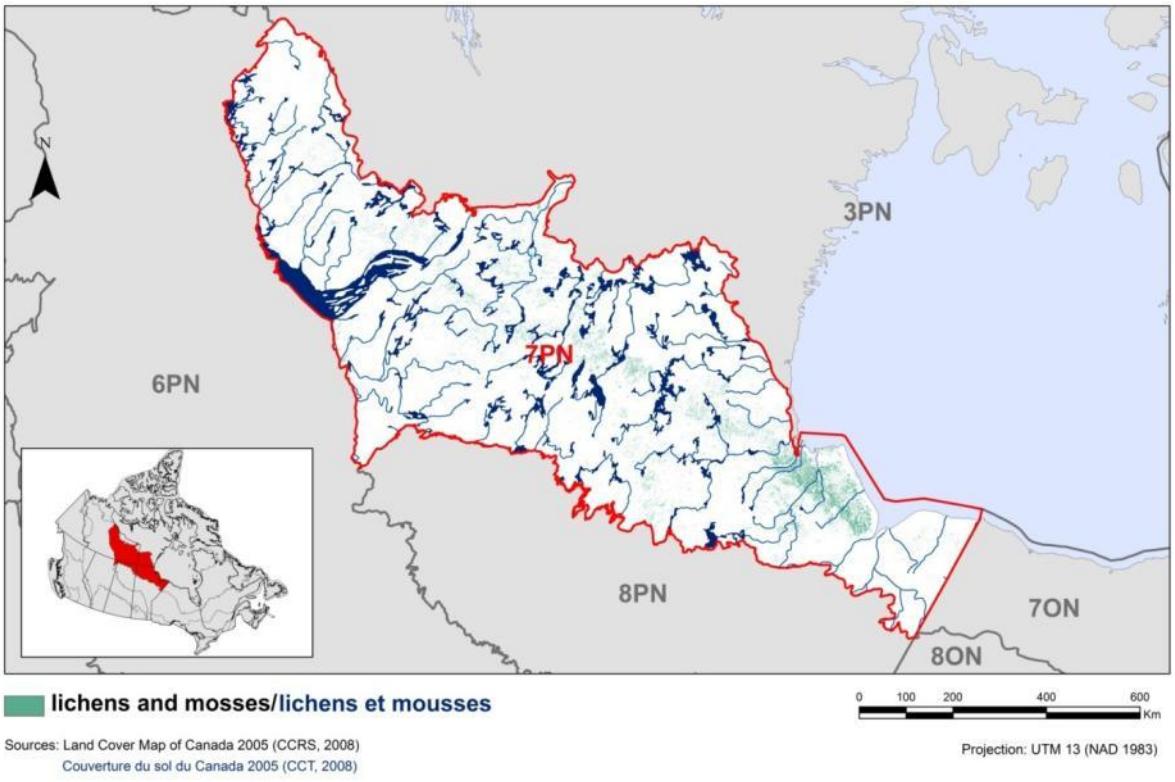

Figure 32. Lichen and moss land cover in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.

Table 14. Priority species that use lichen/moss habitat, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
American Golden-Plover	Lichen tundra		Assess/Maintain		Yes	Yes		
American Pipit	Moss/lichen		Assess/Maintain					Yes
Short-eared Owl			Increase 100%	Yes	Yes			Yes
Whimbrel	Lichen tundra		Assess/Maintain		Yes	Yes		

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

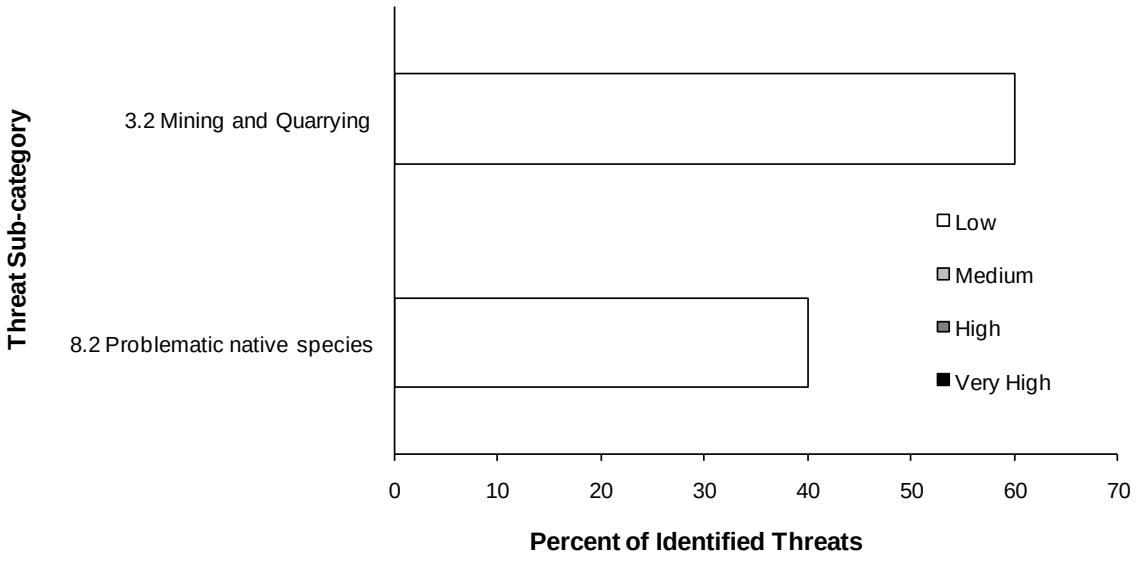

Figure 33. Percent of identified threats to priority species in lichen/moss habitat in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in lichen/moss habitat (for example, if 100 threats were identified in total for all priority species in lichen/moss 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 lichen/moss habitat is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

Bare Habitat Areas

Nine species, including Common Nighthawk (Figure 34), are associated with bare habitat areas, most of which use these areas for nesting and food access near freshwater and marine waterbodies (Table 15). Areas categorized as bare are mainly sandy soils and rock that is devoid of vegetation. Sandy soils are primarily present in the Hudson Plains coastal regions, while bare Canadian Shield bedrock is scattered throughout the BCR (Figure 35).

Figure 34. Common Nighthawks nest in open areas, often on bare rock or gravel but will use areas such as in the photo above. The open Canadian Shield areas near Yellowknife are near the range limit for the species but it is common to hear nighthawks at dusk in the area.
© Environment Canada – Photo: Craig Machtans

Threats to these species are indirect and are likely due to many variables that are associated with food sources, pollution, and climate change rather than threats specific to bare area habitat types (Figure 36), although some specific threats were identified for species associated with this habitat class. Large overpopulations of geese can limit food resources for other species (8.2 Problematic native species), and may be having irreversible or long-term effects on some types of wetland habitat in the region. Habitat alteration from the mining industry has a localized impact on bare habitats (3.2 Mining and quarrying), with effects from heavy metal contamination also possible (9.2 Industrial and military effluents). Two priority species associated with bare areas are sensitive to water quality degradation stemming from disturbance by humans (6.1 Recreational activities). As all these threats are of low magnitude, conservation objectives and recommended actions have not been developed.

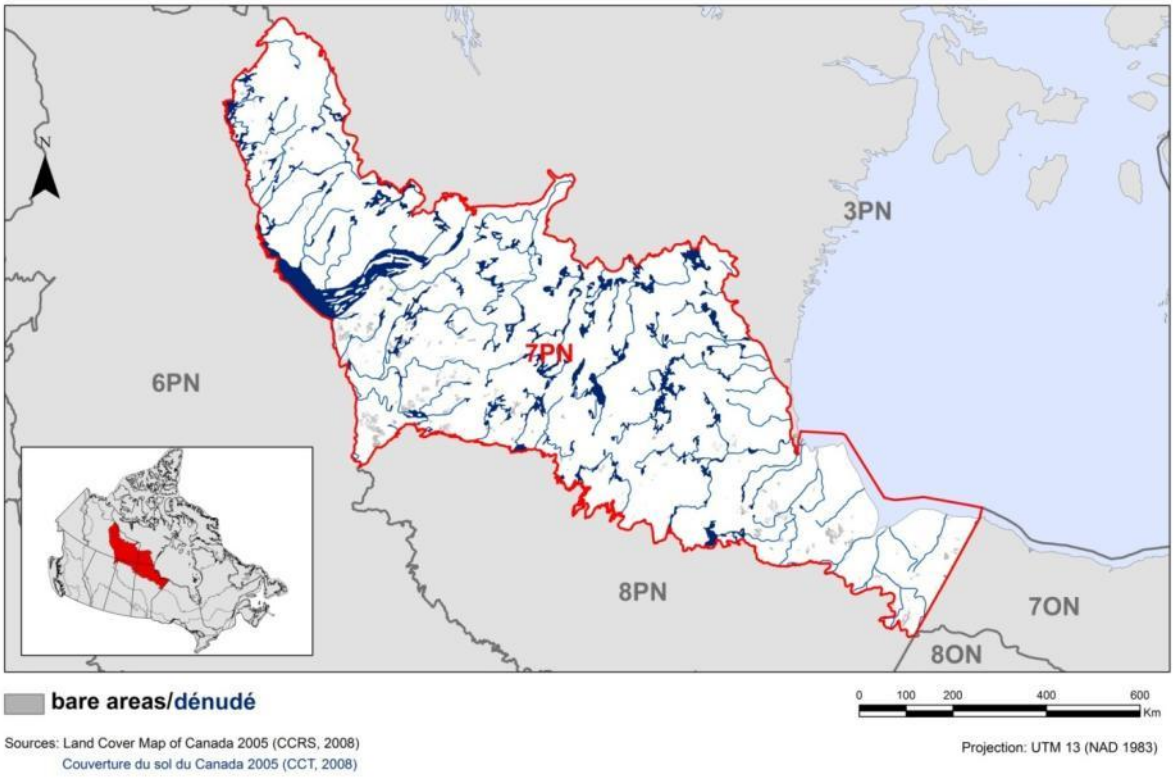

Figure 35. Bare areas in BCR 7 Prairie and Northern Region mapped at 250 m resolution from the Land Cover of Canada 2005, Canadian Centre for Remote Sensing.
A large number of bare areas are below the resolution of the imagery so this representation is not accurate in terms of available habitat.

Table 15. Priority species that use bare habitat areas, regional habitat sub-class, important habitat features, population objectives and reason for priority status.

Priority species	Regional habitat sub-class	Important habitat features	Population objective	Reason for priority status				
				At Risk	CC	S	NAWMP	Other
Arctic Tern	Rock/gravel/sand	Islands	Increase 50%		Yes	Yes		
Caspian Tern	Rocky islands for nesting	flat rocky islands, beaches, and sandy shores; sparsely vegetated	Assess/Maintain		Yes			Yes
Common Nighthawk	Rocks	Open ground	Recovery Objective	Yes	Yes			
Common Tern	Sand/gravel/shell/cobble	Islands	Assess/Maintain		Yes			
Eastern Phoebe	Rocks	Natural/man-made overhang for nest site	Assess/Maintain					Yes
Herring Gull	Rock/sand beaches	Islands	Assess/Maintain		Yes	Yes		
Killdeer	Mud/gravel/sand	Man-made gravel areas	Increase 50%		Yes			
Peregrine Falcon	Cliffs	Cliffs/ledges	Assess/Maintain	Yes		Yes		
Semipalmated Sandpiper	Sand		Increase 100%		Yes	Yes		

Note: Reasons for inclusion in the priority species list are as follows:
"At Risk": the species is assessed as either Endangered, Threatened or Special Concern by COSEWIC or SARA, or the species is listed by Alberta, Saskatchewan, Manitoba, Northwest Territories or Nunavut; "CC": the species meets conservation concern criteria for its bird group; "S": the species meets stewardship criteria for its bird group; "NAWMP": the species has NAWMP breeding or breeding habitat priority of Moderate-High or High or Highest in the BCR; "Other": expert input or General Status rank as described in Table 1.

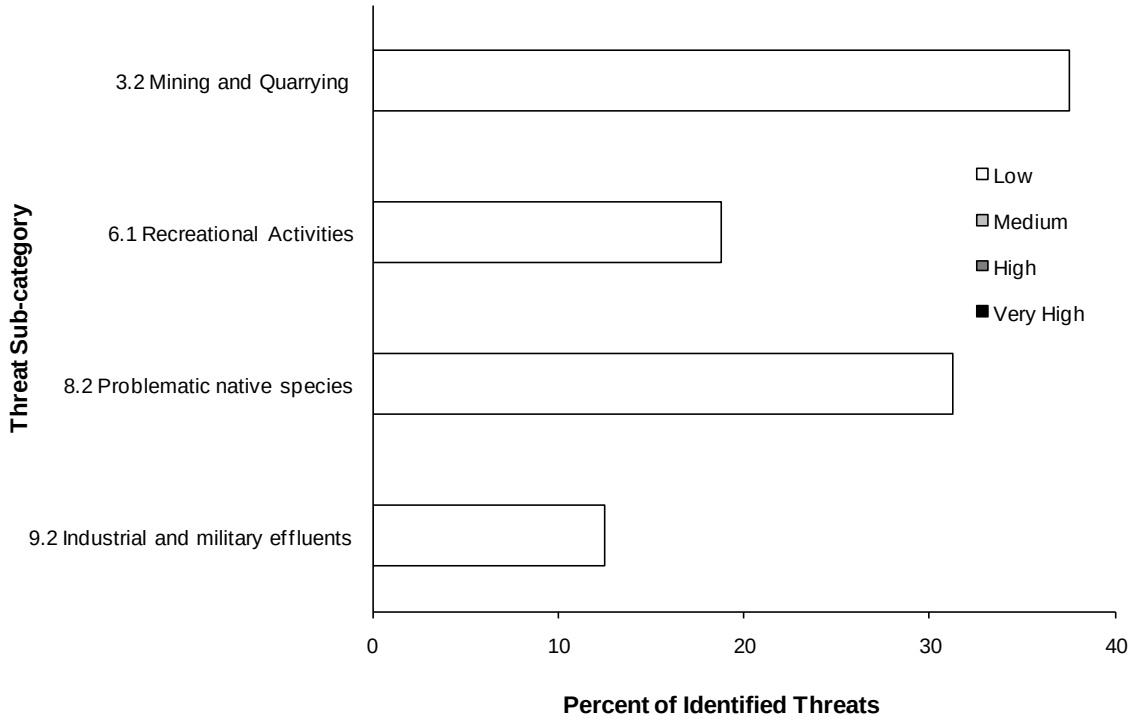

Figure 36. Percent of identified threats to priority species in bare areas in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in bare habitat areas (for example, if 100 threats were identified in total for all priority species in bare habitat 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 sub-threat in bare habitat areas is shown at the end of each bar (also presented in Table 4, Relative magnitude of identified threats to priority species within BCR 7 Prairie and Northern Region by threat category and broad habitat class).

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
- 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

Five types of structures were considered in an overall assessment of collision risks to birds: buildings (all types), wind turbines, communication towers, power lines and vehicles. There are no wind turbines in BCR 7-PNR, very few communication towers, few powerlines (most settlements have power generated in the community) and hardly any roads. As such, only collisions with buildings are discussed for BCR-7 PNR.

Buildings

Collisions with glass windows or reflective panels on buildings (Figure 37), is believed to be a significant source of bird mortality in Canada. Estimates of mortality from collisions with houses in Canada (including birds using feeders) range from approximately 15.8–30.5 million birds per year (Machtans et al. 2013). Mortality from collisions with buildings of fewer than 12 storeys is estimated at approximately

Figure 37. This juvenile warbler from Yellowknife is one of millions of birds that die each year in Canada from collisions with windows. Photo © Craig Machtans.

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. The total estimate of mortality from collisions with buildings in Canada is therefore between 16.1–42.2 million birds/year (Machtans et al. 2013).

Individual species are not all equally susceptible to this source of mortality. For low-rise and high-rise types of buildings, Passerine species were by far the most often killed order (90.4% tall buildings, 82.5% commercial and institutional buildings). Warblers (26.4% tall buildings, 21.2% commercial and institutional) and sparrows (23.5%, 17.6%) were the most commonly killed by both types of buildings. Other families of species representing more than 3% total relative mortality from tall buildings were Turdidae (6.3%), Certhiidae (3.4%) and Paridae (3.3%); for commercial and institutional buildings the families were Turdidae (14.8%), Cardinalidae (6.3%), and Fringillidae and Mimidae (both 4.0%) (Machtans et al. 2013). Differences in the rates and ranks of relative mortality among families may be attributable to study locations, species ranges, and/or differential susceptibilities of species in combination with building characteristics. The population-level effects of bird mortality from building strikes are unknown. See Table 16 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. Close to 60% of the kill is estimated to occur in Ontario and Quebec, another 30% in western provinces, and 10% in Atlantic Canada and closely reflects human population distribution. BCR 7-PNR has a small total human population (< 30,000), and therefore relatively few cats compared to southern Canada. Total losses in the BCR subregion would be concomitantly small but it is still a source of mortality that can be reduced by individual action.

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 16 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 16 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 16 for conservation objectives and actions.

It is unclear what the accumulation of toxic substances in birds is in most of BCR 7-PNR. A study by Wayland et al. (2000) on chlorinated hydrocarbon contaminants, mercury and selenium in Herring and Mew Gulls, and Caspian and Black Terns in Great Slave Lake found levels lower than present in the same species in the Great Lakes, but similar to levels from other clean lakes in the species' ranges. They also concluded that many of the contaminants in the birds likely originated outside BCR 7-PNR. In contrast, four lakes in the Northwest Territories portion of BCR 7-PNR have mercury advisories for fish consumption on them, including two northeast of Yellowknife. The source of the mercury in those lakes is Discovery Mine (1946–1969) from a tailings pond breach in 1965. Therefore there are certainly point sources of contaminants that are of concern to birds in BCR 7-PNR, but their effect is not documented. As noted earlier, the main industry in this BCR subregion is mining, and modern mines still often require tailings ponds or waste rock piles that can leach toxic metals. The environmental assessment process and contaminants monitoring is the appropriate way to deal with such concerns.

Table 16. 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	Primarily warblers and sparrows.
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	Primarily warblers and sparrows.
Predation by domestic cats						
Predation by domestic and feral cats.	8.1 Invasive non-native/ alien species	Reduce mortality from domestic and feral cats	2.4 Reduce incidental mortality.	Implement a "Cats Indoors!" Campaign following the guidelines of the American Bird Conservancy (http://www.abcbirds.org/abcprograms/policy/cats/index.html). Work to reduce feral cat overpopulation through cat control regulations.	5.3 Private sector standards and codes 5.2 Policies and regulations	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
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.	8.1 Research 8.2 Monitoring	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas

Table 16 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
				Continue to monitor bird populations so changes in numbers and distributions can be identified and management of cats can be altered to reflect these changes. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.		
Environmental Contaminants						
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. Support compliance with regulations regarding 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	American Wigeon, Bald Eagle, Black Scoter, Blue-winged Teal, Cackling Goose, Canada Goose, Canvasback, Common Loon, Greater Scaup, Greater White-fronted Goose, Green-winged Teal, Lesser Scaup, Lesser Snow Goose, Mallard, Northern Pintail, Northern Shoveler, Tundra Swan
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:** Common Goldeneye, Common Loon, Northern Harrier, Surf Scoter **PCBs:** Common Goldeneye, Caspian Tern, Common Tern, Greater Scaup **Other contaminants:** Horned Grebe, Peregrine Falcon

Table 16 continued

Threats addressed	Threat sub-category	Objective	Objective category	Recommended actions	Action category	Example priority species affected
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. Improve the ability to monitor and understand the effects of contaminant concentrations in birds.	8.1 Research	All species

Climate Change

The effects of climate change are already measureable 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 17 and 18 for a summary of impacts of climate change and conservation objectives.

In a recent study (Stralberg et al. 2013), shifts in the distribution and abundance of 102 boreal bird species were modelled and mapped under climate change scenarios for three 30-year windows between the years 2011 and 2100. Detailed bioclimatic niche models for each species were built using the best-available interpolated climate data and bird data from structured surveys in >125,000 locations across boreal North America. Projected shifts in the climatic conditions that currently characterize species' niches resulted in declines in abundance by 2100 for 36 species while increases were expected for 66 species. The largest percent decreases were projected for American Tree Sparrow, White-crowned Sparrow and Common Redpoll. Large percent increases in abundance were expected for Red-winged Blackbird, Black-capped Chickadee, and Townsend's Warbler. Projected shifts in density for 40 northerly species (those that currently breed in boreal Alaska) were provided in individual maps. Refugia were identified as areas within a species' range that had a higher than average density within both the current and a future time period. On average, only 36% of these species' ranges remained in refugia by 2100 according to the model. Multi-species refugia for this group of species were largely restricted to western Alaska, the northern Rocky Mountains and northeastern Labrador. Such refugia will be particularly important to the persistence of many species if, as expected, vegetation changes cannot keep pace with climate change. These refugia could be evaluated as potential conservation targets.

Table 17. Examples of the current and anticipated effects of climate change on bird populations in Canada and some affected bird species impacted by each climate change effect.
Note: the species shown here do not represent an exhaustive list, rather, they provide examples of species for which the effects of climate change have been suggested or documented.

Potential and Realized Effects of Climate Change	Examples of Species Affected
Mismatch between peak hatch and peak food abundance	Olive-sided Flycatcher, Rusty Blackbird, Lesser Scaup
Extended breeding season	Canada Goose, Lincoln's Sparrow
Habitat loss as a result of ecosystem changes (e.g., advances in treeline)	Yellow Rail, White-winged Crossbill
Increase in severe weather events	Canada Goose
Introduction of new predators and competitors	Red-necked Grebe
Range shifts to the north and from coastal to inland sites	Tennessee Warbler, Spruce Grouse
Changes in ocean temperature and currents impact marine productivity and food webs	Pacific Loon, Red-throated Loon, Parasitic Jaeger, Black Scoter
Thawing of permafrost and increased evaporation will result in vegetation shifts and loss of wetlands in arctic habitat	Hudsonian Godwit, Ring-necked Duck, Rusty Blackbird, Yellow Rail

Table 18. 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	Reduce greenhouse gas emissions	6.1 Support efforts to reduce greenhouse gas emissions	Support efforts to reduce greenhouse gas emissions.	5.2 Policies and regulations	All
		Mitigate the effects of climate change on bird habitat	6.2 Manage for habitat resilience as climate changes	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.	1.1 Site/area protection	
				Manage buffer areas and the matrix between protected areas to enhance movement of species across the landscape.	2.1 Site/area management	
				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	
Population-level effects of climate change are unknown	12.1 Informa-tion lacking	Improve under-standing 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
				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.	8.2 Monitoring	

Table 18 continued

				Undertake monitoring to evaluate the effectiveness of mitigation activities.		

Research and Population Monitoring Needs

Population Monitoring

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

A 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;

Shorebirds

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

Waterbirds

- evaluate alternative strategies for filling gaps in coverage for both colonial waterbirds and marsh birds;
- consider both costs and potential reduction in risks; and
- carry out any necessary pilot work to evaluate options.

Waterfowl

- develop strategies to reduce expenditures on the prairie and eastern waterfowl breeding surveys, while retaining acceptable precision in population estimates;
- review the information needs and expenditures for arctic goose and duck banding programs;
- reduce the number of Greater Snow Goose survey components;

- realign resources for eider and scoter monitoring to a more efficient suite of surveys.

As of 2012, most regions farther south are using new or increased BBS coverage to help fill monitoring gaps and bird atlas programs are also collecting some status data. For part of BCR 7-PNR, the Manitoba bird atlas (with fieldwork continuing to at least 2013) should provide excellent information. Without road coverage however, increasing BBS coverage in BCR 7-PNR is not an option.

Most current bird monitoring occurring in BCR 7-PNR is localized in the Yellowknife area, including the two BBS routes (one long term, one new) and the Yellowknife Study Area waterfowl monitoring program; the latter program generates local population trends and collects productivity data. Colonial waterbirds on Great Slave Lake have been monitored periodically (e.g., Sirois et al. 1995). National or international survey efforts such as the USFWS Spring Waterfowl Survey transects are not well-represented in BCR 7-PNR, with only a handful of transects within the region (Figure 38). Therefore no subregion-specific trends can be generated from these surveys. Clearly the lack of roads precludes using the BBS to increase survey coverage in the BCR subregion. The other portion of the BCR 7-PNR with bird monitoring is around Churchill, associated with goose overpopulation issues. Research and monitoring into Lesser Snow and Ross's Geese is a key focus area of the Arctic Goose Joint Venture's 2008–2012 Strategic Plan, with several projects already funded (Arctic Goose Joint Venture Technical Committee 2008).

eBird Canada (eBird.ca) relies on volunteers to submit their observations and data has been used to model occupancy changes within the two territories in BCR 3 (Environment Canada's Northwest Territories/Nunavut Bird Checklist Survey is now integrated with eBird). However, calculating BCR 7-PNR specific occupancy trends is not possible without a considerably larger survey effort than currently exists (Figure 38).

The key priorities for monitoring (Table 19) can be summarized (in ascending levels of investment) as:

- Basic occurrence data on species at risk in the BCR subregion would be highly useful for environmental assessments to enable any necessary pre- and post-construction monitoring.
- Status and trend monitoring for all priority species would allow a much more relevant assessment of population objectives and future management recommendations.
    - Within the priority of status and trend monitoring is the supporting need of determining methods and designs that work for remote landscapes and the species requiring monitoring. For instance, it is not clear what

protocols could be used to monitor some boreal-breeding shorebirds such as Solitary Sandpiper.

- Careful consideration in designing a broad program should be given to understanding what sampling in the BCR subregion would tell managers; areas that are not subject to development pressure or were not recently burned/naturally disturbed could provide trends indicative of changes due to climate and/or migration/wintering ground issues that would be most useful for conservation when contrasted with sampling in other BCRs.

Status and trend of species at risk would be the most difficult for many species given typically low densities and discontinuous distributions (compared to more common species listed on the current priority list).

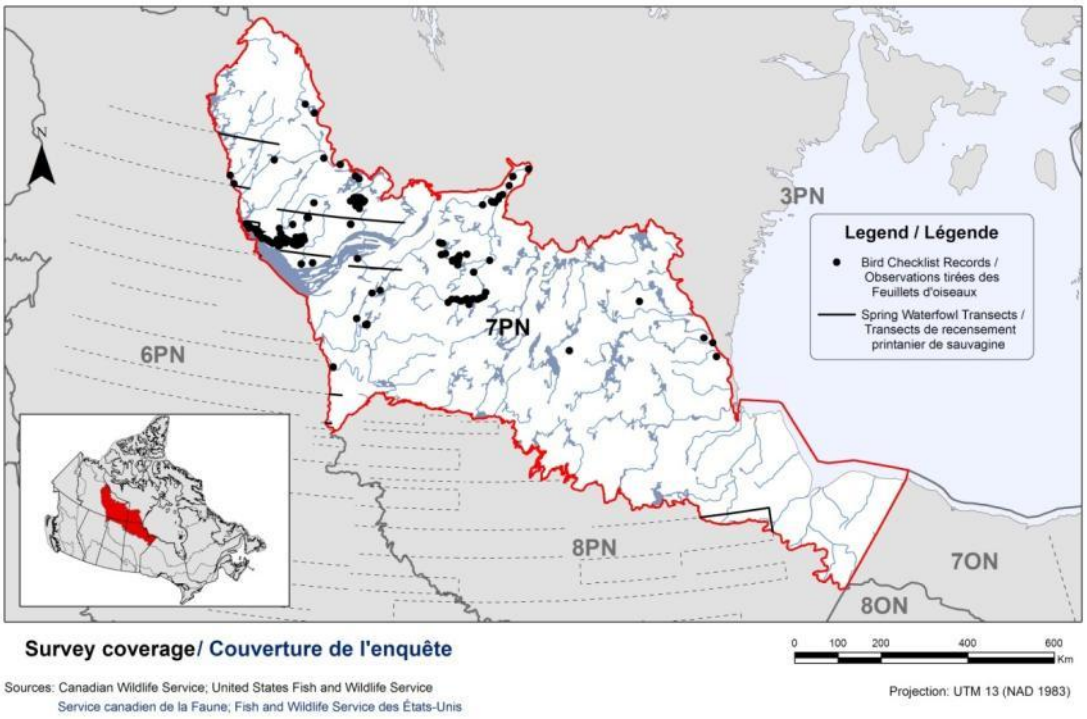

Figure 38. Bird monitoring coverage in BCR 7 Prairie and Northern Region.
The dots are usually one-time records from volunteers providing checklists of species. The lines are aerial transects flown annually to count waterfowl (solid in the BCR, dashed outside). Good waterfowl survey coverage exists to the west and south, but contrasts to that within the BCR subregion. The two BBS (Breeding Bird Survey) routes and the Yellowknife Study Area waterfowl locations are obscured by the cluster of checklist dots on the left of the figure, just above Great Slave Lake. Not shown are colonial waterbird surveys that have been periodically undertaken on Great Slave Lake or Manitoba Bird Atlas point counts.

Table 19. Summary and detailed monitoring recommendations for BCR 7 Prairie and Northern Region.

Action	Justification and Discussion	Priority Species
All bird groups		
Obtain accurate occurrence data for mapping distribution in the BCR	Most planning or management exercises require distribution information on species, usually at the level provided by modern atlas work (e.g., Ontario Bird Atlas 2). This would be especially useful for environmental assessments of species-at-risk and mitigation/monitoring recommendations for developments. Work could build on programs such as eBird and bird atlases to obtain the data. Location data that is tied to specific habitats would allow much better habitat associations within the BCR, also important for environmental assessments and predicting impacts of habitat loss or conversion.	Priority species that are "at risk" especially require better data, but no priority species have good distribution data within the BCR.
Landbirds		
Develop a monitoring program in boreal Canada, including representative sampling in BCR 7-PNR, for species with poor monitoring precision scores from Partners In Flight (PIF) assessments.	These data are necessary for setting population objectives and other management actions. A monitoring program will need to be selective in sampling areas and intensity to balance investment within the BCR compared to other boreal BCRs. Separating breeding ground effects from outside-BCR influences would be a benefit of working in BCR 7-PNR given the low level of development. The opportunity for broad-scale "management" actions is very low given that development is sparse and there is little fire suppression. Monitoring data would be most useful in the national context hence the recommendation of "representative sampling" rather than "comprehensive sampling".	All BCR 7-PNR priority landbirds except Barn Swallow, Common Nighthawk, Eastern Phoebe and Peregrine Falcon are listed by PIF as having poor monitoring precision. All four of the above species would need specialized surveys in a small number of locations or habitats to get a trend for BCR 7-PNR.
Shorebirds and Waterbirds		
Develop a monitoring program for selected shorebird and waterbird species	Little information on boreal shorebirds and waterbird trends exists beyond the few species that can be covered by Breeding Bird Survey methodology in other boreal BCRs or from colony surveys in Great Slave Lake. Like landbirds, selective effort will need to be used to determine what information on trend is needed from within the BCR to compare to other boreal areas for context. Methodology would need to be determined for several difficult-to-monitor species (e.g., Sinclair et al. 2004, Elliot et al.	All priority shorebird and waterbird species.

Table 19 continued

Action	Justification and Discussion	Priority Species
	2010). Work is needed to provide appropriate field data that could be used to design a monitoring program (logistics, detectability issues, between site and between year variance estimates especially).	
Waterfowl		
Increase monitoring effort for species with a poor trend score.	Spring waterfowl transect surveys do not currently cover much of the BCR. However, the original design was prioritized to focus on areas with higher waterfowl abundance to balance survey costs with areas of population importance. Consideration could be given if expansion of spring surveys into BCR 7-PNR is warranted for continental management of any waterfowl populations. Regional issues may require smaller programs (e.g., monitoring in protected areas, specific management questions related to threats in the BCR).	All priority waterfowl species

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. Undertaking research will allow us to improve future iterations of BCR strategies and to focus future implementation, and will also enable the development of new tools for conservation.

The paucity of monitoring data, or even detailed information on species' distribution in BCR 7-PNR, requires improvements on that front to enable development of specific research questions. However, there is still a need for site-specific research programs that can accomplish the following (in no particular order):

- Research on species-at-risk to understand regional biology, status and (potentially) trends and the relationship of national trends and populations to local data.
- Research that links BCR 7-PNR priority species with their migration routes and wintering grounds.
- Continued research on overabundant species if management actions are not yet apparent or need validation.
- Determine specific impacts of development activities (mining primarily) on birds to properly understand the local impacts of these activities.

- Research projects that use sites in this BCR subregion as a control for impacted sites in other BCRs.
- Research to understand the observed impacts of changing climate on habitats and birds.

Threats Outside Canada

Many bird species found in Canada spend a large portion of their lifecycle outside of the country (Figure 39). These species face threats while they are outside Canada; in fact, threats to some migratory species may be most severe outside of the breeding season (Calvert et al. 2009). Of the 62 priority species in BCR 7 Prairie and Northern Region, 59 (95%) are migratory and spend part of their annual cycle – up to half the year or more – outside the BCR and usually outside of Canada.

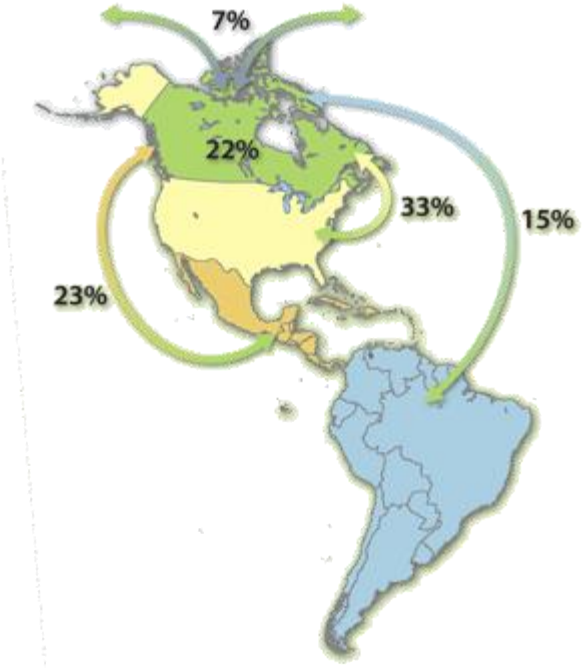

Figure 39. Only 22% of Canadian bird species spend the whole year in Canada. Most others migrate to the United States (33%), to Central America, Mexico and the Caribbean (23%) or to South America (15%). Some travel to Europe or Asia or spend long periods of time at sea (7%) (reproduced with permission from 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.

Regardless, some information is available to inform conservation work outside Canada (Figure 40). Priority birds from BCR 7 in Prairie and Northern Region face the loss or degradation of key migration, and wintering habitats. The primary sources of habitat loss and degradation are conversion of grasslands and wetlands to agriculture (threat sub-category 2.1) and residential development (threat sub-category 1.1). The threat of loss and degradation of stopover or overwinter habitat is greater for species that have relatively small and concentrated wintering ranges. A few species are particularly vulnerable as large numbers of the species concentrate at just a handful of key migratory stopover sites (e.g., Semipalmated Sandpipers, other shorebirds); degradation or loss of these sites could have devastating impacts on the species.

In addition to habitat loss, priority birds from BCR 7 in Prairie and Northern Region are also affected by increased mortality from human sources during migration and over-wintering. Lethal and sub-lethal impacts to priority birds from BCR 7 in Prairie and Northern Region include exposure to industrial contaminants such as oil pollution and heavy metals (threat sub-category 9.2) and agricultural pesticides, either through direct poisoning or through the consumption of poisoned prey (threat sub-category 9.3). Other large sources of mortality include collisions with structures such as buildings (threat sub-category 1.2), many species, shorebirds and waterfowl in particular, are affected by hunting (threat sub-category 5.1) and several species are killed accidentally as a result of fisheries bycatch (threat sub-category 5.4). Predation by cats during migration and wintering (threat sub-category 8.1) was not assessed but would affect many species.

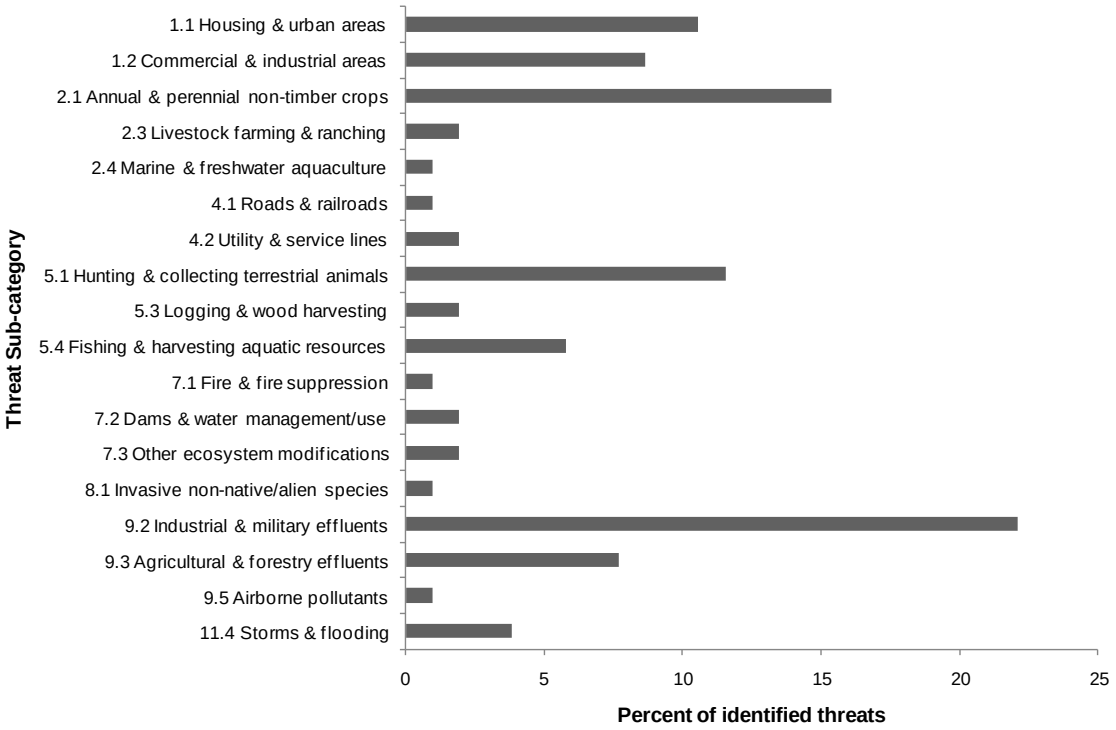

Figure 40. Percent of identified threats to priority species (by IUCN threat sub-category) from BCR 7 in Prairie and Northern Region when they are outside Canada.
Note: Magnitudes could not be assigned for threats outside Canada due to lack of information on scope and severity.

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 (oiseauxmigrateurs_migratorybirds@ec.gc.ca).

References

Abraham, K. F. and C. J. Keddy. 2005. *The Hudson Bay Lowland*. Chapter 4, pp. 118-148 *in* The World's Largest Wetlands: Ecology and Conservation. Fraser, L.H. and P.A. Keddy (*eds*.), Cambridge University Press, New York, USA.

Abraham, K. F., R. L. Jefferies and R. T. Alisauskas, 2005. *The dynamics of landscape change and snow geese in mid-continent North America*. Global Change Biology 11: 841–855.

Arctic Goose Joint Venture Technical Committee. 2008. *Arctic Goose Joint Venture strategic plan: 2008-2012*. Unpublished report. C/o AGJV coordination office, Canadian Wildlife Service, Edmonton, Alberta. 112pp.

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

Blancher, P. 2013. *Estimated Number of Birds Killed by House Cats* (Felis catus) *in Canada*. Avian Conservation and Ecology in press.

Calvert, A.M., C.A. Bishop, R.D. Elliot, E.A. Krebs, T.M. Kydd, C.S. Machtans, and G.J. Robertson.. 2013. A synthesis of human-related avian mortality in Canada. Avian Conservation and Ecology. In press.

Calvert, A. M., S. J. Walde and P. D. Taylor 2009. *Non-breeding drivers of population dynamics in seasonal migrants: conservation parallels across taxa*. Avian Conservation and Ecology - Écologie et conservation des oiseaux 4(2): 5. www.ace-eco.org/vol4/iss2/art5/

Donaldson, G. M., C. Hyslop, R. I. G. Morrison, H. L. Dickson, and I. Davidson (editors). 2000. *Canadian Shorebird Conservation Plan*. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 27pp. www.cws-scf.ec.gc.ca/publications/AbstractTemplate.cfm?lang=e&id=318

Ecosystem Classification Group. 2008. *Ecological regions of the Northwest Territories – Taiga Shield*. Department of Environment and Natural Resources, Government of the Northwest Territories, Yellowknife, NT, Canada. viii + 146 pp. + insert map.

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

Elliot, K. H., P. A. Smith and V. H. Johnson. 2010. *Aerial surveys do not reliably census boreal-nesting shorebirds*. Canadian Field-Naturalist 124:145-150.

Faaborg, J., R. T. Holmes, A. D. Anders, K. L. Bildstein, K. M. Dugger, S. A. Gauthreaux, P. Heglund, K. A. Hobson, A. E. Jahn, D. H. Johnson, S. C. Latta, D. J. Levey, P. P. Marra, C. L. Merkord, E. Nol, S. I. Rothstein, T. W. Sherry, T. S. Sillett, F. R. Thompson, and N. Warnock. 2010. *Conserving migratory land birds in the New World: Do we know enough?* Ecological Applications 20(2): 398-418.

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

Food and Agriculture Organization (FAO). 2000. *Land cover classification system*. United Nations Food and Agriculture Organization, Rome. www.fao.org/docrep/003/x0596e/x0596e00.htm

Fournier, M. A. and J. E. Hines. 1999. *Breeding ecology of the Horned Grebe* Podiceps auratus *in subarctic wetlands*. Occasion Paper 99, Canadian Wildlife Service, Ottawa, ON.

Fournier, M. A. and J. E. Hines. 2001. *Breeding ecology of sympatric Greater and Lesser Scaup* (Aythya marila *and* Aythya affinis) *in the Subarctic Northwest Territories*. Arctic 54:444–456.

Fournier, B. J. and J. E. Hines. 2005. *Geographic distribution and changes in population densities of waterfowl in the Northwest Territories, Canada, 1976-2003*. Technical Report Series No. 433 Canadian Wildlife Service, Yellowkife, NT.

Glooschenko, W. A., N. T. Roulet, L. A. Barrie, H. I. Schiff and H. G. McAdie. 1994. *The Northern Wetland Study (NOWES): an overview*. Journal of Geophysical Research 99: 1423-1429.

IPCC, 2007: Climate Change 2007: Synthesis Report. *Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, Pachauri, R.K and Reisinger, A. (eds.)]. IPCC, Geneva, Switzerland, 104 pp.

Jefferies, R. L., P. J. Andrew and K. F. Abraham, 2006. *A biotic agent promotes large-scale catastrophic change in the coastal marshes of Hudson Bay*. Journal of Ecology 94: 234-242.

Kennedy, J.A., E.A. Krebs and A.F. Camfield. 2012. *A Manual for Completing All-bird Conservation Plans in Canada*, April 2012 version. Canadian Wildlife Service, Environment Canada. Ottawa, ON

Klein, E. E. E. Berg. And R. Dial. 2005. *Wetland drying and succession across the Kenai Peninsula Lowlands, south-central Alaska*. Canadian Journal of Forest Research 35:1931-1941. doi: 10.1139/X05-129

Leafloor, J. O., T. J. Moser, and B. D. J. Batt (editors). 2012. *Evaluation of special management measures for midcontinent lesser snow geese and Ross's geese*. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, Ontario.

Machtans, C. S., C. H. R Wedeles, and E. M Bayne. 2013. *A First Estimate for Canada of the Number of Birds Killed By Colliding with Buildings*. Avian Conservation and Ecology in press.

Milko, R., L. Dickson, R. Elliot, and G. Donaldson. 2003. *Wings Over Water: Canada's Waterbird Conservation Plan*. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 28pp. www.cws-scf.ec.gc.ca/publications/wow/Wings-EN-2003.pdf

National Audubon Society. 2009. *Birds and climate change - Ecological disruption in motion*. 16 pages.

North American Bird Conservation Initiative Canada. 2012. *The State of Canada's Birds, 2012*. Environment Canada, Ottawa, Canada. 36 spages.

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

North American Bird Conservation Initiative, U.S. Committee, 2010. *The State of the Birds 2010 Report on Climate Change, United States of America*. U.S. Department of the Interior: Washington, DC.

North American Waterfowl Management Plan, Plan Committee. 2004. North American Waterfowl Management Plan 2004. *Implementation Framework: Strengthening the Biological Foundation*. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales, 106pp. www.nawmp.ca/pdf/impfr-en-k.pdf

Panjabi, A. O., E. H. Dunn, P. J. Blancher, W. C. Hunter, B. Altman, J. Bart, H. Berlanga, G. S. Butcher, S. K. Davis, D. W. Demarest, R. Dettmers, W. Easton, H. G. de Silva Garza, E. E. Inigo-Elias, D. N. Pashley, C. J. Ralph, T. D. Rich, K. V. Rosenberg, C. M. Rustay, J. M. Ruth, J. S. Wendt, and T. C. Will. 2005. *The Partners in Flight Handbook on Species Assessment.* Partners in Flight Science Committee, Technical Series No. 3, 30 pp.

Pullin, A. S. and T. M. Knight. 2001. *Effectiveness in conservation practice: Pointers from medicine and public health*. Conservation Biology 15:50-54.

Pullin, A. S. and T. M. Knight. 2003. *Support for decision making in conservation practice: An evidence-based approach*. Journal for Nature Conservation 11:83-90.

Pullin, A. S., T. M. Knight, D. A. Stone, and K. Charman. 2004. *Do conservation managers use scientific evidence to support their decision-making?* Biological Conservation 119:245-252.

Rich, T. D., C. J. Beardmore, H. Berlanga, P. J. Blancher, M. S. W. Bradstreet, G. S. Butcher, D. W. Demarest, E. H. Dunn, W. C. Hunter, E. E. Iñigo-Elias, J. A. Kennedy, A. M. Martell, A. O. Panjabi, D. N. Pashley, K. V. Rosenberg, C. M. Rustay, J. S. Wendt, T. C. Will. 2004. *Partners in Flight North American Landbird Conservation Plan.* Cornell Lab of Ornithology. Ithaca, NY.

Riordan, B. D. Verbyla, and A. D. McGuire. 2006. *Shrinking ponds in subarctic Alaska based on 1950-2002 remotely sensed images*. Journal of Geophysical Research 111, G04002, doi:10.1029/2005JG000150.

Rocky Mountain Bird Observatory. 2005. *Partners in Flight Species Assessment database (online).* Available at: www.rmbo.org/pif/pifdb.html

Rockwell, R.F., R.L. Jefferies, and P.J. Weatherhead, 2003. *Response of nesting savannah sparrows to 25 years of habitat change in a snow goose colony*. Ecoscience, 10 (1): 33-37.

Salafsky, N., D. Salzer, A. J. Stattersfield, C. Hilton-Taylor, R. Neugarten, S. H. M. Butchart, B. Collen, N. Cox, L. L. Master, S. O'Connor, and D. Wilkie. 2008. *A standard lexicon for biodiversity conservation: Unified classifications of threats and actions*. Conservation Biology 22(4):897-911.

Scheuhammer, A.M., S. L. Money, D. A. Kirk, and G. Donaldson. 2003. *Lead fishing sinkers and jigs in Canada: Review of their use patterns and toxic impacts on wildlife*. Occasional paper no. 108. Canadian Wildlife Service.

Scheuhammer, A. M., and S. L. Norris. 1996. *The ecotoxicology of lead shot and lead fishing weights*. Ecotoxicology 5: 297-295.

Sinclair, P., Y. Aubry, J. Bart, V. Johnston, R. Lanctot, B. McCaffrey, K. Ross, P. Smith, and L. Tibbitts. 2004. *Boreal shorebirds: an assessment of conservation status and potential for population monitoring.* www.bsceoc.org/download/Borealshorebirdmonitorpaper.pdf.

Sirois, J., M. A. Fournier, and M. F. Kay. 1995. *The colonial waterbirds of Great Slave Lake, Northwest Territories: an annotated atlas.* Occasional Paper Number 89, Canadian Wildlife Service, Ottawa, ON.

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

Stralberg, D., S.M. Matsuoka, P. Sólymos, E.M. Bayne, F.K.A. Schmiegelow, S.G. Cumming, S.J. Song, T.C. Fontaine and C.M. Handel. 2012. *Modeling avifaunal responses to climate change across North America's boreal-arctic transition zone.* Final Report to the Arctic Landscape Conservation Cooperative from the Boreal Avian Modelling Project. Edmonton, Alberta. 97 pages. www.borealbirds.ca.

Walters, C., G. Gunderson, and C. S. Holling. 1992. *Experimental policies for water management in the Everglades.* Ecological Applications 2:189-202.

Wayland, M. K. A. Hobson, and J. Sirois. 2000. *Environmental contaminants in colonial waterbirds from Great Slave Lake, N.W.T.: spatial, temporal and food-chain considerations*. Arctic 53:221-233.

Appendix 1

List of All Bird Species in BCR 7 Prairie and Northern Region

Table A1 -1. Complete list of species in BCR 7-Prairie and Northern Region, when they are in the BCR (breeding, migrant, resident year round) and their priority status.

Common Name	Scientific Name	Bird group	Residency	Priority
Landbirds				
Alder Flycatcher	*Empidonax alnorum*	Landbird	Breeding	
American Crow	*Corvus brachyrhynchos*	Landbird	Breeding	
American Kestrel	*Falco sparverius*	Landbird	Breeding	
American Pipit	*Anthus rubescens*	Landbird	Breeding	Yes
American Robin	*Turdus migratorius*	Landbird	Breeding	
American Three-toed Woodpecker	*Picoides dorsalis*	Landbird	Resident	
American Tree Sparrow	*Spizella arborea*	Landbird	Breeding	Yes
Bald Eagle	*Haliaeetus leucocephalus*	Landbird	Breeding	
Bank Swallow	*Riparia riparia*	Landbird	Breeding	
Barn Swallow	*Hirundo rustica*	Landbird	Breeding	Yes
Belted Kingfisher	*Megaceryle alcyon*	Landbird	Breeding	Yes
Black-and-white Warbler	*Mniotilta varia*	Landbird	Rare	
Black-backed Woodpecker	*Picoides arcticus*	Landbird	Resident	Yes
Black-capped Chickadee	*Poecile atricapillus*	Landbird	Resident	
Blackpoll Warbler	*Setophaga striata*	Landbird	Breeding	Yes
Blue-headed Vireo	*Vireo solitarius*	Landbird	Breeding	
Bohemian Waxwing	*Bombycilla garrulus*	Landbird	Breeding	
Boreal Chickadee	*Poecile hudsonica*	Landbird	Resident	Yes
Boreal Owl	*Aegolius funereus*	Landbird	Resident	
Brown-headed Cowbird	*Molothrus ater*	Landbird	Rare	
Cape May Warbler	*Setophaga tigrina*	Landbird	Breeding	
Cedar Waxwing	*Bombycilla cedrorum*	Landbird	Breeding	
Chipping Sparrow	*Spizella passerina*	Landbird	Breeding	
Cliff Swallow	*Petrochelidon pyrrhonota*	Landbird	Rare	
Common Grackle	*Quiscalus quiscula*	Landbird	Breeding	
Common Nighthawk	*Chordeiles minor*	Landbird	Breeding	Yes
Common Raven	*Corvus corax*	Landbird	Resident	
Common Redpoll	*Acanthis flammea*	Landbird	Resident	
Common Yellowthroat	*Geothlypis trichas*	Landbird	Breeding (irreg.)	
Dark-eyed Junco	*Junco hyemalis*	Landbird	Breeding	

Table A1-1 continued

Common Name	Scientific Name	Bird group	Residency	Priority
Downy Woodpecker	*Picoides pubescens*	Landbird	Resident	
Eastern Kingbird	*Tyrannus tyrannus*	Landbird	Breeding	
Eastern Phoebe	*Sayornis phoebe*	Landbird	Breeding	Yes
European Starling	*Sturnus vulgaris*	Landbird	Breeding	
Evening Grosbeak	*Coccothraustes vespertinus*	Landbird	Breeding	
Fox Sparrow	*Passerella iliaca*	Landbird	Breeding	
Golden Eagle	*Aquila chrysaetos*	Landbird	Breeding	
Golden-crowned Kinglet	*Regulus satrapa*	Landbird	Breeding	
Gray Jay	*Perisoreus canadensis*	Landbird	Resident	
Gray-cheeked Thrush	*Catharus minimus*	Landbird	Breeding	
Great Gray Owl	*Strix nebulosa*	Landbird	Resident	
Great Horned Owl	*Bubo virginianus*	Landbird	Resident	
Gyrfalcon	*Falco rusticolus*	Landbird	Rare	
Hairy Woodpecker	*Picoides villosus*	Landbird	Resident	
Harris's Sparrow	*Zonotrichia querula*	Landbird	Breeding	Yes
Hermit Thrush	*Catharus guttatus*	Landbird	Breeding	
Hoary Redpoll	*Acanthis hornemanni*	Landbird	Resident	
Horned Lark	*Eremophila alpestris*	Landbird	Breeding	
House Sparrow	*Passer domesticus*	Landbird	Breeding	
Lapland Longspur	*Calcarius lapponicus*	Landbird	Breeding	
Le Conte's Sparrow	*Ammodramus leconteii*	Landbird	Breeding	
Least Flycatcher	*Empidonax minimus*	Landbird	Breeding (irreg.)	
Lincoln's Sparrow	*Melospiza lincolnii*	Landbird	Breeding	
Long-eared Owl	*Asio otus*	Landbird	Resident	
Magnolia Warbler	*Setophaga magnolia*	Landbird	Breeding	
Merlin	*Falco columbarius*	Landbird	Breeding	Yes
Nelson's Sparrow	*Ammodramus nelsoni*	Landbird	Breeding	
Northern Flicker	*Colaptes auratus*	Landbird	Breeding	
Northern Goshawk	*Accipiter gentilis*	Landbird	Resident	
Northern Harrier	*Circus cyaneus*	Landbird	Breeding	
Northern Hawk Owl	*Surnia ulula*	Landbird	Resident (irreg.)	
Northern Shrike	*Lanius excubitor*	Landbird	Resident	Yes
Northern Waterthrush	*Parkesia noveboracensis*	Landbird	Breeding	
Olive-sided Flycatcher	*Contopus cooperi*	Landbird	Breeding	Yes
Orange-crowned Warbler	*Oreothlypis celata*	Landbird	Breeding	
Osprey	*Pandion haliaetus*	Landbird	Breeding	
Ovenbird	*Seiurus aurocapilla*	Landbird	Breeding (irreg.)	
Palm Warbler	*Setophaga palmarum*	Landbird	Breeding	Yes

Table A1-1 continued

Common Name	Scientific Name	Bird group	Residency	Priority
Peregrine Falcon	*Falco peregrinus*	Landbird	Breeding	Yes
Philadelphia Vireo	*Vireo philadelphicus*	Landbird	Breeding (irreg.)	
Pine Grosbeak	*Pinicola enucleator*	Landbird	Breeding	Yes
Pine Siskin	*Spinus pinus*	Landbird	Breeding	
Purple Finch	*Carpodacus purpureus*	Landbird	Breeding (irreg.)	
Red Crossbill	*Loxia curvirostra*	Landbird	Resident	
Red-breasted Nuthatch	*Sitta canadensis*	Landbird	Breeding	
Red-eyed Vireo	*Vireo olivaceus*	Landbird	Breeding	
Red-tailed Hawk	*Buteo jamaicensis*	Landbird	Breeding	
Red-winged Blackbird	*Agelaius phoeniceus*	Landbird	Breeding	
Rock Pigeon	*Columba livia*	Landbird	Rare (usually cage birds)	
Rock Ptarmigan	*Lagopus muta*	Landbird	Breeding	
Rough-legged Hawk	*Buteo lagopus*	Landbird	Breeding	
Ruby-crowned Kinglet	*Regulus calendula*	Landbird	Breeding	
Rusty Blackbird	*Euphagus carolinus*	Landbird	Breeding	Yes
Savannah Sparrow	*Passerculus sandwichensis*	Landbird	Breeding	
Sharp-shinned Hawk	*Accipiter striatus*	Landbird	Resident	
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Landbird	Resident	
Short-eared Owl	*Asio flammeus*	Landbird	Breeding	Yes
Smith's Longspur	*Calcarius pictus*	Landbird	Breeding	Yes
Snowy Owl	*Bubo scandiacus*	Landbird	Breeding	
Song Sparrow	*Melospiza melodia*	Landbird	Breeding	
Spruce Grouse	*Falcipennis canadensis*	Landbird	Resident	
Swainson's Thrush	*Catharus ustulatus*	Landbird	Breeding	
Swamp Sparrow	*Melospiza georgiana*	Landbird	Breeding	Yes
Tennessee Warbler	*Oreothlypis peregrina*	Landbird	Breeding	
Tree Swallow	*Tachycineta bicolor*	Landbird	Breeding	
Western Tanager	*Piranga ludoviciana*	Landbird	Breeding	
White-crowned Sparrow	*Zonotrichia leucophrys*	Landbird	Breeding	Yes
White-throated Sparrow	*Zonotrichia albicollis*	Landbird	Breeding	Yes
White-winged Crossbill	*Loxia leucoptera*	Landbird	Resident	
Willow Ptarmigan	*Lagopus lagopus*	Landbird	Resident	
Wilson's Warbler	*Cardellina pusilla*	Landbird	Breeding	
Winter Wren	*Troglodytes troglodytes*	Landbird	Breeding (irreg.)	
Yellow Warbler	*Setophaga petechia*	Landbird	Breeding	
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Landbird	Breeding	
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Landbird	Breeding	

Table A1-1 continued

Common Name	Scientific Name	Bird group	Residency	Priority
Yellow-rumped Warbler	*Setophaga coronata*	Landbird	Breeding	
Shorebirds				
American Golden-Plover	*Pluvialis dominica*	Shorebird	Breeding (irreg.)	Yes
Baird's Sandpiper	*Calidris bairdii*	Shorebird	Migrant	
Black-bellied Plover	*Pluvialis squatarola*	Shorebird	Migrant	
Buff-breasted Sandpiper	*Tryngites subruficollis*	Shorebird	Migrant	
Dunlin	*Calidris alpina*	Shorebird	Breeding	Yes
Greater Yellowlegs	*Tringa melanoleuca*	Shorebird	Breeding	Yes
Hudsonian Godwit	*Limosa haemastica*	Shorebird	Breeding	Yes
Killdeer	*Charadrius vociferus*	Shorebird	Breeding	Yes
Least Sandpiper	*Calidris minutilla*	Shorebird	Breeding	
Lesser Yellowlegs	*Tringa flavipes*	Shorebird	Breeding	Yes
Pectoral Sandpiper	*Calidris melanotos*	Shorebird	Migrant	
Red Knot	*Calidris canutus*	Shorebird	Migrant	
Red Knot	*Calidris canutus rufa*	Shorebird	Migrant	
Red Phalarope	*Phalaropus fulicarius*	Shorebird	Breeding (irreg.)	
Red-necked Phalarope	*Phalaropus lobatus*	Shorebird	Breeding	Yes
Ruddy Turnstone	*Arenaria interpres*	Shorebird	Migrant	
Sanderling	*Calidris alba*	Shorebird	Migrant (irreg.)	
Semipalmated Plover	*Charadrius semipalmatus*	Shorebird	Breeding	
Semipalmated Sandpiper	*Calidris pusilla*	Shorebird	Breeding	Yes
Short-billed Dowitcher	*Limnodromus griseus*	Shorebird	Breeding	Yes
Solitary Sandpiper	*Tringa solitaria*	Shorebird	Breeding	Yes
Spotted Sandpiper	*Actitis macularius*	Shorebird	Breeding	
Stilt Sandpiper	*Calidris himantopus*	Shorebird	Breeding	
Wandering Tattler	*Tringa incana*	Shorebird	Rare	
Western Sandpiper	*Calidris mauri*	Shorebird	Rare	
Whimbrel	*Numenius phaeopus*	Shorebird	Breeding	Yes
White-rumped Sandpiper	*Calidris fuscicollis*	Shorebird	Migrant	
Wilson's Phalarope	*Phalaropus tricolor*	Shorebird	Rare	
Wilson's Snipe	*Gallinago delicata*	Shorebird	Breeding	Yes
Waterbirds				
American Bittern	*Botaurus lentiginosus*	Waterbird	Breeding	Yes
American Coot	*Fulica americana*	Waterbird	Rare	
Arctic Tern	*Sterna paradisaea*	Waterbird	Breeding	Yes
Black Tern	*Chlidonias niger*	Waterbird	Breeding (irreg.)	
Black-legged Kittiwake	*Rissa tridactyla*	Waterbird	Migrant	
Bonaparte's Gull	*Chroicocephalus philadelphia*	Waterbird	Breeding	Yes

Table A1-1 continued

Common Name	Scientific Name	Bird group	Residency	Priority
California Gull	*Larus californicus*	Waterbird	Breeding	Yes
Common Loon	*Gavia immer*	Waterbird	Breeding	Yes
Caspian Tern	*Hydroprogne caspia*	Waterbird	Breeding	Yes
Common Tern	*Sterna hirundo*	Waterbird	Breeding	Yes
Glaucous Gull	*Larus hyperboreus*	Waterbird	Resident	
Herring Gull	*Larus argentatus*	Waterbird	Breeding	Yes
Horned Grebe	*Podiceps auritus*	Waterbird	Breeding	Yes
Little Gull	*Hydrocoloeus minutus*	Waterbird	Breeding (irreg.)	Yes
Long-tailed Jaeger	*Stercorarius longicaudus*	Waterbird	Breeding (irreg.)	
Mew Gull	*Larus canus*	Waterbird	Breeding	
Pacific Loon	*Gavia pacifica*	Waterbird	Breeding	Yes
Parasitic Jaeger	*Stercorarius parasiticus*	Waterbird	Breeding (irreg.)	
Pied-billed Grebe	*Podilymbus podiceps*	Waterbird	Breeding	
Pomarine Jaeger	*Stercorarius pomarinus*	Waterbird	Rare	
Red-necked Grebe	*Podiceps grisegena*	Waterbird	Breeding (irreg.)	
Red-throated Loon	*Gavia stellata*	Waterbird	Breeding	Yes
Ring-billed Gull	*Larus delawarensis*	Waterbird	Breeding	
Ross's Gull	*Rhodostethia rosea*	Waterbird	Breeding (irreg.)	Yes
Sabine's Gull	*Xema sabini*	Waterbird	Rare	
Sandhill Crane	*Grus canadensis*	Waterbird	Breeding	
Sora	*Porzana carolina*	Waterbird	Breeding	Yes
Thayer's Gull	*Larus thayeri*	Waterbird	Rare	
Yellow Rail	*Coturnicops noveboracensis*	Waterbird	Breeding	Yes
Yellow-billed Loon	*Gavia adamsii*	Waterbird	Breeding (irreg.)	
Waterfowl				
American Black Duck	*Anas rubripes*	Waterfowl	Breeding	Yes
American Wigeon	*Anas americana*	Waterfowl	Breeding	Yes
Black Scoter	*Melanitta americana*	Waterfowl	Breeding (irreg.)	Yes
Blue-winged Teal	*Anas discors*	Waterfowl	Breeding	
Bufflehead	*Bucephala albeola*	Waterfowl	Breeding	Yes
Cackling Goose	*Branta hutchinsii*	Waterfowl	Migrant	
Canada Goose	*Branta canadensis*	Waterfowl	Breeding	Yes
Canvasback	*Aythya valisineria*	Waterfowl	Breeding (irreg.)	
Common Eider	*Somateria mollissima*	Waterfowl	Breeding	Yes
Common Goldeneye	*Bucephala clangula*	Waterfowl	Breeding	
Common Merganser	*Mergus merganser*	Waterfowl	Breeding	
Gadwall	*Anas strepera*	Waterfowl	Breeding (irreg.)	
Greater Scaup	*Aythya marila*	Waterfowl	Breeding	Yes

Table A1-1 continued

Common Name	Scientific Name	Bird group	Residency	Priority
Greater White-fronted Goose	*Anser albifrons*	Waterfowl	Migrant	
Green-winged Teal	*Anas crecca*	Waterfowl	Breeding	
King Eider	*Somateria spectabilis*	Waterfowl	Breeding (irreg.)	
Lesser Scaup	*Aythya affinis*	Waterfowl	Breeding	Yes
Lesser Snow Goose	*Chen caerulescens caerulescens*	Waterfowl	Breeding	Yes
Long-tailed Duck	*Clangula hyemalis*	Waterfowl	Breeding (irreg.)	Yes
Mallard	*Anas platyrhynchos*	Waterfowl	Breeding	
Northern Pintail	*Anas acuta*	Waterfowl	Breeding	Yes
Northern Shoveler	*Anas clypeata*	Waterfowl	Breeding	
Red-breasted Merganser	*Mergus serrator*	Waterfowl	Breeding	
Redhead	*Aythya americana*	Waterfowl	Breeding	
Ring-necked Duck	*Aythya collaris*	Waterfowl	Breeding	
Ross's Goose	*Chen rossii*	Waterfowl	Breeding (irreg.)	
Ruddy Duck	*Oxyura jamaicensis*	Waterfowl	Breeding (irreg.)	
Surf Scoter	*Melanitta perspicillata*	Waterfowl	Breeding	Yes
Tundra Swan	*Cygnus columbianus*	Waterfowl	Migrant (irreg.)	
White-winged Scoter	*Melanitta fusca*	Waterfowl	Breeding	Yes

Species Removed from Priority List in BCR 7

Table A1-2. Species removed from priority list by the expert review process.

Species	Scientific Name	Reason for Removal
American Three-toed Woodpecker	*Picoides dorsalis*	Peripheral in BCR 7
Canada Warbler	*Wilsonia canadensis*	No evidence of occupancy in BCR 7
Snow Bunting	*Plectrophenax nivalis*	No evidence of breeding in BCR 7
Northern Hawk Owl	*Surnia ulula*	Peripheral in BCR 7
Black-bellied Plover	*Pluvialis squatarola*	No evidence of breeding in BCR 7
Buff-breasted Sandpiper	*Philomachus pugnax*	No evidence of breeding in BCR 7
Eskimo Curlew	*Numenius borealis*	No evidence of breeding in BCR 7
Marbled Godwit	*Limosa fedoa*	Does not occur in BCR 7
Red Knot	*Calidris canutus*	No evidence of breeding in BCR 7
Red Phalarope	*Phalaropus fulicarius*	No evidence of breeding in BCR 7
Ruddy Turnstone	*Arenaria interpres*	No evidence of breeding in BCR 7
Sanderling	*Calidris alba*	No evidence of breeding in BCR 7
American White Pelican	*Pelecanus erythrorhynchos*	Does not occur in BCR 7
Black Tern	*Chlidonias niger*	Peripheral in BCR 7
Yellow-billed Loon	*Gavia adamsii*	Peripheral in BCR 7
Barrow's Goldeneye	*Bucephala islandica*	Does not occur in BCR 7
Brant	*Branta bernicla*	Does not occur in BCR 7
Gadwall	*Anas strepera*	Rare migrant
King Eider	*Somateria spectabilis*	Peripheral in BCR 7

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.[13]

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

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

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

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

For landbirds, BCR-specific assessment data were obtained from the Rocky Mountain Bird Observatory and priority and stewardship species were identified following Partners In Flight (PIF) guidelines (Panjabi et al. 2005). However, population trend scores for species in this portion of BCR 7-PNR are not from BCR-specific surveys. In cases where survey data were not available for even a portion of the BCR, the population trend score was sometimes revised to "uncertain trend." For waterfowl, waterfowl conservation region (WCR)-specific assessment data were obtained from the NAWMP Implementation Framework (North American Waterfowl Management Plan 2004). Additional population trend information was considered from an N.W.T. analysis of waterfowl density for 1976–2003 (Fournier and Hines 2005) and long-term count data from a waterfowl study near Yellowknife[14] as well as Strata 16 spring waterfowl transects. For shorebirds and waterbirds, only national assessment data and information were available (Donaldson et al. 2000 , Milko et al. 2003). As for landbirds, species that had no information to substantiate a population score in the BCR were revised to "uncertain trend." See Element 3 for more detail.

Within BCR 7-PNR, additional species were added to the priority species list based on two assessments at the regional level: Provincial/Territorial General Status Ranks and expert opinion.

General Status Ranks

This is a numerical rank (0.1, 1–8) assigned for a species that represents its status in a specific province or territory where it occurs. GS ranks are reassessed every five years; GS ranks from 2010 were used to assess additional PNR species. To be included as a priority species (P-PNR), a species' GS rank had to be ≤3 ("At Risk," "May be at Risk," or "Sensitive") in a province or territory that overlaps the species' range within BCR 7-PNR. See Wild Species for more information on GS ranks.

[14] Yellowknife Study Area (YKSA)

Expert Opinion
Opinions of experts of the four bird groups were sought for each BCR. Some species were added or removed from the priority list based on expert opinion, and the reasoning was documented (for a list of species removed by the expert review process, see Table A1-2 in Appendix 1).

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, etc.), or to group species into regionally relevant habitat classes, individual BCR strategies may identify finer scale habitat classes. Finer-scale habitat attributes and the surrounding landscape context were also captured when possible to better guide the development of specific conservation objectives and actions.

A maximum of five habitat associations were identified for each priority species for BCR 7-PNR. Although other habitats may be used by priority species, the five selected represented the most important or most commonly used habitats for each species. However, we did not rank the relative importance of each habitat association for a given species. A complete list of all broad habitat class associations for all priority species is provided in Appendix 3.

Element 3: Population Objectives for Priority Species

A central component of effective conservation planning is setting clear objectives that can be measured and evaluated. Bird Conservation Strategies set objectives based upon the conservation philosophies of national and continental bird initiatives, including the North American Bird Conservation Initiative (NABCI), that support conserving the

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

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

Final population objectives for BCR 7-PNR were adjusted beyond a standard prescription (the 1:1 correspondence of national population trend scores:population objective) based on several criteria owing to the lack of BCR 7-PNR specific survey data. For landbirds with a BCR trend that was based on wintering ground surveys (Christmas Bird Count), the trend and resulting objective was not adjusted (e.g., Harris's Sparrow). For remaining species with no valid trend data in the BCR, the objective was modified to Assess/Maintain unless other published research data with trend information was available. For waterfowl, those species in Waterfowl Conservation Area 7.1 and 7.2 with a "Highest" or "High" or "Moderately High" or "Moderate" breeding need were given objectives commensurate with their trend data from the larger (outside BCR 7-PNR) traditional survey data (six species). A few species' trends were plotted from Strata 16 population estimates (1955–2011) as a final check. Shorebirds and waterbirds were treated similarly to landbirds (data deficient = "Assess/Maintain"). Finally, results were compared to (and often harmonized with) other areas of BCR 7 or BCR 3 (for arctic-breeding shorebirds that are mostly around Churchill in BCR 7-PNR) because data may have been available from those regions to assess the species' population objective (Eastern Waterfowl Survey Area, Ontario Breeding Bird Atlas 1 & 2, Ontario and Quebec Shorebird Monitoring programs, Étude des Populations d'Oiseaux du Québec, among others). These adjustments are documented in the national BCR database.

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

In BCR 7-PNR, threats were identified using a variety of sources, including peer-reviewed literature, national and regional conservation plans, government reports, internal documents, and regional staff knowledge. We employed a systematic review process (Pullin and Knight 2001, 2003, Pullin et al. 2004) to assess the strength of evidence of each information source. Our threats assessment only considered threats believed to have a population-level effect on priority species. As per the methodology in Kennedy et al. (2012), threats identified as "Low" are not considered further for Conservation Objectives or Recommended Actions. **Since all threats in BCR 7-PNR were deemed to be "Low," this strategy has no Element 5 or 6.**

Appendix 3

Habitat Associations for Priority Species

Table A3. Habitat associations of priority species in BCR 7, Prairie and Northern Region. Much more specific information, including rank preferences of habitats of species in each BCR/province combination, is available at www.borealbirds.ca. The additional information is available for species with an ** notation.

Species	Coniferous	Deciduous	Mixed Wood	Shrub/Early Successional	Herbaceous	Lichens/Mosses	Bare Areas	Urban (Artificial Surfaces & Bare Areas)	Wetlands	Waterbodies, Snow and Ice	Coastal
Landbirds											
American Pipit				X	X	X					
American Tree Sparrow	X			X							
Barn Swallow								X	X		
Belted Kingfisher								X		X	
Black-backed Woodpecker	X										
Blackpoll Warbler**	X		X	X							
Boreal Chickadee**	X		X								
Common Nighthawk	X						X	X	X		
Eastern Phoebe		X		X			X	X			
Harris's Sparrow	X	X		X					X		
Merlin			X					X			
Northern Shrike	X			X				X			
Olive-sided Flycatcher**	X		X	X					X		
Palm Warbler**	X								X		
Peregrine Falcon (*anatum/tundrius*)							X	X	X		
Pine Grosbeak	X	X									
Rusty Blackbird**	X								X		
Short-eared Owl					X	X			X		
Smith's Longspur			X						X		
Swamp Sparrow**									X		
White-crowned Sparrow**	X		X	X					X		
White-throated Sparrow**	X	X	X	X					X		
Shorebirds											

Table A3 continued

Species	Coniferous	Deciduous	Mixed Wood	Shrub/Early Successional	Herbaceous	Lichens/Mosses	Bare Areas	Urban (Artificial Surfaces & Bare Areas)	Wetlands	Waterbodies, Snow and Ice	Coastal
American Golden-Plover				X	X	X					
Dunlin									X	X	
Greater Yellowlegs		X		X					X	X	
Hudsonian Godwit									X		
Killdeer					X		X	X			
Lesser Yellowlegs	X	X	X						X		
Red-necked Phalarope									X	X	
Semipalmated Sandpiper				X	X		X		X	X	
Short-billed Dowitcher	X								X		
Solitary Sandpiper				X					X	X	
Whimbrel						X			X		
Wilson's Snipe				X					X	X	
Waterbirds											
American Bittern					X				X		
Arctic Tern							X		X	X	
Bonaparte's Gull	X								X	X	
California Gull								X	X	X	
Caspian Tern							X			X	
Common Loon									X	X	
Common Tern							X		X	X	
Herring Gull							X	X		X	
Horned Grebe (western)									X	X	
Little Gull									X		
Pacific Loon									X	X	
Red-throated Loon									X	X	
Ross's Gull									X		
Sora									X	X	
Yellow Rail									X		
Waterfowl											
American Black Duck			X						X	X	
American Wigeon				X	X				X	X	

Table A3 continued

Species	Coniferous	Deciduous	Mixed Wood	Shrub/Early Successional	Herbaceous	Lichens/Mosses	Bare Areas	Urban (Artificial Surfaces & Bare Areas)	Wetlands	Waterbodies, Snow and Ice	Coastal
Black Scoter										X	
Bufflehead		X							X	X	
Canada Goose				X	X			X	X	X	
Common Eider										X	X
Greater Scaup									X	X	
Lesser Scaup				X					X	X	
Lesser Snow Goose				X	X				X		
Long-tailed Duck				X					X	X	
Northern Pintail									X		
Surf Scoter				X	X					X	
White-winged Scoter				X	X				X	X	
Totals	**16**	**7**	**9**	**21**	**12**	**4**	**9**	**11**	**45**	**29**	**1**
Percent of species selecting this habitat	**26**	**11**	**15**	**34**	**18**	**7**	**15**	**18**	**74**	**47**	**2**

www.**ec.gc.ca**

Additional information can be obtained at:
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