Environment Canada Environnement Canada

Bird Conservation Strategy for Bird Conservation Region 3 Prairie and Northern Region: Arctic Plains and Mountains

- Abridged Version -

June 2013



Canada

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.

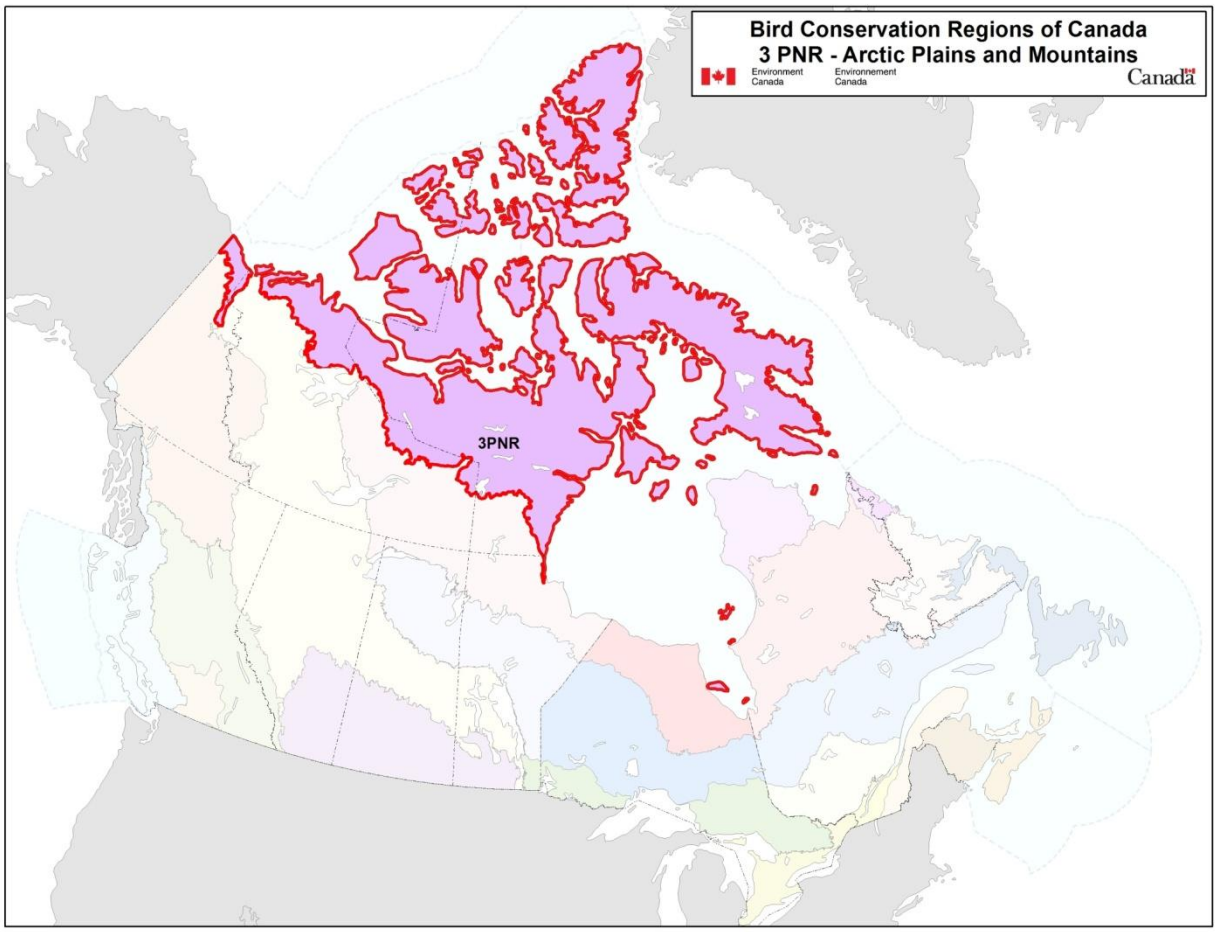
Conservation objectives and recommended actions from the conservation strategies will be used as the biological basis to develop guidelines and beneficial management practices that support compliance with regulations under the *Migratory Birds Convention Act*, 1994.

Acknowledgements

Paul Smith, Vicky Johnston and Craig Machtans were the main authors of this document, which follows templates developed by Alaine Camfield, Judith Kennedy and Elsie Krebs with the help of the BCR planners in each of the Canadian Wildlife Service regions throughout Canada. However, work of this scope cannot be accomplished without the contribution of other colleagues who provided or validated technical information, commented on earlier draft versions of the strategy and supported the planning process. We would like to thank the following people: Kathy Dickson, Lynne Dickson, Garry Donaldson, Dave Duncan, Tony Gaston, Grant Gilchrist, Jim Leafloor, Josée Lefebvre, Mark Mallory, Erica Nol, Myra Robertson, Jennie Rausch, Pam Sinclair and Samantha Song.

To obtain a copy of the complete version of this strategy, please contact us at migratorybirds_oiseauxmigrateurs@ec.gc.ca.

Bird Conservation Strategy for Bird Conservation Region 3 Prairie and Northern Region: Arctic Plains and Mountains



Executive Summary

Bird Conservation Region (BCR) 3, Arctic Plains and Mountains, covers an area of more than 2 900 000 km^2 and spans the continent from Alaska to Labrador. The habitats within this area are varied, from sparse taiga forests at the treeline, to wet coastal meadows of sedges and grasses, to gravel barrens and glaciers. The majority of this BCR falls within Nunavut and the Northwest Territories, with smaller portions in Quebec, Labrador and the Yukon. This strategy covers all of BCR 3 contained within Environment Canada's Prairie and Northern Region, the small portion in the Yukon, and the five associated marine ecoregions. We refer to this area as BCR 3 PNR.

These conservation strategies serve as a framework for implementing bird conservation nationally and also identify international conservation issues for Canada's priority birds. Objective and replicable methods were used to identify priority species, define habitat associations, set population targets, assess and rank threats, set conservation objectives, and address these objectives with conservation actions. This strategy is not intended to be highly prescriptive, but rather is intended to guide future implementation efforts undertaken by various partners and stakeholders.

We evaluated 159 species of birds that occur in the terrestrial and marine habitats of BCR 3 PNR, and determined that 65 met the criteria for priority status. More than 70% of these species used wetland habitats, although shrub habitats (especially heath tundra), bare areas (including a variety of coastal habitats, gravel barrens and cliffs) and aquatic habitats (freshwater and marine) were also important.

Population objectives were set on the basis of observed trends; however, inadequate monitoring information was a pervasive issue: we were unable to assign a quantitative population objective for 34% of the priority species. For 35% of priority species, there was sufficient evidence of declines that we recommend increasing the population size. Management for a majority of species would be improved with better information on population size, trend and range. Recommendations are made for the priority species most in need of improved monitoring.

The threats assessment identified many activities or issues potentially causing harm to BCR 3 PNR's priority birds. Given the limited footprint of development in the region and the migratory habits of almost all arctic-breeding birds, a majority of these threats are outside of the BCR. Pollution, habitat loss and degradation, and legal and illegal hunting (primarily outside of North America) are among the most important threats. Even within the BCR, some of the most important threats stem indirectly from human activities elsewhere; issues such as anthropogenic climate change, degradation of tundra habitats from abundant waterfowl (a result of southern land-use changes), and long-range transport and deposition of contaminants all negatively impact arctic wildlife but are not caused by activities in the North.

Conservation actions are recommended to address threats both within and outside BCR 3 PNR. Within the BCR, many recommended actions relate to law and policy, including continued enforcement of existing regulations, development of new regulations or beneficial management practices, and strengthening of legislation. Actions involving direct management or protection of species or habitats were recommended in fewer cases because such direct management would be difficult to achieve on the scale required for such a large planning unit. For some issues, it was determined that additional research, monitoring or other information could increase our ability to address threats. Suggestions to acquire this information are provided.

Introduction: Bird Conservation Strategies

Context

This document is one of a suite of Bird Conservation Region Strategies (BCR strategies) that have been drafted by Environment Canada for all regions of Canada. These strategies respond to Environment Canada's need for integrated and clearly articulated bird conservation priorities to support the implementation of Canada's migratory birds program, both domestically and internationally. This suite of strategies builds on existing conservation plans for the four "bird groups" (waterfowl,[1] waterbirds,[2] shorebirds[3] and landbirds[4]) in most regions of Canada, as well as on national and continental plans, and includes birds under provincial/territorial jurisdiction. These new strategies also establish standard conservation planning methods across Canada, and fill gaps, as previous regional plans do not cover all areas of Canada or all bird groups.

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

The BCR strategies are not highly prescriptive. In most cases, practitioners will need to consult additional information sources at local scales to provide sufficient detail to implement the recommendations of the strategies. Tools such as beneficial management practices will also be helpful in guiding implementation. Partners interested in participating in the implementation of these strategies, such as those involved in the habitat Joint Ventures established under the North American Waterfowl Management Plan, 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, published here, 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, included in the full version of the strategy, 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, also part of the full strategy, 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 of the full strategy, 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 3

BCR 3 covers an area from the treeline to the northernmost tip of Ellesmere Island (Fig. 1a,b), and spans the breadth of the continent from the North Slope of Alaska to the Atlantic coast of Labrador. It encompasses an area of more than 2 900 000 km^2. Within Canada, a majority of BCR 3 falls within Nunavut and the Northwest Territories, and is therefore within the boundaries of Environment Canada's Prairie and Northern Region (PNR). In addition, five marine ecoregions are associated with BCR 3 PNR: Hudson Bay Complex, Arctic Basin, Eastern Arctic (Lancaster Sound, Baffin Bay – Davis Strait), Arctic Archipelago and Western Arctic (Beaufort-Amundsen-Viscount-Melville-Queen Maud; see Fisheries and Oceans Canada 2009). The North Slope of the Yukon falls within BCR 3 and is considered here; however, the portions of BCR 3 within Quebec and Labrador are considered in separate conservation strategies.

Habitats within this vast area are diverse, but all are influenced by a short growing season and continuous permafrost. The northeast portion of the region is mountainous, with unvegetated, barren rock and glaciers predominating (Fig. 1a,b). Elsewhere in the High Arctic, ground cover is often sparse and in drier areas is dominated by herbs, lichens and dwarf shrubs. At these latitudes, many of the key habitats for birds are marine (Fig. 2a,b). Low-lying wetlands of grasses, sedges and mosses are not widespread but offer important bird habitat where they occur. These wetlands are more common at mid- and low-arctic latitudes, and some areas such as the Great Plain of the Koukdjuak or the Mackenzie Delta offer large expanses of comparatively rich tundra wetlands; these wetlands figure prominently in the network of protected areas and key sites in the region (Fig. 2a,b). Surface water is extensive, and areas of patterned ground are common. Upland habitats at mid- and low-arctic latitudes range from heavily vegetated heath communities to sparse "cryptobiotic crusts" of cyanobacteria, lichens and moss. Shrubs, especially willows, are taller at lower latitudes. At the southern fringe of BCR 3 PNR, small spruce trees are found in sheltered areas; these restricted patches of taiga (i.e., coniferous) habitat are home to a number of species not found elsewhere in the BCR.

Bird diversity in this vast area is low in comparison to more temperate latitudes. Still, a large number of species are reliant on the marine and terrestrial habitats of BCR 3 PNR. In terms of number of species, the bird community is dominated by shorebirds, waterbirds and waterfowl. Although numerous landbirds are found here, few species have their range centred in the Canadian Arctic. This pattern holds across the circumpolar Arctic, where 108 of 162 Arctic specialist species are from the Orders Charadriiformes and Anseriformes (especially from families Scolopacidae [sandpipers and allies, Laridae (gulls) and Alcidae [auks] and subfamilies Mergini [sea ducks] and Anserini [geese]; Gantner and Gaston in prep.).

A small number of species remain in BCR 3 during the non-breeding season, travelling only as far as is necessary to find food. Some seaducks and seabirds migrate east or west to winter in high-latitude marine environments. Some shorebirds and Brant breeding in the High Arctic winter in northern Europe. However, the vast majority of species migrate south, including many shorebirds that travel thousands of kilometres to winter in Central and South America.

These long-range migrations expose arctic-breeding species to a variety of risks throughout the annual cycle. Identifying these risks, both within and outside BCR 3 PNR, is a focus of this conservation strategy.

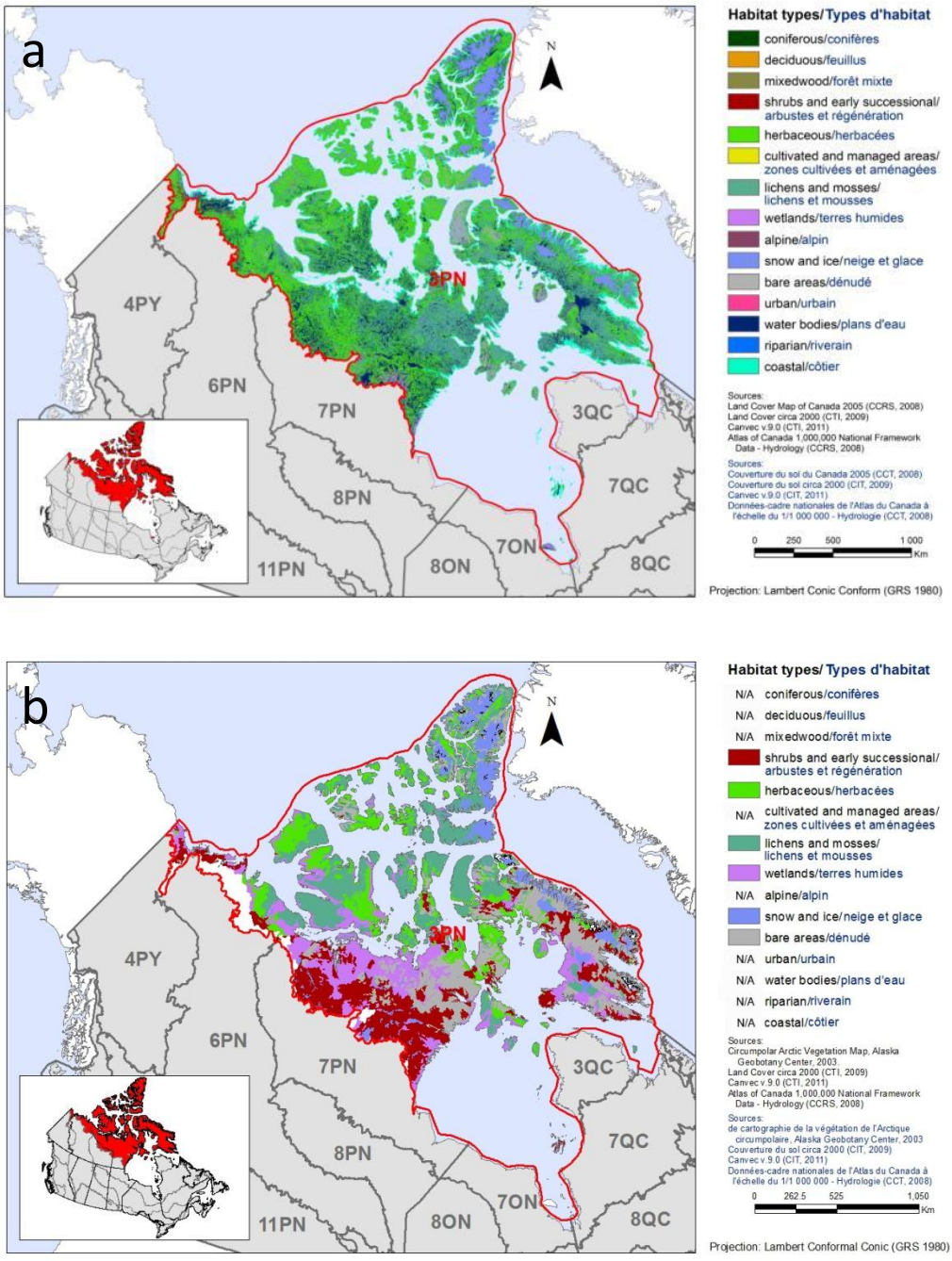


Figure 1. Landcover in BCR 3 PNR as described by the Land Cover Map of Canada (a), and the Circumpolar Arctic Vegetation Map (CAVM; b). The former offers a consistent national classification while the latter is better suited to capturing variation in arctic habitats specifically. A small portion of the southern edge of BCR 3 is outside of the area classified by the CAVM.

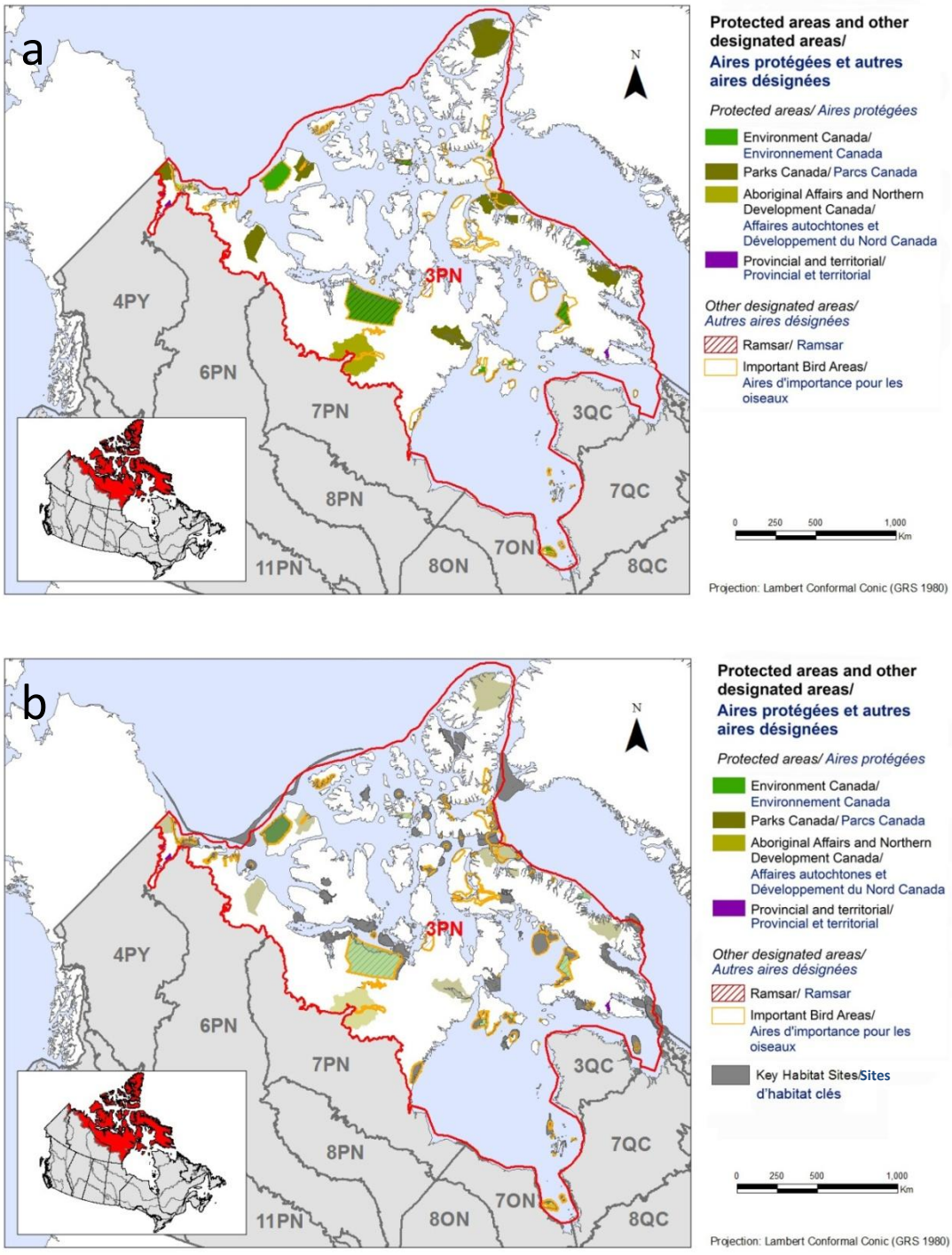


Figure 2. Map of protected and designated areas in BCR 3 PNR (a), and a map including areas considered by Environment Canada to be Key Habitat Sites for migratory birds, including those with no formal protection (b). The areas from the top panel were made partially transparent in the bottom panel so that overlap of key areas and protected areas would be visible.

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. 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.

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 3 PNR by bird group and by the reason for priority status.

Across all bird groups, 65 of 159 (41%) species/populations were designated as priority taxa (Table 1 and 2). A large fraction of the candidate species, especially for landbirds, did not merit priority status because their populations are concentrated outside of the Arctic. For landbirds, for example, 43/62 species (69%) were estimated to have ≤10% of their range within BCR 3. For shorebirds and waterfowl, bird groups with many arctic specialist species, >50% of candidate species were assigned priority status (Table 2). Nine arctic species are formally assessed as "at risk" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) or listed under the *Species at Risk Act* (SARA; Table 3). The vast majority of species were assigned priority status based on concern over population size or trend, or threats that they face throughout the year.

Table 1. Priority species in BCR 3 PNR, population objectives, and the reasons for priority status.

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Landbirds										
American Pipit	Maintain current									Yes
American Tree Sparrow	Increase 50%									Yes
Bluethroat	Assess/Maintain									Yes
Eastern Yellow Wagtail	Assess/Maintain									Yes
Golden Eagle	Increase 50%				Yes					
Gyrfalcon	Assess/Maintain					Yes	Yes			
Harris's Sparrow	Increase 100%			Yes			Yes			
Hoary Redpoll	Increase 50%					Yes	Yes			
Lapland Longspur	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 http://www.registrelep-sararegistry.gc.ca/species/schedules_e.cfm?id=1).
[3] NAWMP: North American Waterfowl Management Plan (NAWMP Plan Committee 2004)
[4] The higher of the Waterfowl Conservation Region (WCR) ranks for breeding or non-breeding needs presented in the NAWMP Management Plan
[5] Expert review indicates that a species was added to the priority list as a result of expert opinion

Table 1 continued

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Peregrine Falcon (*anatum*/*tundrius*)	Assess/Maintain†	SC	SC			Yes	Yes			
Rock Ptarmigan	Assess/Maintain					Yes				
Rough-legged Hawk	Assess/Maintain					Yes	Yes			
Rusty Blackbird	Increase 100%†	SC	SC	Yes						
Short-eared Owl	Increase 100%†	SC	SC	Yes	Yes					
Smith's Longspur	Assess/Maintain			Yes			Yes			
Snow Bunting	Assess/Maintain					Yes				
Snowy Owl	Maintain current					Yes	Yes			
Shorebirds										
American Golden-Plover	Assess/Maintain			Yes						
Black-bellied Plover	Increase 100%			Yes						
Buff-breasted Sandpiper	Increase 50%			Yes						
Common Ringed Plover	Assess/Maintain									Yes
Dunlin	Assess/Maintain			Yes						

† This interim population objective will be replaced with the official recovery objective once a recovery document is published for this species under the *Species at Risk Act*.

Table 1 continued

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Eskimo Curlew	Recovery objective	E	E	Yes						
Hudsonian Godwit	Increase 100%									Yes
Least Sandpiper	Increase 100%			Yes						
Purple Sandpiper	Assess/Maintain									Yes
Red Knot (*islandica*)	Assess/Maintain	SC	SC	Yes						
Red Knot (*rufa*)	Increase 100%[†]	E	E	Yes						
Red Phalarope	Increase 50%			Yes						
Red-necked Phalarope	Increase 100%			Yes						
Ruddy Turnstone	Assess/Maintain			Yes						
Sanderling	Assess/Maintain			Yes						
Semipalmated Sandpiper	Increase 100%			Yes						
Stilt Sandpiper	Increase 100%			Yes						
Surfbird	Assess/Maintain			Yes						
Whimbrel	Assess/Maintain			Yes						

[†] This interim population objective will be replaced with the official recovery objective once a recovery document is published for this species under the *Species at Risk Act*.

Table 1 continued

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Waterbirds										
Arctic Tern	Increase 50%			Yes						
Common Loon	Maintain current			Yes						
Ivory Gull	Recovery objective	E	E	Yes						
Pacific Loon	Assess/Maintain			Yes						
Ross's Gull	Recovery objective	T	T	Yes						
Thayer's Gull	Assess/Maintain			Yes						
Thick-billed Murre	Maintain current			Yes						
Yellow-billed Loon	Assess/Maintain			Yes						
Waterfowl[6]										
Brant (Atlantic)	Maintain current							Mod. Low	High	
Brant (Black)	Maintain current							High	Highest	
Brant (Eastern High Arctic)	Maintain current							Mod. High	High	

[6] These population divisions correspond to those in the most current management plan (NAWMP 2012). However, evolving knowledge of distributions and a trend towards defining management units that reflect breeding aggregations means that these divisions may be lost in future iterations of this strategy (e.g., Leafloor et al. 2012)

Table 1 continued

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Brant (Western High Arctic)	Assess/Maintain							High	Highest	
Cackling Goose (Shortgrass Prairie)	Increase 50%							Mod.	High	
Cackling Goose (Tallgrass Prairie)	Maintain current							Mod. Low	High	
Canada Goose (Atlantic)	Maintain current							High	Highest	
Common Eider (*borealis*)	Increase 50%							High	Highest	
Common Eider (*sedentaria*)	Increase 50%							High	Highest	
Common Eider (*v-nigra*)	Increase 50%							High	Highest	
Greater Snow Goose	Decrease							Above Objective	High	
Greater White-fronted Goose	Maintain current							Mod. Low	High	
Harlequin Duck (Eastern)	Maintain current	SC	SC					Mod.	Mod. High	
King Eider	Increase 50%							Mod. High	High	
Lesser Snow Goose (Mid-Continent)	Decrease							Above Objective	High	
Lesser Snow Goose (Western Arctic)	Decrease							Above Objective	High	
Lesser Snow Goose (Western Central Flyway)	Maintain current							Mod.	High	
Long-tailed Duck	Increase 50%							Mod. High	High	

Table 1 continued

Priority species	Population objective	COSEWIC[1]	SARA[2]	National/continental concern (landbirds, shorebirds, waterbirds)	Regional concern (landbirds only)	Continental stewardship (landbirds only)	Regional stewardship (landbirds only)	NAWMP[3] continental priority (waterfowl only)	NAWMP WCR rank[4] (waterfowl only)	Expert review[5] (added to priority list)
Northern Pintail	Increase 50%							High	High	
Ross's Goose	Decrease							Above Objective	High	
Tundra Swan (Eastern)	Maintain current							Mod. Low	High	

Table 2. Summary of priority species, by bird group, in BCR 3 PNR.

Bird group	Total species	Total priority species	Percent listed as priority	Percent of priority list
Landbird	62	17	27%	26%
Shorebird	31	19	61%	29%
Waterbird	28	8	29%	12%
Waterfowl	38	21	55%	32%
All	159	65	41%	100%

Table 3. Number of priority species in BCR 3 PNR by reason for priority status.

Reason for priority listing[1]	Landbirds	Shorebirds	Waterbirds	Waterfowl
COSEWIC[2]	3	3	2	1
Federal SARA Listed[3]	3	3	2	1
NAWMP[4]	-	-	-	21
National/Continental Concern	4	16	8	-
Regional Concern	2	-	-	-
National/Continental Stewardship	8	-	-	-
Regional Stewardship	7	-	-	-
Expert Review	4	3	-	-

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

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. 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.

Wetland habitats were used by 72% of priority species, and nearly half of all priority species used three additional habitat categories: shrub/early successional (shrub tundra, including both willow and heath habitat types), bare areas (e.g., rocky coasts or cliffs) or waterbodies, snow and ice (freshwater or marine; Fig. 3). Habitats were further defined on the basis of their location; nearly half of the priority species used habitats that were located in coastal areas, while few species were found in alpine habitats. Taiga (i.e., coniferous) habitats, although uncommon in BCR 3 PNR, were used by 8% of priority species.

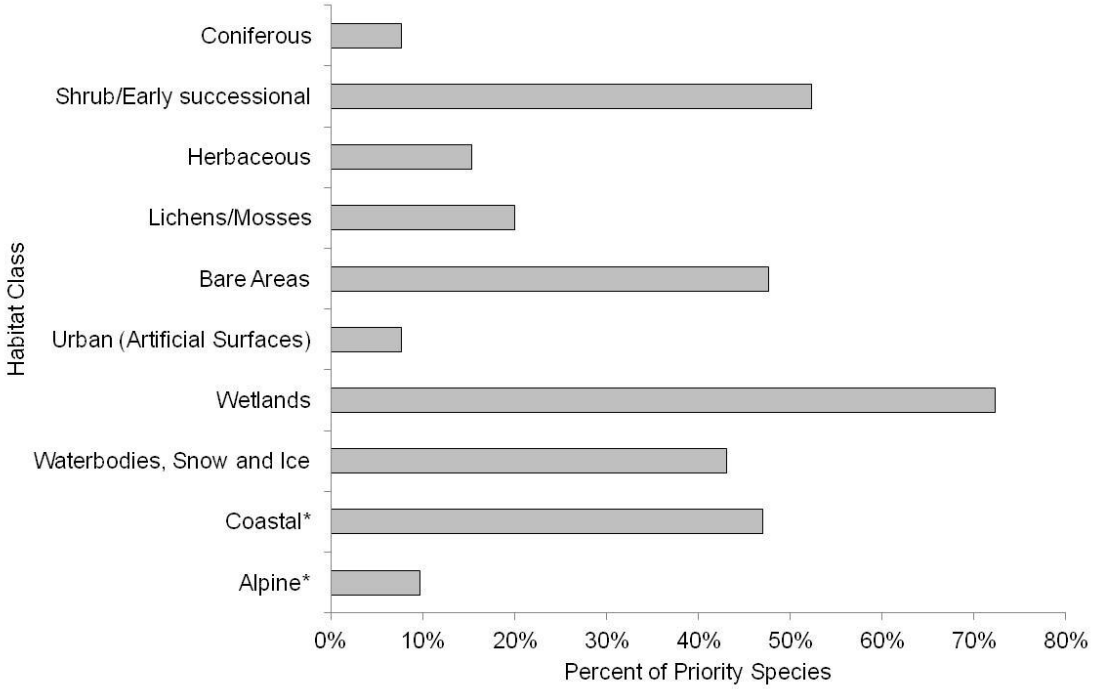


Figure 3. Percent of priority species that are associated with each habitat type in BCR 3 PNR.
The total exceeds 100% because each species may be assigned to more than one habitat (median = 3).
*"Coastal" and "Alpine" are descriptors applied after the habitat category was assigned.

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. For any species listed under SARA or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. The ultimate measure of conservation success will be the extent to which population objectives have been reached over the next 40 years. Population objectives do not currently factor in feasibility of achievement, but are held as a standard against which to measure progress.

In BCR 3 PNR, incomplete monitoring information (leading to unknown trends) resulted in 22 species (34%) being assigned an objective of "assess/maintain" the population (Fig. 4). Although the lack of detailed monitoring data was a pervasive issue, for 23 (35%) species, evidence for declines was sufficient to make recommendations for increasing population size. Methods are described in Kennedy et al. (2012), but in general, species with large, documented declines were assigned an objective of 100% population increase, whereas those with small or possible declines were assigned an objective of 50% increase. Four populations of white geese are considered to be above their population objectives, and objectives of decreasing current population size were assigned. An additional four species (Ivory Gull, Ross's Gull, Red Knot *rufa* and Eskimo Curlew), are listed under SARA as species at risk, and therefore their population objectives are or will be defined in recovery documents.

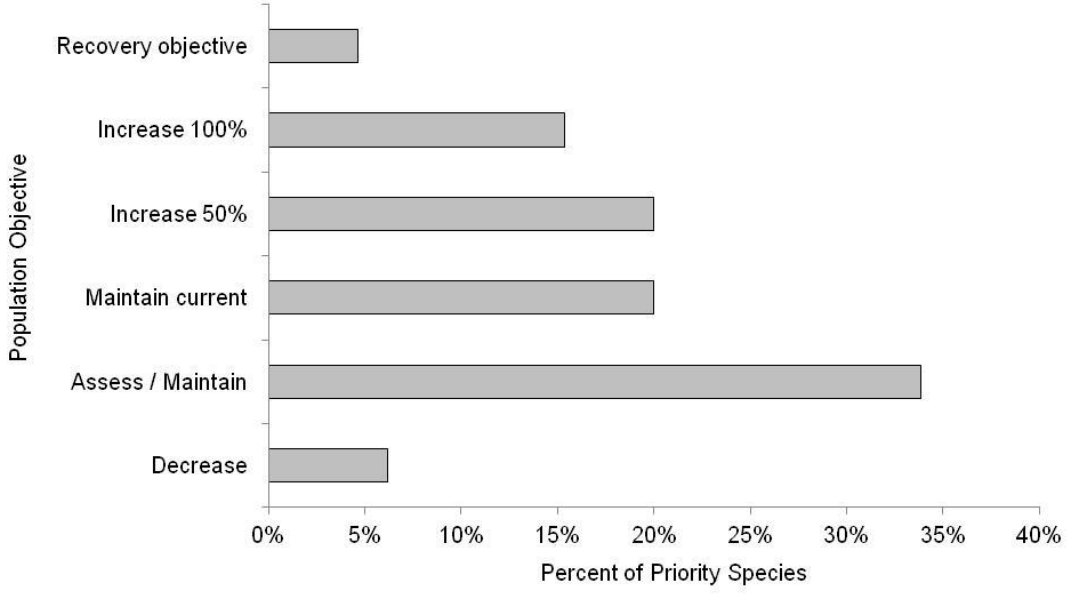


Figure 4. Percent of priority species that are associated with each population objective category in BCR 3 PNR.

Element 4: Threat Assessment for Priority Species

The threat assessment process 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 of sparse human settlement and limited development in BCR 3 PNR, the dominant threats to priority bird populations differ from those in most other parts of the country. Development has a limited footprint, and agriculture is non-existent. Resource extraction does impact priority birds, but because such activities are on a localized scale, effects are estimated to be low at the population level (Fig. 5). Similarly, harvest and bycatch of priority birds have low impacts on any one population, and are considered a threat of low magnitude overall (Table 4) despite influencing a number of priority species. Among the most important threats to priority birds in BCR 3 are issues that stem indirectly from human activities elsewhere. Issues such as anthropogenic climate change, degradation of tundra habitats from abundant waterfowl (a result of southern land-use changes) and deposition of contaminants transported over long ranges all negatively impact arctic wildlife but have little to do with activities in the North.

It is perhaps not surprising then that a majority of the significant threats to BCR 3 PNR's priority species occur outside of the BCR. While outside the BCR, the Arctic's priority birds are exposed to a diversity of threats including pollution, legal and illegal hunting, and development. These and other threats occurring outside of Canada are discussed in a subsequent section of the strategy.

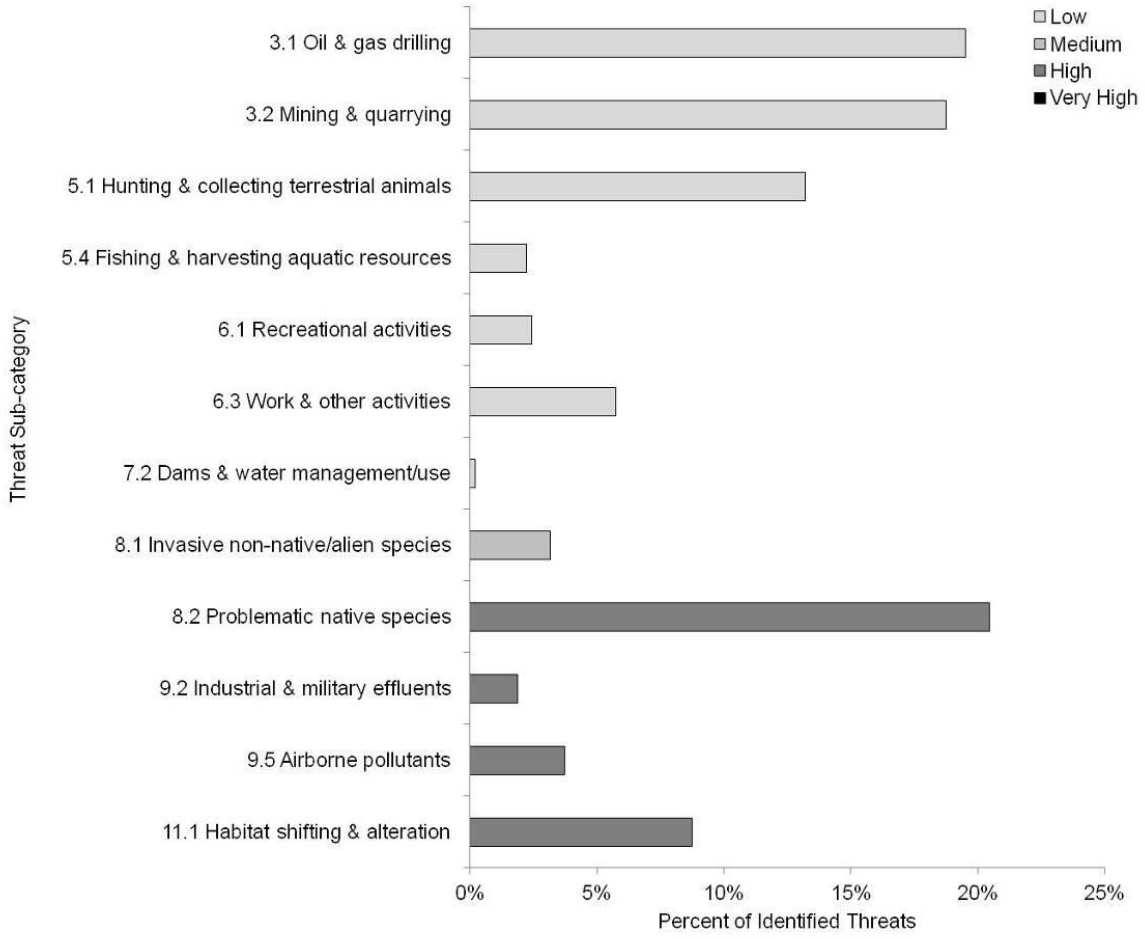


Figure 5. Percent of identified threats to priority species within BCR 3 PNR by threat sub-category.
Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 3 PNR (for example, if 100 threats were identified in total for all priority species in BCR 3 PNR, and 10 of those threats were in the category 3.1 Oil & gas drilling, the bar on the graph would represent this as 10%). Shading in the bars represents the rolled up magnitude of all threats in each threat sub-category in the BCR. "9.2 Industrial & military effluents" refers primarily to accidental oil spills and chronic oil discharge.

Table 4. Relative magnitude of identified threats to priority species within BCR 3 PNR 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	Coniferous	Shrub/Early successional	Herbaceous	Lichens/Mosses	Bare areas	Artificial surfaces	Wetlands	Waterbodies, snow and ice	Overall
Overall	**L**	**M**	**M**	**L**	**M**	**L**	**H**	**H**	
1. Residential & Commercial Development									
2. Agriculture & aquaculture									
3. Energy production & mining	L	L	L	L	L	L	L	L	**L**
4. Transportation & service corridors									
5. Biological resource use		L	L	L	L		L	L	**L**
6. Human intrusions & disturbance		L	L	L	L	L	L	L	**L**
7. Natural system modifications								L	**L**
8. Invasive & other problematic species & genes	L	H	H	M	L	L	H	M	**H**
9. Pollution		L	L		H	L	L	H	**H**
11. Climate change & severe weather	L	M	M		M		H	H	**H**

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 3 PNR, the largest proportion of objectives relate to ensuring an adequate supply and quality of habitat (38%; Fig. 6). Examples of objectives in this category include the development or implementation of policies relating to habitat conservation, objectives related to maintaining specific habitat features or characteristics, and reduction of pollution or other forms of habitat degradation. Objectives related to an improved understanding of species' ecology or limiting factors were also important, contributing 26% of records. Direct management of individual species accounted for only 11% of records.

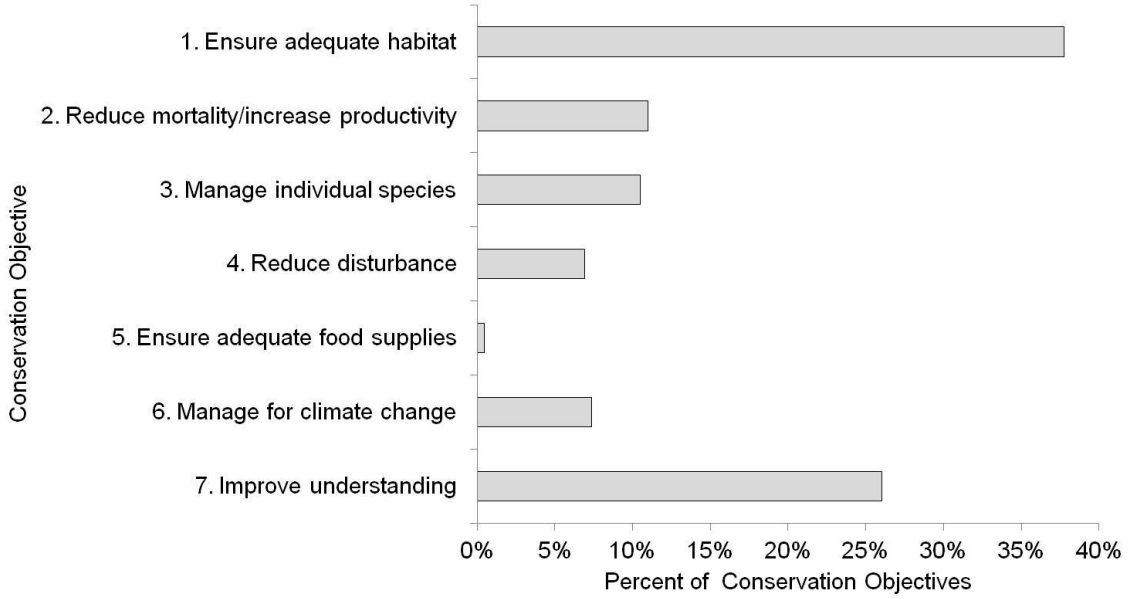


Figure 6. Percent of all conservation objectives assigned to each conservation objective category in BCR 3 PNR.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (Fig. 7). Actions are strategic rather than highly detailed and prescriptive. Whenever possible, recommended actions benefit multiple species and/or respond to more than one threat. Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but will usually be more general than those developed for individual species.

The largest proportion of recommended actions for BCR 3 PNR relate to law and policy (sub-categories 5.1 and 5.4), including increasing the enforcement of existing regulations, developing new regulations or beneficial management practices, and strengthening legislation. Actions involving management or protection of sites or habitats were recommended in 21% of cases. Direct management of species was recommended in only 18% of cases, a lower proportion than for some other regions because it would be difficult to achieve on the scale required for such a large and remote area. For some issues, it was determined that additional research or monitoring information was needed in order to devise appropriate conservation actions. Additional detail on suggested conservation actions is provided in subsequent sections.

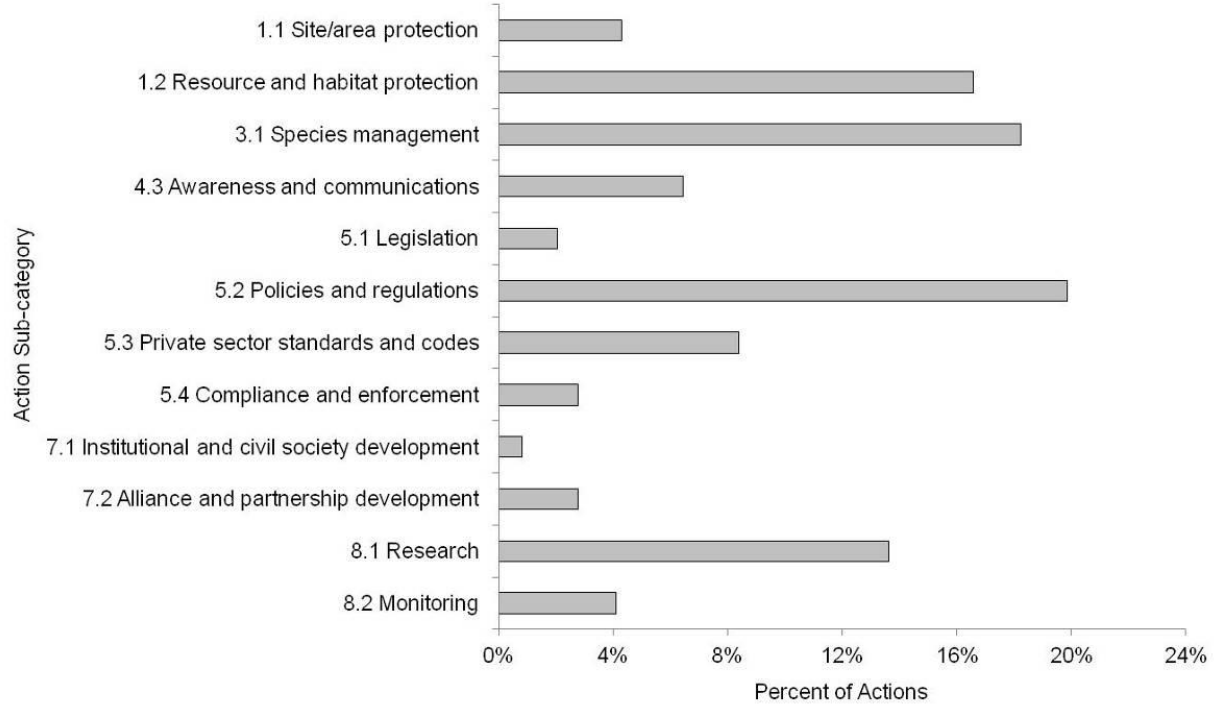


Figure 7. Percent of recommended actions assigned to each sub-category in BCR 3 PNR.
"8.1 Research" and "8.2 Monitoring" refers to cases where additional species-specific information is required.

References

CAVM Team. 2003. *Circumpolar Arctic Vegetation Map (scale 1:7,500,000).* Conservation of Arctic Flora and Fauna (CAFF) Map No. 1. U.S. Fish and Wildlife Service, Anchorage, Alaska, USA.

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

Fisheries and Oceans Canada. 2009. *Development of a Framework and Principles for the Biogeographic Classification of Canadian Marine Areas*. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2009/056.

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

Gantner, B. and A.J. Gaston. in prep. *Birds*. Chapter 4 in "The Arctic Biodiversity Assessment" (H. Meltote, ed.). Conservation of Arctic Flora and Fauna.

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

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.

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

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

North American Waterfowl Management Plan (NAWMP). 2012. *North American Waterfowl Management Plan 2012: people conserving waterfowl and wetlands*. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales. 70pp.

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 et T.C. Will. 2004. *Partners in Flight North American Landbird Conservation Plan.* Cornell Lab of Ornithology. Ithaca (NY).

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.