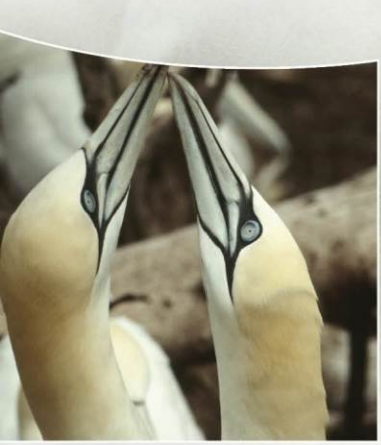
Environment Canada Environnement Canada

Bird Conservation Strategy for Bird Conservation Region 8 in Ontario Region: Boreal Softwood Shield

June 2014



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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*. Furthermore, these strategies will guide conservation action in support of The State of Canada's Birds 2012 (North American Bird Conservation Initiative Canada 2012), which points to the strong influence of human activity on bird populations, both positive and negative, and presents solutions towards keeping common birds common and restoring populations which are in decline.

Acknowledgements

Brigitte Collins and Paul Smith 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 especially like to thank the following people: Graham Bryan, Mike Cadman, Alaine Camfield, Lesley Carpenter, Britt Dupuis, Christian Friis, Jeanette Goulet, Krista Holmes, Jack Hughes, Judith Kennedy, Sarah Mainguy, Shawn Meyer, Jocelyn Neysmith, Marie-France Noel, Michele Rodrick, Daniel Rokitnicki-Wojcik, Richard Russell, Paul Watton, Chris Wedeles, Russ Weeber and D.V. Weseloh.

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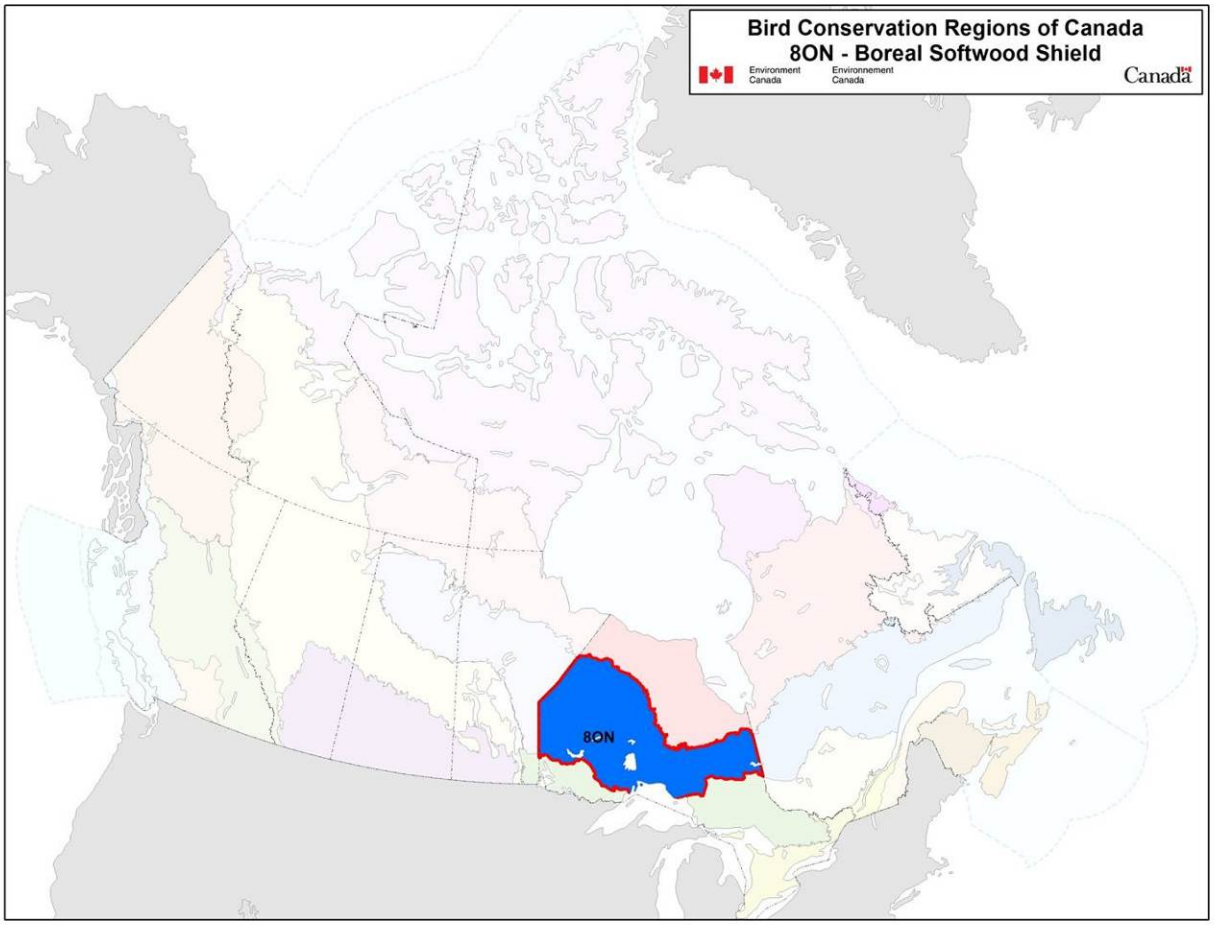

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Executive Summary

The Boreal Softwood Shield Bird Conservation Region, BCR 8, spans 6 provinces and covers an area over 1,470,000 km^2. The focus of this strategy is the portion of the BCR within Ontario (BCR 8 ON), comprising 30% of the total area of the BCR. BCR 8 ON covers a substantial fraction of the province (about 48%) and is its largest BCR. These 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 Boreal Softwood Shield is a region dominated by coniferous forest, underlain by Precambrian shield, and interspersed with numerous lakes, rivers and wetlands. Disturbances from fire, forestry, wind and insect outbreaks shape the composition and structure of the forest habitats at a variety of spatial and temporal scales. Tree species diversity is low, as is characteristic of boreal habitats, and bird diversity is also lower than in Ontario's more southerly BCRs. However, the region supports a staggering abundance of birds; greater than 10% of the global population of at least 20 species are present in Ontario's BCR 8 (BCR 8 ON) during the breeding season.

Within BCR 8 ON, 229 species of birds breed, overwinter, reside year-round or migrate through the region.[1] Of these, 71 species are identified as priorities in this BCR. All bird groups are represented on the priority species list, although the list is dominated by landbirds (65% of the priority list). The priority list also includes waterfowl (17%), waterbirds (12%), and shorebirds (6%). Over one third of the waterbirds (43%) and waterfowl (39%) occurring in BCR 8 ON are identified as priority species, as compared with 31% of the landbirds and only 14% of shorebirds. Among the 71 priority species, 12 are assessed by the Committee on the Status of Endangered Wildlife in Canada as "at risk," 8 are listed under the federal *Species at Risk Act* (SARA) and 14 are listed under Ontario's *Endangered Species Act 2007* at the time of writing this strategy.

Identifying the broad habitat requirements for each priority species within the BCR allows species to be grouped by shared habitat-based conservation issues and actions. Priority species are associated with 10 habitat types in BCR 8 ON. Dense forests, primarily coniferous and mixed wood, account for 60% of the terrestrial area of this BCR and are an important habitat for many priority species (31% use coniferous, and 32% use mixed wood). Wetlands are also very important and are used by 31% of priority species (22 species). A prominent feature of the landscape of BCR 8 ON is an abundance of lakes, including Lake Superior and Lake Nipigon, and 24% of priority species use waterbodies extensively throughout the BCR. Shrub and early successional habitats as well as riparian habitats are used by 14% and 13% of priority species, respectively.

[1] Species occurrence was determined using Ontario's Breeding Bird Atlas (Cadman et al. 2007), Birds of North America online (Cornell Lab of Ornithology 2013) and expert opinion.

The population objectives in this strategy are categorical and are based on a quantitative or qualitative assessment of species' population trends. Although survey coverage is far from complete, many of the priority species in BCR 8 ON have some monitoring information available. For only 3 of 71 species that are not species at risk (4%), monitoring data suggest declines with sufficient certainty to support an objective of increasing population size. Maintaining populations at current levels is the objective for 45% of the priority species in BCR 8 ON, while 25% are assigned a population objective of Assess/Maintain because monitoring data is insufficient to propose an objective. A recovery objective is assigned to 21%, or 15 species, that are considered at risk under federal and/or provincial legislation. Three priority waterfowl species (4%) are identified as migrating through BCR 8 ON and are not assigned an objective, as those are set in other BCR strategies covering the breeding range of these species.

An assessment of threats identified a number of conservation issues facing priority species in the various habitats of BCR 8 ON; however, the diversity and magnitude of threats faced by priority birds in the region are lower than in the more southerly BCRs in Ontario. Currently, the dominant threats relate to forestry, fire suppression and pollution. Although forestry is widespread in the region, much of it occurs on Crown land where provincial partners are working towards science-based management that emulates natural disturbance patterns. This active management, including consideration of birds and other wildlife, means that threats to birds from forestry are less severe than they might otherwise be. Importantly, mining, renewable energy development and the infrastructure to support these and other developments were determined to have low-magnitude effects at present, but the cumulative effects of these threats could be substantial on the birds and habitats of BCR 8 ON in the future (Far North Advisory Panel 2010). For approximately 65% of priority species, a lack of information on the population status and/or limiting factors is a major concern for effective management and conservation of priority species in BCR 8 ON.

Conservation objectives and actions have been designed to fill significant information gaps and to address the dominant threats facing priority species in the region. For BCR 8 ON, the largest proportion of objectives and actions relate to increasing the understanding of population status and limiting factors of priority species through research and monitoring. Although southern portions of the region have some coverage from large-scale surveys, much of the northern portion (and Canada's boreal forest in general) is sparsely surveyed. As such, even basic information, such as population size and distribution, includes significant extrapolation and reliance on expert opinion for many species. An improved understanding of the population status of priority birds and the anthropogenic activities affecting their status is a prerequisite for effective conservation in BCR 8 ON. Habitat conservation objectives and actions for many priority species are consistent with current forest management objectives, which aim to ensure the supply of habitat types and forest attributes in each forest management unit and eco-region is maintained within an Estimated Range of Natural Variation. Environment Canada recognizes this rigorous, science-based approach to forest management in BCR 8 ON as a dominant vehicle for conservation of birds in areas where these activities occur.

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

Much of the northern extent of Ontario's BCR 8 remains a somewhat intact ecological system, free from large-scale anthropogenic disturbance, and this presents a unique opportunity to pursue development in the context of conservation, rather than vice versa. The "conservation matrix" approach advocated by the Far North Science Advisory panel holds significant promise to achieve this. However, achieving conservation successes in this region, through implementation of the recommendations contained within this strategy and others, will require broad collaboration among First Nations, provincial and federal agencies, and a number of other stakeholders.

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,[2] waterbirds,[3] shorebirds[4] and landbirds[5]) 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 species of birds.

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.

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

Strategy Structure

Section 1 of this strategy presents general information about the BCR and the sub-region, with an overview of the six elements[6] 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 sub-region. 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.

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

Characteristics of Bird Conservation Region 8: Boreal Softwood Shield

BCR 8, the Boreal Softwood Shield, encompasses over 1,470,000 km² and spans 6 provinces from Alberta to Newfoundland. The portion of BCR 8 in Ontario (BCR 8 ON) is substantial, comprising roughly 30% of the total area of the BCR (489,816 km²). BCR 8 ON covers a substantial fraction of the province (about 48%) and is its largest BCR (Fig. 1). This region is characterised by extensive cover of primarily coniferous forest, with deciduous and mixed forests more common in BCR 12 ON to the south, and sparsely treed taiga and treeless tundra more common in BCR 7 ON to the North.

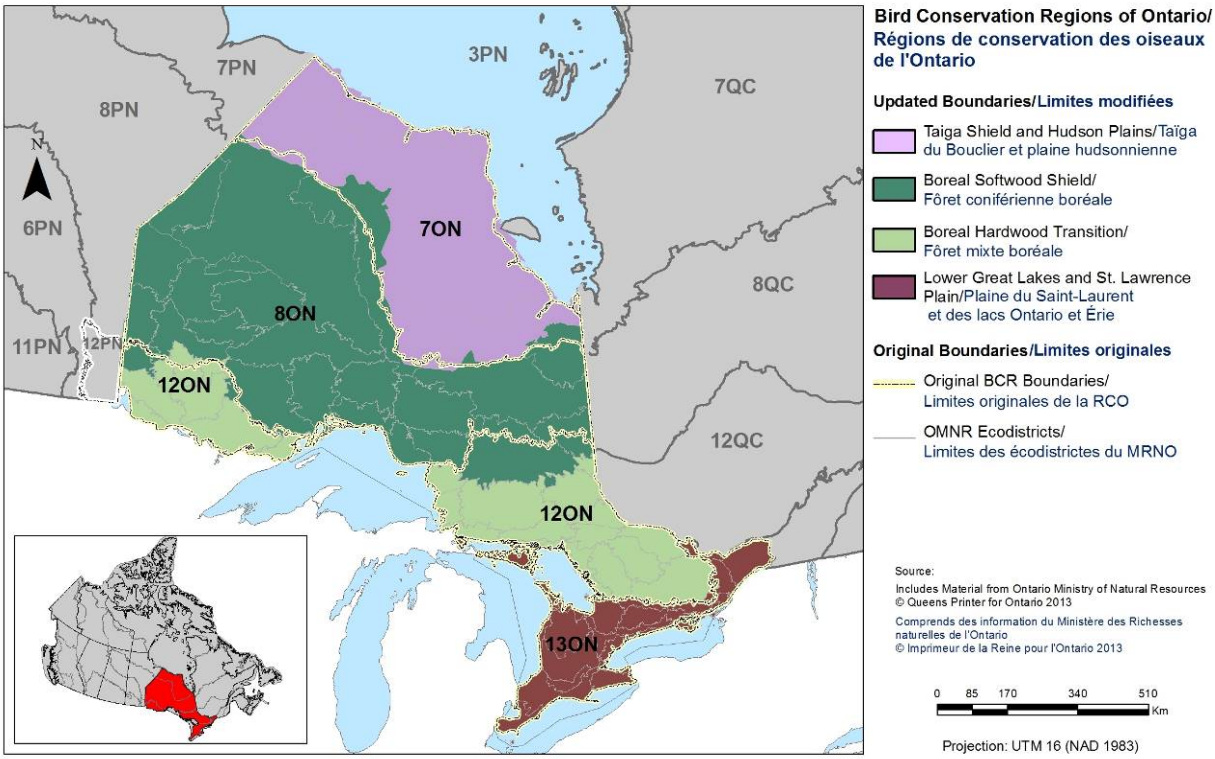

Figure 1. Map of Boundary Changes to BCR 8 ON: Boreal Softwood Shield.
Note: For conservation planning purposes, the original North American Bird Conservation Initiative-defined boundaries of Ontario's BCR boundaries have been slightly modified to align with the Ontario Ministry of Natural Resources Ecodistrict boundaries.[7]

The Boreal Softwood Shield region is underlain by the Precambrian bedrock of the Canadian Shield. Topography varies throughout the region, from rugged areas of exposed bedrock in the northwestern portion of the region, to high elevation ridges inland from Lake Superior, to extensive, poorly drained, low-lying areas in the northeast. The region shows evidence of extensive glacial activity (glaciers receded some 10,000 years ago; Baldwin et al. 2000), with

[7] Ecodistrict 4S-3 has been included in BCR 12 while 4S-1 and 4S-2 remain in BCR 8. Ecodistrict 6E-17 was placed in BCR 13, resulting in Cockburn and St. Joseph Islands being included in BCR 13 rather than BCR 12. Ecodistrict 3E-5 has been included in BCR 8 as well as 2W-2 in the north.

thin glacial till being the most widespread surficial material, and disrupted drainage patterns from glacial scouring visible throughout the region. Because of the poor and disrupted drainage, aquatic habitats are common throughout BCR 8 ON; wetlands, lakes and ponds comprise 25% of the region's land cover (Fig. 2, Table 1).

BCR 8 ON is dominated by dense boreal forest, which in comparison to the forests of southern Ontario has a limited diversity of tree species. Black spruce (*Picea mariana*), Jack pine (*Pinus sylvestris*), tamarack (*Larix laricina*), balsam fir (*Abies balsamea*), trembling aspen (*Populus tremuloides*), balsam poplar (*Populus balsamifera*) and white birch (*Betula papyrifera*) are the dominant species (Thompson 2000), and in various associations cover more than 60% of the landscape. Black spruce alone comprises 60% of the standing stock by volume (Ontario Ministry of Natural Resources 2006). Although the diversity of tree species is low, the boreal forest is a dynamic habitat with natural disturbances such as fire, insect outbreaks and wind operating at multiple spatial scales and over long periods of time to create a mosaic of different-aged stands and different species assemblages. Fire return times (without suppression) range from an average of approximately 50 years in the northwestern portion of BCR 8 ON to 100 years in the northeastern portion (Thompson 2000). Only 5–10% of the landscape consists of patches of old-growth forest that have escaped fire (Voigt et al. 2000, Ontario Partners In Flight 2008).

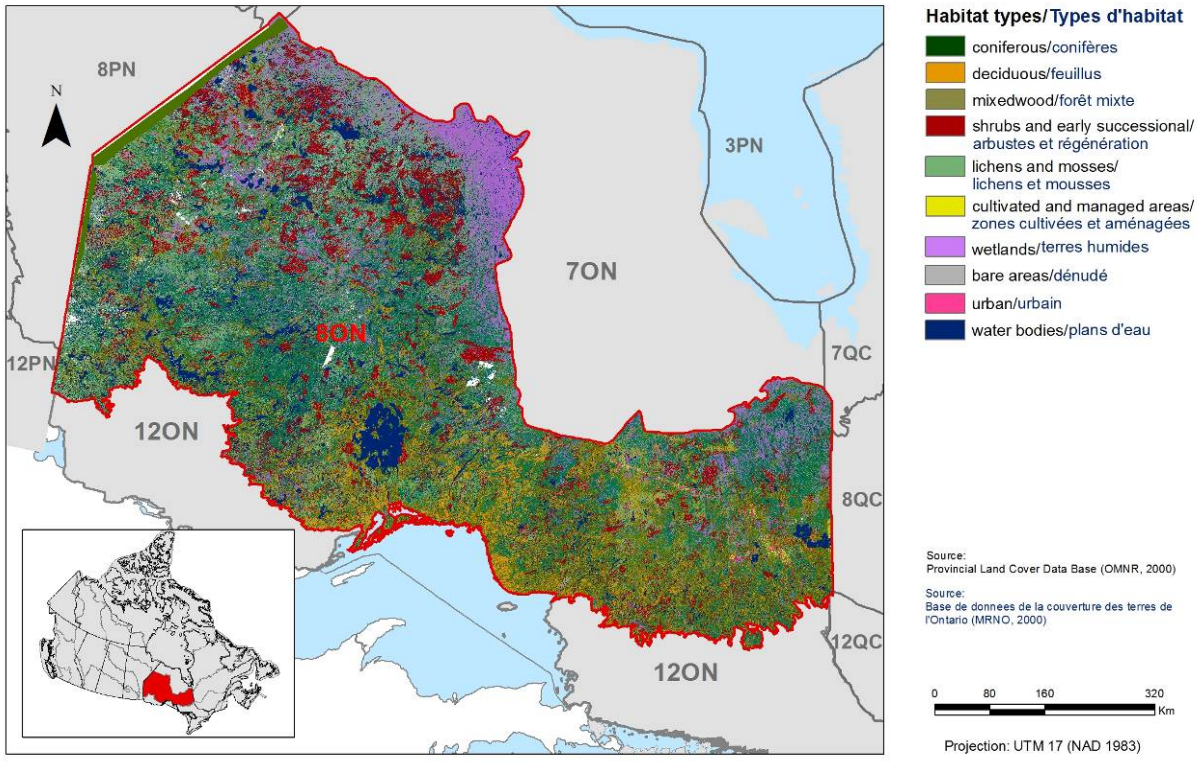

Figure 2. Map of land cover in BCR 8 ON.
Note: Riparian habitat areas are not depicted on this map because they represent a "zone" and are not a true land cover class. A map depicting the extent of derived riparian areas for illustration purposes can be found in the Riparian section of this strategy.

Table 1. Major categories of land cover in BCR 8 ON and their proportions on the landscape.
Note: Data Source: Spectranalysis Inc., 2004. Provincial Land Cover (PLC) 27.

BCR Habitat Class[1]	Provincial Land Cover (PLC 27) Class(es)	Area (ha)	% of Total Area
Coniferous Forest	Forest – Dense Coniferous Forest – Sparse	20,365,722	41.58%
Deciduous Forest	Forest – Dense Deciduous	2,168,048	4.43%
Mixed Forest	Forest – Dense Mixed	8,873,099	18.12%
Shrub/Early Successional	Forest Depletion – Cuts Forest Depletion – Burns Forest – Regenerating Depletion	4,722,747	9.64%
Cultivated/Managed Areas	Agriculture – pasture/abandoned fields Agriculture – cropland	48,706	0.10%
Bare Areas	Sand/Gravel/Mine Tailings Bedrock Coastal shoreline[2]	189,326 16,261	0.39% N/A
Urban	Settlement / Infrastructure	76,557	0.16%
Wetlands[3]	Marsh – inland Swamp - deciduous Swamp – coniferous Fen – open Fen – treed Bog – open Bog – treed	5,911,441	12.07%
Waterbodies	Water – deep clear Water – shallow/sedimented	6,235,581	12.73%
Riparian[4]	30m inland from shoreline	1,601,514	N/A
Unknown	Unknown, Cloud/shadow	390,345	0.80%
	Total Area	**48,981,572**	**100%**

[1] BCR Habitat Classes are based on the United Nations international LCCS (Food and Agriculture Organization 2000).
[2] Coastal shoreline area is defined as: 30 m of land adjacent to large body of water – Lake Nipigon and the North Shore of Lake Superior in BCR 8 ON. Coastal shoreline areas are not included in the total area as they are "zones" and do not represent a true provincial land cover class. Length of coastal shoreline is 5,760 km (based on Natural Resource and Values Information System drainage scale mapping range of 1:20,000 for the near north).
[3] Coastal wetlands are not differentiated at the resolution of PLC data.
[4] Riparian areas are not included in the total area as they are "zones" and do not represent a true provincial land cover class.

The avifauna of the region is less species-rich than in more southerly portions of the province, and few species are resident. However, what the boreal forest lacks in diversity, it makes up in abundance. BCR 8 ON supports greater than 10% of the global population of 20 landbird species, along with a significant proportion of the population for a number of waterfowl, waterbird and shorebird species such as the American Black Duck, the Bonaparte's Gull and the Solitary Sandpiper. Populations fluctuate in abundance and distribution from year to year, especially among landbirds, in response to natural disturbances from fire and variable abundance of food (both insects and seeds vary widely in abundance from year to year). This natural variability, coupled with incomplete coverage from large-scale surveys, means that the status of bird populations in BCR 8 ON is, in some cases, poorly understood.

Human settlements and agricultural lands have a small footprint in the region (approximately a quarter percent; Table 1), but despite the sparse settlement, humans still exert a substantial influence on the region's habitats through forestry and fire suppression. Commercial logging began in the region more than 150 years ago, but has increased dramatically in intensity in recent decades, with the total area harvested doubling every decade since 1950 (Perera and Baldwin 2000; Ontario Partners in Flight 2008). As forestry operations have increased in coverage and intensity, active suppression of forest fires has also become more widespread. Today, forest fires are suppressed across much of BCR 8 ON, and large fires spread naturally only in the northwestern portion of the region, beyond the limit of intensive forestry operations. Elsewhere in the region, timber harvest has replaced fire as the largest agent of disturbance (Perera and Baldwin 2000; Ontario Partners In Flight 2008). Still, in comparison to drastically human-altered landscapes such as BCR 13 ON, much of BCR 8 ON remains in a relatively intact state.

The *Crown Forest Sustainability Act of 1994* (Statutes of Ontario 1994) legally requires that Crown forest in Ontario be managed to conserve healthy, diverse and productive forests, and their associated ecological processes and biological diversity (Pearce 2011). Management guidelines address harvest practices from local to landscape scales, including consideration of everything from retention of individual wildlife trees to landscape-level distribution of age classes. In recent years, management guidelines have been devised to emulate natural disturbance patterns and maintain forest attributes within a Simulated or Estimated Range of Natural Variation. Landscape-level guides for sustainable forestry have been completed for the Great Lakes–St. Lawrence Landscapes to the south as well as for Boreal Landscapes further north, both of which apply in BCR 8 ON (see *Forest Management Guide for Boreal Landscapes,* Ontario Ministry of Natural Resources 2014c). The rigorous, science-based approach to forest management in Ontario is a dominant vehicle for the conservation of birds in the region.

The forestry companies working in the boreal forest have demonstrated a willingness to work collaboratively and proactively in order to minimize the environmental impacts of their activities, for example through the signing of the Canadian Boreal Forest Agreement (Canadian Boreal Forest Agreement 2010). This agreement between 21 major Canadian forest product companies and leading environmental non-governmental organizations covers over 70 million hectares of boreal forest across the full breadth of the country. The agreement seeks to achieve

a balance between environmental protection and competitiveness of Canada's forestry sector, for example through suspension of forestry activities in key habitats for the Woodland Caribou (a Species at Risk) and by seeking market recognition for progress towards sustainable forestry practices (Canadian Boreal Forest Agreement 2010). While regulatory authority still rests with the provincial and federal governments, this historic agreement demonstrates an unprecedented commitment to protection of boreal habitats on the part of the forestry sector.

Another important piece of legislation for the conservation of the region's wildlife and habitats is the *Far North Act, 2010* (Statues of Ontario 2010). This Act, which received Royal Assent in October of 2010, provides a framework for community-based land use planning across Ontario's North including the northern portion of BCR 8 ON. The Act is intended to ensure a significant role for First Nations in land-use planning in the region, to preserve the region's ecological and cultural assets with a large network of protected areas (totalling more than 50% of the region's area), to protect biodiversity and ecosystem services throughout the region, and to foster sustainable economic growth that benefits First Nations. These goals are to be met through the development and implementation of community-based land use plans, guided by a larger-scale Far North Land Use Strategy. Conservation of birds and their habitats in northern BCR 8 ON is best accomplished by recognizing the important role that these Land Use Plans will play in guiding the region's future.

At present, approximately 14% of BCR 8 ON is protected within national parks, provincial parks and conservation reserves (Fig. 3). The largest protected areas are found within three provincial parks, namely Wabakimi (892,061 ha), Opasquia (473,000 ha) and Woodland Caribou Provincial Park (450,000 ha) and are located within the central and northwestern regions of BCR 8 ON (Ontario Ministry of Natural Resources 2014b). Pukaskwa, which is Ontario's largest national park, protects 187,800 hectares of boreal forest and Lake Superior shoreline (Parks Canada 2014). Recent significant discoveries of minerals in the "ring of fire" mineral deposit at the boundary of BCR 8 ON and BCR 7 ON mean that the northern portion of BCR 8 ON could face increasing pressures from development. The *Far North Act*, *2010* has established a goal for the development of a significant network of new protected areas, and because much of BCR 8 ON remains a relatively intact ecosystem, a unique opportunity exists to define first the matrix of conservation lands needed to maintain biodiversity, ecosystem services, and natural and cultural heritage, as well as the areas where development can be sustainably pursued. This "conservation matrix" approach, advocated by the Far North Science Advisory panel (Far North Science Advisory Panel 2010), holds significant promise for the conservation of migratory birds and their habitats within BCR 8 ON. Moreover, this opportunity underscores the need for collaboration between First Nations, provincial and federal agencies, and other stakeholders to achieve the conservation objectives identified in this strategy.

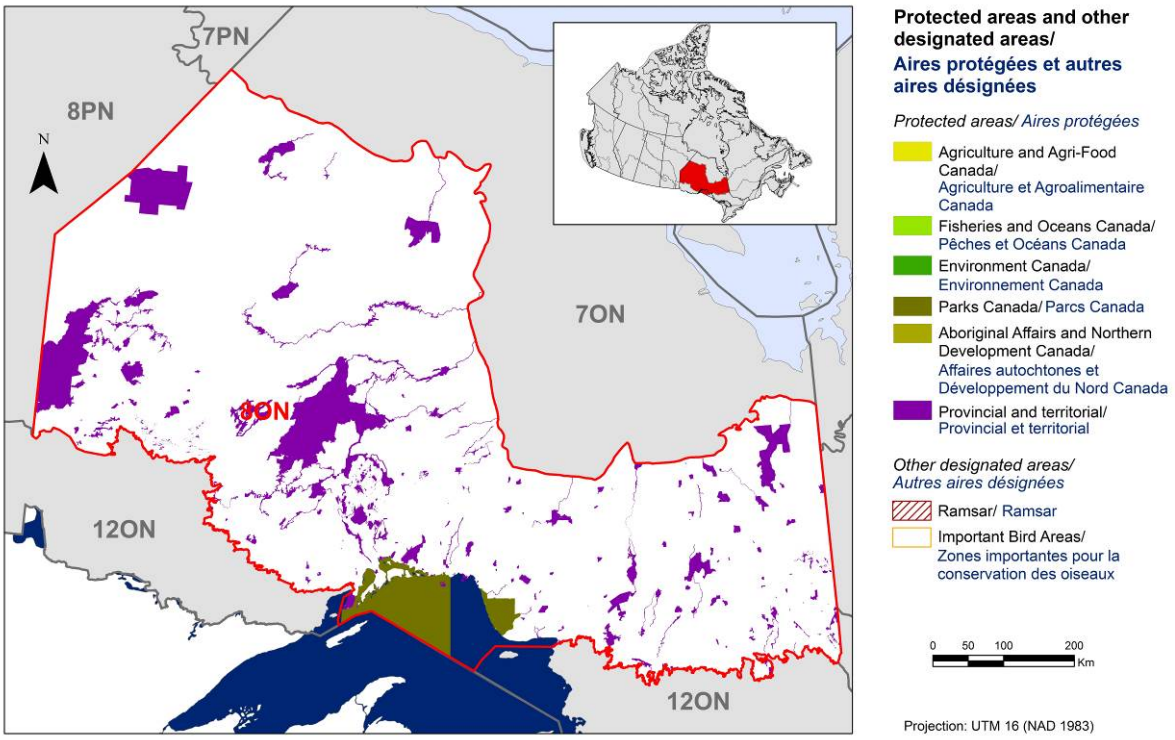

Figure 3. Map of protected and designated areas in BCR 8 ON.

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

Element 1: Priority Species Assessment

These BCR Strategies identify "priority species" from all regularly occurring bird species in each BCR sub-region (see Appendix 1). Species that are vulnerable due to population size, distribution, population trend, abundance and threats are included as priorities 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 sub-region; 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 and 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 species and issues of greatest significance to Ontario's avifauna. As with any priority-setting exercise, some important species may be excluded; however, the issues of importance to any excluded species are usually captured by addressing the threats identified for species that are included on the priority list. With this in mind, species present in the region only as migrants were included as priority species only when their inclusion introduced new regional conservation issues, such as for the protection of migratory staging sites. Otherwise, the BCR 8 ON strategy relies on conservation actions arising from threats to other (breeding or regularly occurring) priority species to address more general conservation concerns for migrants. Tables 2, 3 and 4 outline the priority species in BCR 8 ON, the relative breakdown by bird group, and the reasons for priority status.

A total of 229 bird species occur regularly in BCR 8 ON. Of these, 71 were assessed as priority species (Table 2) with representatives from all 4 bird groups. Landbirds show the greatest diversity in BCR 8 ON, representing the majority (46 species, nearly 65%) of the candidate species list (Table 3). However, because many are common species facing comparatively few threats, only 31% of these species qualified for priority status. All other species groups had markedly lower diversity by comparison, and shorebirds, waterbirds, and waterfowl contributed 4, 9 and 12 species, respectively, to the priority species list (Table 3). The diversity of breeding shorebirds in the region is low, and although the coastal beaches of Lake Superior, wetlands and other habitats in BCR 8 ON are used by migrant shorebirds, few concentrate in large numbers within this region during migration.

The list of priority species also includes species at risk: 12 species assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as "at risk", 8 species listed under the federal *Species at Risk Act* (SARA; Species at Risk Public Registry 2014), and 14 species listed as

species at risk in Ontario under its *Endangered Species Act 2007* (SARO; as of January 2014; Ontario Ministry of Natural Resources 2014d).

Table 2. Priority species in BCR 8 Ontario, population objective and reasons for priority status.
Note: All assessments, listings and designations are current to January 2014. A species can be on the priority list for more than one reason.

Priority Species	Population Objective	COSEWIC[1]	SARA[2]	SARO[3]	Regional/Sub-regional Concern[4]	Regional/Sub-regional Stewardship[5]	National/Continental Concern	National/Continental Stewardship
Landbirds								
Alder Flycatcher	Maintain current					Y		Y
Bald Eagle	Recovery objective[6]			SC	Y			Y
Bank Swallow	Assess/Maintain	T			Y			
Barn Swallow	Recovery objective	T		T	Y			
Bay-breasted Warbler	Maintain current					Y	Y	
Belted Kingfisher	Maintain current					Y		
Black-and-white Warbler	Maintain current					Y		
Black-backed Woodpecker	Assess/Maintain					Y		Y
Blackburnian Warbler	Maintain current						Y	Y
Black-throated Green Warbler	Maintain current					Y	Y	Y
Blue-headed Vireo	Maintain current							Y
Bobolink	Recovery objective	T		T	Y		Y	
Boreal Owl	Assess/Maintain					Y		
Canada Warbler	Recovery objective[6]	T	T	SC	Y	Y	Y	Y

[1] Assessed by COSEWIC as E, Endangered; T, Threatened; SC, Special Concern.
[2] Species listed on Schedule 1 of SARA as E, Endangered; T, Threatened; SC, Special Concern.
[3] Species listed as E, Endangered; T, Threatened; SC, Special Concern on the SARO List.
[4] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR) while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[5] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[6] Species listed under the federal SARA and/or the provincial *Endangered Species Act 2007,* but its federal and/or provincial recovery documents have not yet been finalized.

Table 2 continued

Priority Species	Population Objective	COSEWIC[1]	SARA[2]	SARO[3]	Regional/Sub-regional Concern[4]	Regional/Sub-regional Stewardship[5]	National/Continental Concern	National/Continental Stewardship
Cape May Warbler	Maintain current					Y		Y
Chestnut-sided Warbler	Maintain current					Y	Y	Y
Cliff Swallow	Increase				Y			
Common Nighthawk	Recovery objective[6]	T	T	SC	Y		Y	
Connecticut Warbler	Maintain current				Y	Y	Y	Y
Eastern Kingbird	Assess/Maintain				Y			
Eastern Whip-poor-will	Recovery objective[6]	T	T	T	Y		Y	
Evening Grosbeak	Assess/Maintain					Y		
Golden Eagle	Recovery objective			E	Y			
Magnolia Warbler	Maintain current						Y	Y
Mourning Warbler	Maintain current					Y	Y	Y
Nashville Warbler	Maintain current					Y		Y
Northern Flicker	Maintain current					Y		
Northern Goshawk	Assess/Maintain				Y		Y	
Olive-sided Flycatcher	Recovery objective[6]	T	T	SC	Y		Y	
Ovenbird	Maintain current					Y		
Peregrine Falcon (*anatum/tundrius*)	Recovery objective	SC	SC	SC	Y		Y	Y
Philadelphia Vireo	Maintain current					Y		Y
Pine Grosbeak	Assess/Maintain				Y		Y	
Purple Finch	Maintain current				Y	Y		
Ruby-crowned Kinglet	Maintain current					Y		
Ruffed Grouse	Assess/Maintain					Y		
Rusty Blackbird	Recovery objective[6]	SC	SC		Y		Y	
Sharp-shinned Hawk	Assess/Maintain					Y		

Table 2 continued

Priority Species	Population Objective	COSEWIC[1]	SARA[2]	SARO[3]	Regional/Sub-regional Concern[4]	Regional/Sub-regional Stewardship[5]	National/Continental Concern	National/Continental Stewardship
Short-eared Owl	Recovery objective[6]	SC	SC	SC	Y		Y	
Swamp Sparrow	Maintain current					Y	Y	Y
Tennessee Warbler	Assess/Maintain							Y
Tree Swallow	Increase				Y			
White-throated Sparrow	Maintain current						Y	Y
Winter Wren	Maintain current					Y		
Yellow-bellied Flycatcher	Maintain current					Y		Y
Yellow-bellied Sapsucker	Maintain current					Y		Y
Shorebirds								
Greater Yellowlegs	Assess/Maintain				Y		Y	
Lesser Yellowlegs	Assess/Maintain				Y			
Solitary Sandpiper	Assess/Maintain				Y		Y	
Wilson's Snipe	Assess/Maintain				Y			
Waterbirds								
American Bittern	Maintain current				Y		Y	
American White Pelican	Recovery objective			T	Y		Y	
Black Tern	Recovery objective			SC	Y		Y	
Common Loon	Maintain current						Y	
Common Tern	Assess/Maintain						Y	
Herring Gull	Assess/Maintain				Y		Y	
Horned Grebe (western population)	Recovery objective[6]	SC		SC	Y		Y	
Red-necked Grebe	Assess/Maintain				Y			
Yellow Rail	Recovery objective	SC	SC	SC	Y		Y	

Table 2 continued

Priority Species	Population Objective	COSEWIC[1]	SARA[2]	SARO[3]	Regional/Sub-regional Concern[4]	Regional/Sub-regional Stewardship[5]	National/Continental Concern	National/Continental Stewardship
Waterfowl								
American Black Duck	Increase				Y		Y	
American Wigeon	Maintain current				Y		Y	
Black Scoter	Migrant (no BCR 8-ON population objective)				Y		Y	
Bufflehead	Maintain current				Y			
Common Goldeneye	Maintain current				Y		Y	
Common Merganser	Maintain current				Y			
Green-winged Teal	Maintain current				Y			
Lesser Scaup	Assess/Maintain				Y		Y	
Long-tailed Duck	Migrant (no BCR 8-ON population objective)						Y	
Mallard	Maintain current				Y		Y	
Ring-necked Duck	Maintain current				Y			
Surf Scoter	Migrant (no BCR 8-ON population objective)				Y		Y	

Table 3. Summary of priority species, by bird group, in BCR 8 ON.

Bird Group	Number of Species	Percent of Total Number of Species	Number of Priority Species	Percent Listed as Priority by Bird Group	Percent of Total Number of Priority Species
Landbird	148	65%	46	31%	65%
Shorebird	29	12%	4	14%	6%
Waterbird	21	9%	9	43%	12%
Waterfowl	31	14%	12	39%	17%
Total	**229**	**100%**	**71**	**–**	**100%**

Table 4. Number of priority species in BCR 8 ON by reason for priority status.
Note: All assessments, listings and designations are current to January 2014.

Priority Listing[1]	Landbird	Shorebird	Waterbird	Waterfowl
COSEWIC[2]	10	0	2	0
SARA[3]	7	0	1	0
SARO[4]	10	0	4	0
National/Continental Concern	19	2	8	8
National/Continental Stewardship[5]	20	N/A	N/A	N/A
Regional/Sub-regional Concern[6]	19	4	7	11
Regional/Sub-regional Stewardship	25	N/A	N/A	N/A

[1] A single species can be on the priority list for more than one reason.
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[6] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).

Element 2: Habitats Important to Priority Species

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

Priority species varied in their use of habitat types in BCR 8 ON (Fig. 4). Dense forests, primarily coniferous or mixed, account for 60% of the terrestrial area of this BCR, and the diversity of landbirds can be moderately high in these forests (Rich et al. 2004; Ontario Partners in Flight 2008). Coniferous, mixed and deciduous forests are used extensively by 31%, 32% and 11% of priority species, respectively (Fig. 4). Wetlands are also important habitats that are used by 31% of priority species. A prominent feature of the landscape of BCR 8 ON is an abundance of lakes, including Lake Superior and Lake Nipigon, and 24% of priority species use waterbodies extensively. Shrub and early successional habitats as well as riparian habitats are used by 14% and 13 % of priority species, respectively.

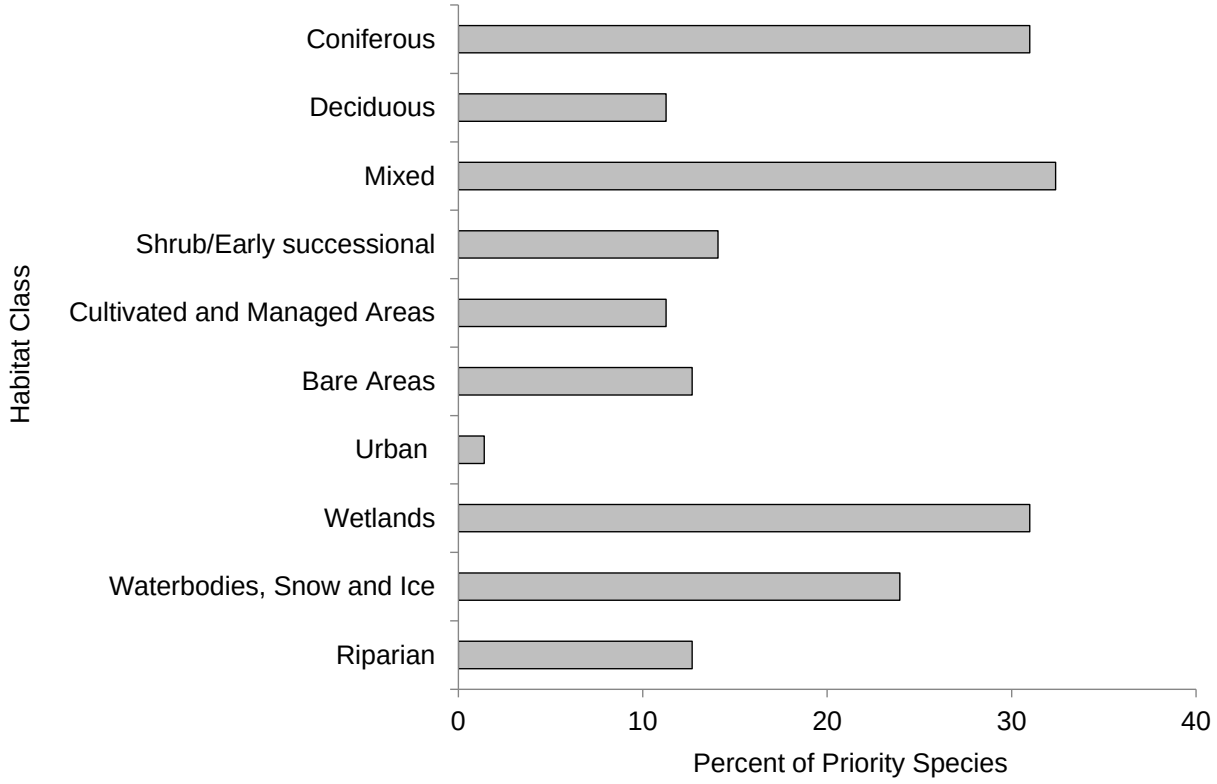

Figure 4. Percent of priority species that are associated with each habitat type in BCR 8 ON.
Note: The total exceeds 100% because each species may use more than one habitat.

Element 3: Population Objectives

Population objectives allow us to measure and evaluate conservation success. The objectives in this strategy are assigned to categories and are based on a quantitative or qualitative assessment of species' population trends. If the population trend of a species is unknown, the objective is set as "assess and maintain," and a monitoring objective is given (see Appendix 2). For any species listed under SARA or under provincial/territorial endangered species legislation, Bird Conservation Strategies defer to population objectives in available Recovery Strategies and Management Plans. If recovery documents are not yet available, interim breeding population objectives are provided by species, by habitat in Section 2. When recovery objectives are available, they will replace the interim objectives. The ultimate measure of conservation success will be the extent to which population objectives have been reached within the timeframes set by national and continental bird conservation plans. Population objectives do not currently factor in feasibility of achievement but are held as a standard against which to measure progress.

Spatial coverage of BCR 8 ON by bird surveys is sparse, and limited primarily to those areas accessible by road. The Breeding Bird Survey (BBS) offers useful information for many landbird species but is restricted to areas accessible by roads, in the southern fringe of the BCR. The Ontario Breeding Bird Atlas provides more extensive spatial coverage, but data are heavily weighted to road and canoe accessible sites. A variety of targeted surveys (e.g., the Eastern Waterfowl Survey, Great Lakes Colonial Waterbird Monitoring Surveys, Great Lakes Marsh Monitoring Program, Ontario Shorebird Survey) provide monitoring data for some species in parts of the region, but in general, monitoring coverage is limited, especially in the northern extent of the region. Gaps in monitoring information are significant for some species, and even distribution and abundance are largely unknown for some species. As a result, monitoring data were insufficient to propose a population objective for 18 of the 71 priority species (25%); these species were assigned an objective of "Assess/Maintain" (Fig. 5).

A recovery objective was assigned to 21%, or 15 priority species, that are considered at risk under federal and/or provincial legislation though their recovery documents may not yet be finalized. For priority species that are not at risk, monitoring data suggested declines with sufficient certainty to support an objective of increasing population size for only 3 of 71 priority species (4%). In contrast, the best available monitoring information suggested stable populations for 45% of priority species (32 species), and an objective of maintaining current populations was assigned. Priority species that were identified as migrating through BCR 8 ON were not assigned an objective (3 species or 4%), as those were set in other BCR strategies covering the breeding range of these species.

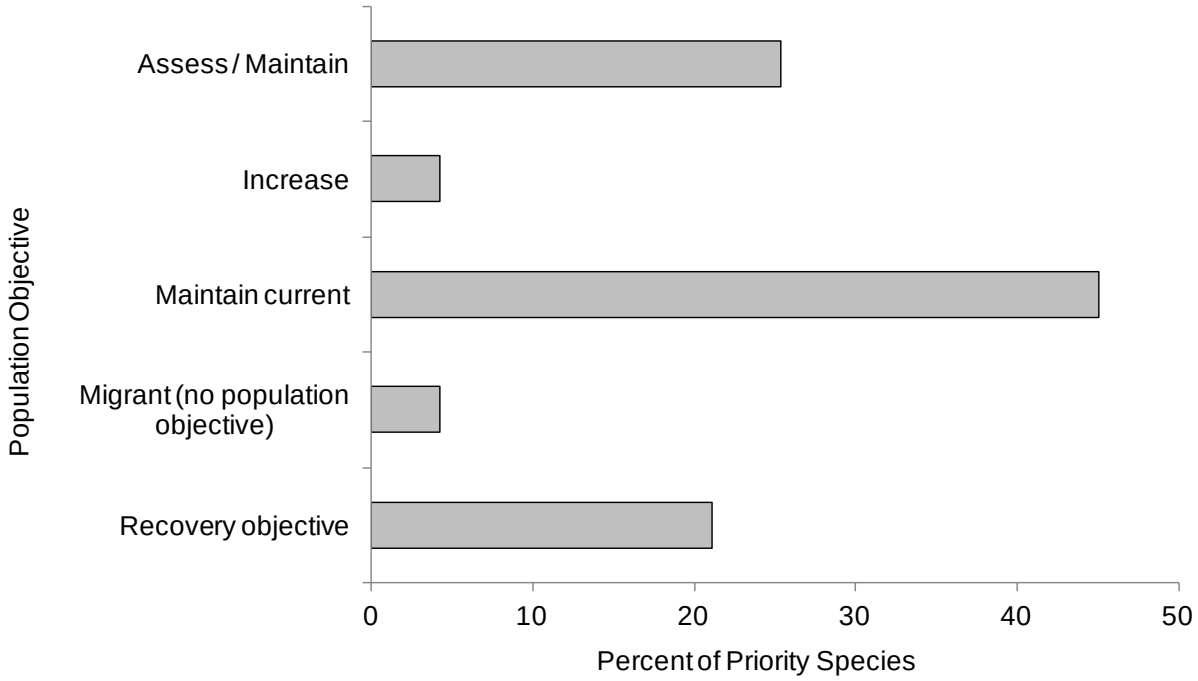

Figure 5. Percent of priority species that are associated with each population objective category in BCR 8 ON.

Element 4: Threat Assessment for Priority Species

Bird population trends are driven by factors that negatively affect either their reproduction or survival during any point in their annual life cycle. Threats that can reduce survival include reduced food availability at migratory stopovers or exposure to toxic compounds. Examples of threats that can reduce reproductive success are high levels of nest predation or reduced quality or quantity of breeding habitat. The threats assessment process (see Appendix 2) identifies threats believed to have a population-level effect on individual priority species. These threats are assigned a relative magnitude (Low, Medium, High), based on their scope (the proportion of the species' range within the sub-region 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 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. Usually these issues transcend habitat types and are considered "widespread" and are therefore addressed in a separate section (see Section 3), but unlike other threats, they are not ranked.

The threat assessment exercise identified a number of conservation issues facing priority species in the various habitats of BCR 8 ON. However, the diversity and magnitude of threats faced by priority birds in the region are lower than those in the more southerly BCRs due in large part to the low density of industrial development and human settlements, particularly in the northwestern portion of BCR 8 ON. For example, residential and commercial development has a limited footprint, and agricultural production occurs largely in the Greater Clay Belt area of the BCR such that associated threats to birds are estimated to be at the localized scale, having little to no effect at the population level.

At present, the dominant threats to priority species, with an overall medium-magnitude, relate to habitat loss and/or degradation from forestry activities (threat sub-category 5.3), fire suppression, which can limit the amount of successional or burned forest habitats required by some priority species (sub-category 7.1), and pollution which can affect habitat quality and the availability of prey items for priority species in aquatic habitats (sub-category 9.5; Fig. 6).

However, the scope and severity of many medium- and low-magnitude threats identified in this strategy are likely to increase as the potential for expanded resource development increases. Expanding forestry operations[8] into northwestern areas of BCR 8 ON along with other emerging threats could have important effects on populations of priority birds in the years to come. Increasing interest in the mineral resources of the region, potential development of renewable energy, and the infrastructure to support these and other developments could all have substantial effects on the birds and habitats of BCR 8 ON in the future (Far North Advisory Panel 2010).

[8] An estimated 6–7% of the Far North region includes forests with "commercial potential" (Far North Advisory Panel 2010).

In BCR 8 ON, threat category 12 “Other direct threats” and sub-category 12.1 “Information lacking” was used to identify priority species that lack adequate biological or demographic information required for population conservation and management. Using this category in this manner facilitated the development of targeted research and monitoring conservation actions to address knowledge gaps for these species, but unlike the other threats, they were not ranked (Fig. 6). For more than 65% of priority species, a lack of knowledge of population status and/or limiting factors (sub-category 12.1; Fig. 6) was identified as an important information gap for which research and monitoring actions are needed to facilitate conservation and management planning efforts for these species.

Within BCR 8 ON, threats related to collisions with human-made structures, collisions with vehicles, as well as climate change and severe weather were considered to be widespread, and as such are addressed in the Widespread Issues section of this strategy.

Cumulative Effects of Threats to Priority Species

For several of the threats identified in this strategy, the long-term effect of several combined threats is equal to or greater than the sum of the effects of the individual threats. There is no standardized method for assessing these “cumulative effects.” The threat ranking and roll-up procedures (Appendix 2) demonstrate the sum of effects for threats within and among threat categories, and are useful for identifying the most important threats within a habitat class, or the relative importance of individual threats across the BCR sub-region (Table 5). However, it is important to consider that threats might interact in unanticipated ways, or that in aggregate, threats might exceed some ecological threshold to produce cumulative effects of an unanticipated magnitude. Cumulative impact studies assessing population responses to multiple stressors are an important tool to better understand the long-term consequences of some of the threats described in this strategy.

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

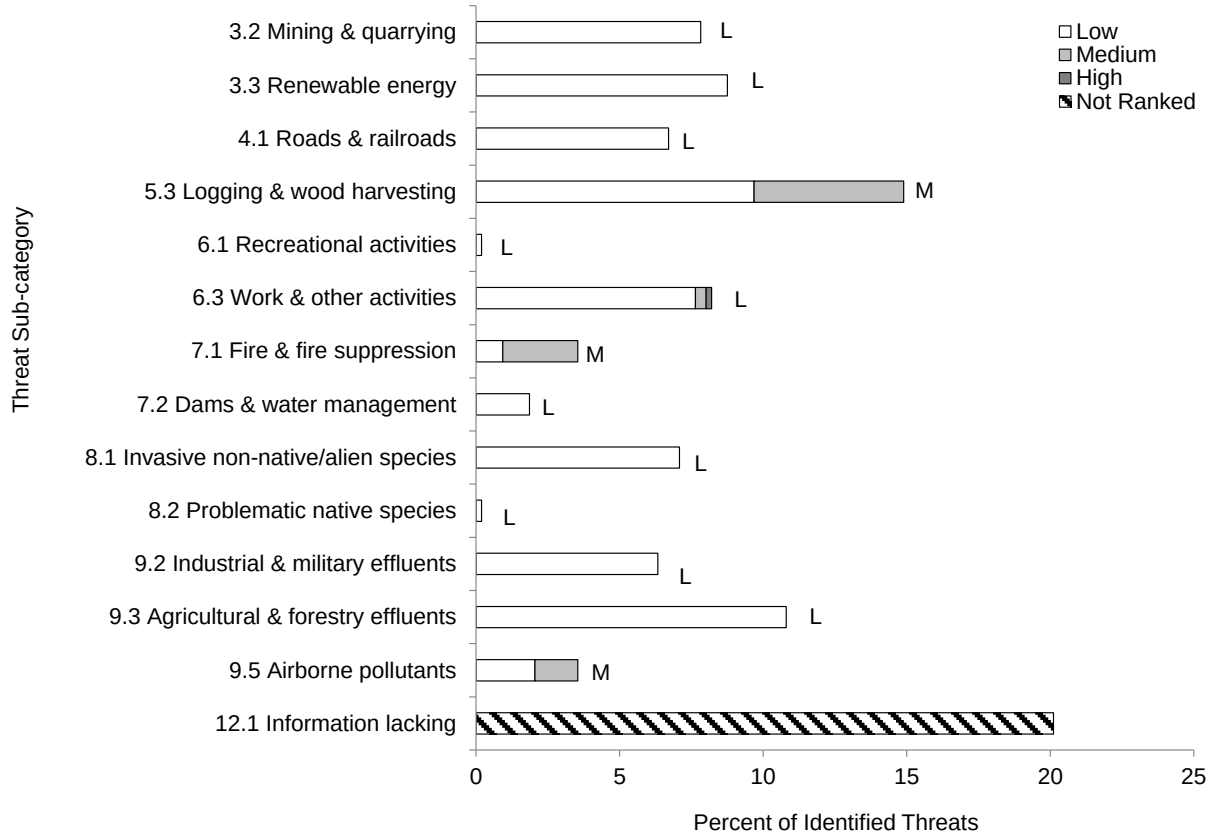

Figure 6. Percent of identified threats to priority species within BCR 8 ON by threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 8 ON (for example, if 100 threats were identified in total for all priority species in BCR 8 ON, and 10 of those threats were in the category 9.5 Airborne pollutants, the bar on the graph would represent this as 10%). Shading in the bars (H= High, M = Medium, L = Low) represents the magnitude of the threats in each threat sub-category in the BCR. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall rolled-up magnitude of the threat sub-category is shown at the end of each bar (also presented in Table 5). Threat sub-category 12.1 Information lacking was not ranked. See Element 4 in Appendix 2 for details on how magnitude was assessed.

Table 5. Relative magnitude of identified threats to priority species within BCR 8 ON by threat category and broad habitat class.

Only threats with a population-level effect were considered, and overall ranks were generated through a roll-up procedure described in Kennedy et al. (2012). L represents low-magnitude threats, M is medium. Cells with hyphens indicate that no priority species had population level threats identified in the threat category/habitat combination.

Threat Category	Habitat Class									
	Coniferous	Deciduous	Mixed	Shrub/Early Successional	Cultivated and Managed Areas	Bare Areas	Wetlands	Waterbodies	Riparian	Overall
Overall	**M**	**L**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	
3. Energy Production & Mining	-	-	-	-	-	L	L	L	L	**L**
4. Transportation & Service Corridors	L	L	L	L	L	L	L		L	**L**
5. Biological Resource Use	M	M	M	-	-	-	L		M	**M**
6. Human Intrusions & Disturbance	-	-	-	-	M	L	L	L	L	**L**
7. Natural System Modifications	M	-	M	M	-	L	L	L	-	**M**
8. Invasive & Other Problematic Species & Genes	L	L	L	-	-	-	L	-		**L**
9. Pollution	L	-	-	L	L	L	L	M	L	**L**

Element 5: Conservation Objectives

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

For BCR 8 ON, the majority of conservation objectives identified relate to increasing the understanding of population status and limiting factors of priority species (conservation objective category 7; Fig. 7). Objectives in this category reflect the need to improve understanding of species' ecology and/or factors causing population declines of priority species, as well as enhancing population/demographic and habitat monitoring across the BCR. Other conservation objectives relate to ensuring an adequate supply and quality of habitat (conservation objective category 1; Fig. 7). Included in these objectives are the maintenance of the full range of naturally occurring habitat types, maintaining the quality of existing habitats, and retaining important features on the landscape (e.g., standing dead snags for cavity-nesting birds). Also important is the need to develop and/or implement recovery strategies and management plans for the species at risk in BCR 8 ON (category 3).

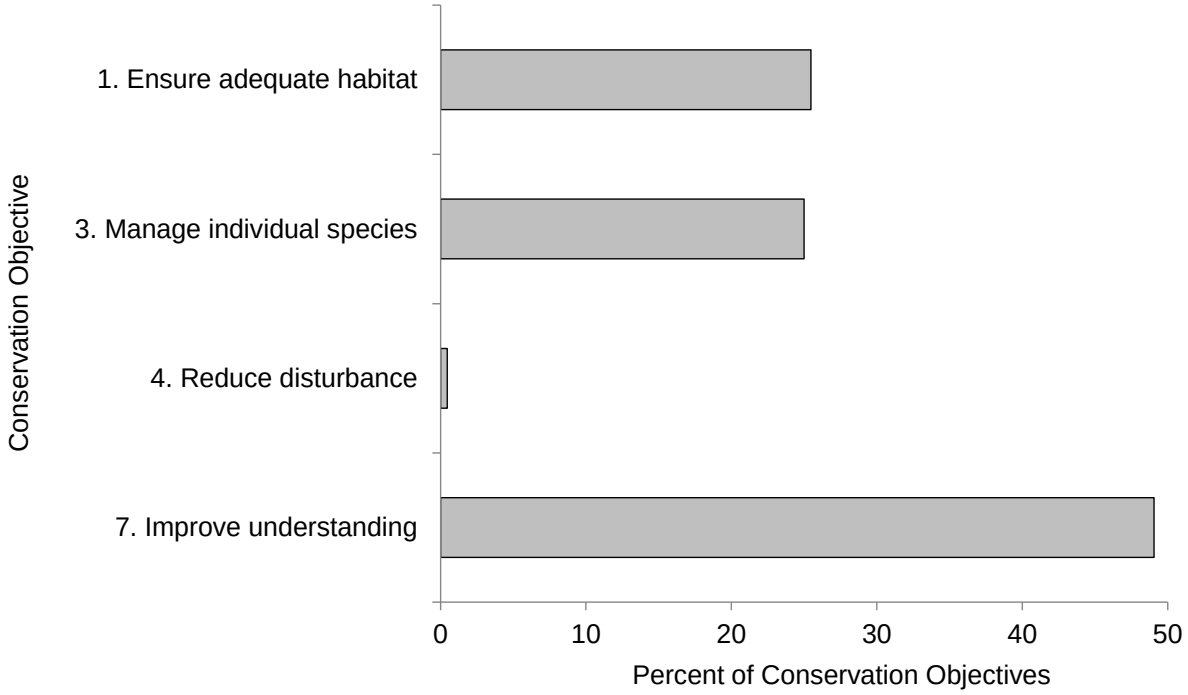

Figure 7. Percent of all conservation objectives assigned to each conservation objective category in BCR 8 ON.

Element 6: Recommended Actions

Recommended actions indicate on-the-ground activities that will help to achieve the conservation objectives (Fig. 8). Actions are strategic rather than highly detailed and prescriptive (see Appendix 2). Whenever possible, recommended actions benefit multiple species and/or respond to more than one threat. Recommended actions defer to or support those provided in recovery documents for species at risk at the federal, provincial or territorial level, but will usually be more general than those developed for individual species. However, for detailed recommendations for species at risk, readers should consult published federal recovery documents (Species at Risk Public Registry 2014) or provincial recovery documents (Ontario Ministry of Natural Resources 2014e). Similarly, a number of landbird species included in this strategy are stewardship species as defined by Partners In Flight (Rich et al. 2004). These are species with stable populations or for which no specific conservation issues have been identified, but which depend on BCR 8 ON to such an extent that the region has a high responsibility for their protection. These species may not appear prominently in the threats, objectives and actions described in this strategy, but should benefit from the implementation of actions that target multiple species.

In BCR 8 ON, many conservation objectives relate to the protection or restoration of habitats, and accordingly, the more specific recommended conservation actions are related to this theme. Recommended actions are diverse in their approach (Fig. 8) and include working collaboratively with forest planning initiatives to ensure guidance for priority species addresses conservation needs (action sub-category 7.2), promoting the development and use of BMPs (sub-category 5.3), establishing a network of protected areas (sub-category 1.2), undertaking actions to promote awareness of issues (sub-category 4.3), and improving monitoring to track the effectiveness of conservation activities (sub-category 8.2).

The majority of the recommended actions in BCR 8 ON relate to knowledge acquisition through research and monitoring (Fig. 8; sub-categories 8.1 and 8.2). Although southern portions of the region have some coverage from large-scale surveys, much of the northern portion (and Canada's boreal forest in general) is sparsely surveyed. Many commonly used monitoring programs, such as the BBS, are not feasible through most of northern BCR 8 ON due to a general lack of roads. Similarly, many other standard monitoring programs are not practical due to the financial and logistical challenges of working in this remote and inaccessible region. As such, even basic information, such as population size and distribution, requires significant extrapolation and reliance on expert opinion for many species. An improved understanding of the population status of priority birds and of the anthropogenic activities affecting their status is requisite for effective conservation in BCR 8 ON.

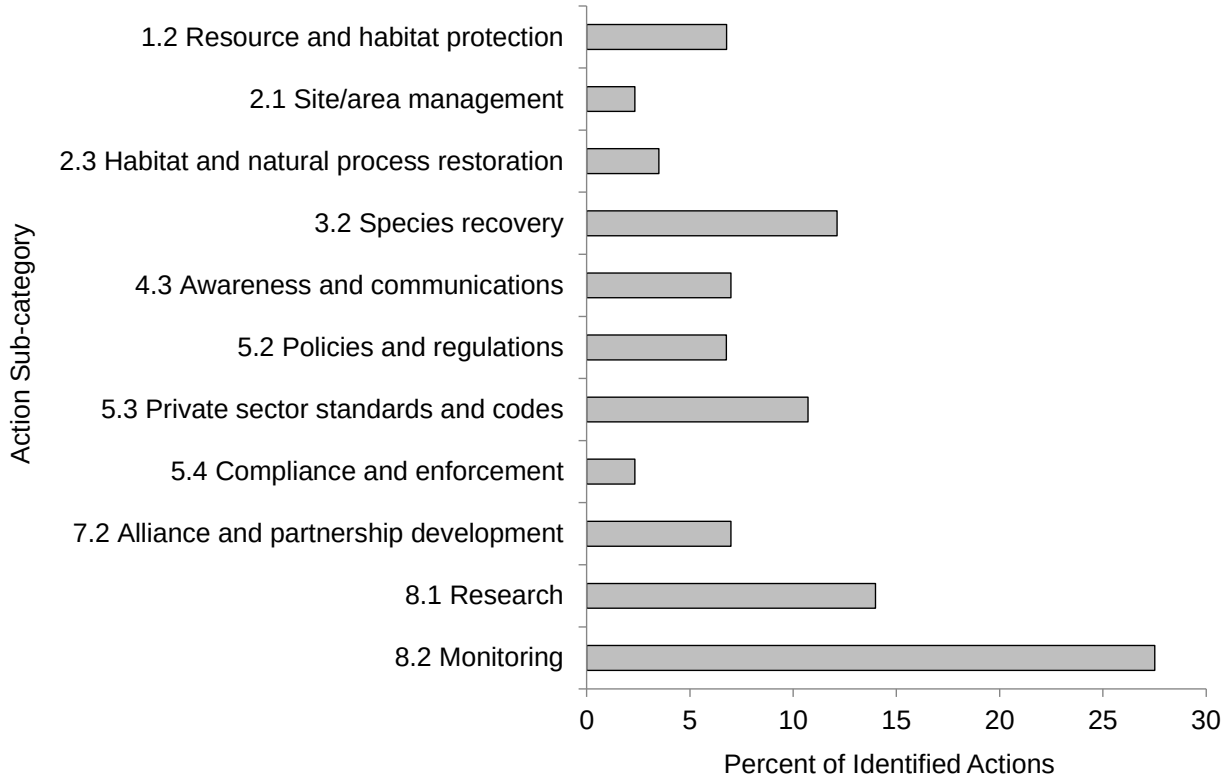

Figure 8. Percent of recommended actions assigned to each sub-category in BCR 8 ON.
Note: "Research and monitoring" refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see the section on Research and Population Monitoring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

Section 2: Conservation Needs by Habitat

The following sections provide more detailed information on priority species, their threats and objectives within each of the broad habitat classes that occur in BCR 8 ON. 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. Conservation objectives and corresponding actions have been developed to address only those threats to priority species that have a magnitude of "medium" or greater. Some species do not appear in the threats table because their low-level threats have not been assigned objectives or actions, they are migrants and no threats were identified in a specific habitat, or identified threats are addressed in the Widespread Issues section of the strategy.

The priority birds of BCR 8 ON face a variety of threats, from habitat loss and degradation, to threats of habitat shifting and alteration due to climate change. As discussed above, some of these threats apply broadly to all habitat types and are better described as "widespread issues". These issues, including collisions with vehicles (e.g., logging trucks) and human-made structures, expansion of road networks, pollution, and habitat alteration or other issues related to climate change are discussed separately in the Section 3 of this strategy.

Forestry and Forest Management in BCR 8 ON

More than 70% of the land area of BCR 8 ON is covered with forest (Table 1), and a significant additional portion (approximately 9%) is early successional habitat post-harvest or post-fire, which will revert to forest in time (Table 1). The Area of the Undertaking, or zone where forest management occurs, is 43.8 million hectares in size (Ontario Ministry of Natural Resources 2009) and is located partly within BCR 12 ON and BCR 8 ON. Within this zone, the forest area managed for harvest, known as productive forest, is 27.2 million hectares. Forestry operations on Crown land are extensive throughout much of BCR 8 ON, with the exception of the northwestern portion of the region, where natural disturbance patterns still predominate (Ontario Partners in Flight 2008; Turcotte in prep.). However, harvest in this region may increase in the years to come if an expanded road network is developed in support of forestry and mining in the region. Between 1995 and 2005, approximately 210,000 ha were harvested in Ontario's boreal forest annually (Ontario Ministry of Natural Resources 2009). Comparable land areas were affected by site preparation and other silvicultural[9] activities. In 2009–10, approximately 58,000 ha were treated with herbicides to support forest regeneration, and over 3,000 km of primary, branch and operational roads were constructed to support of forestry operations (Ontario Ministry of Natural Resources 2011). Primary roads provide access to Forest Management Units and are constructed and maintained as permanent roads, while operational roads are normally not maintained after they are no longer required for forest management purposes, and they are often decommissioned (Ontario Ministry of Natural Resources 2011).

[9] Silviculture is the practice of controlling the establishment, growth, composition, health, and quality of forests to meet diverse needs and values.

Threats related to forestry (threat sub-category 5.3) affect 50 priority species (70%) in BCR 8 ON, and were ranked as moderate in magnitude overall (Table 5). Forestry is therefore the most significant threat facing priority birds in the region, both in terms of magnitude and in terms of number of species affected. However, it should be noted that threats related to forestry in BCR 8 ON were determined to have a lower magnitude than in BCR 12 ON to the south, owing to a relatively smaller extent of harvest activities in the region. BCR 8 ON remains somewhat intact with extensive tracts of continuous forest cover, the presence of tree species and vegetation communities natural to boreal forests, a reduced incidence of non-native invasive species when compared with regions farther south, and a more intact natural disturbance regime remaining a significant factor in the region (Wedeles 2010a). Still, forestry activities merit special attention in this strategy for two reasons: 1) it is the dominant human land use in the region, and 2) regulations, policies and partners are already in place to deliver effective conservation of birds through the management of forestry activities. For example, in an effort to promote compliance with the *Migratory Birds Convention Act, 1994*, and the *Migratory Birds Regulations*, Environment Canada has developed avoidance guidelines to help the forestry industry reduce the risk of incidental take of migratory birds, nests and eggs, facilitating proactive avoidance and mitigation decisions for any activities that might affect migratory birds (Environment Canada 2013a).

Almost all forested lands in BCR 8 ON are Crown forests managed by the Ontario Ministry of Natural Resources under the *Crown Forest Sustainability Act of 1994* (Statutes of Ontario 1994). The Act legally requires that Crown forest in Ontario be managed to conserve healthy, diverse and productive forests, and their associated ecological processes and biodiversity, through management that emulates natural disturbance and landscape patterns. Policies and regulations under the Act address the provision of habitat at a coarse and fine scale, and are the major vehicle for management of the BCR 8 ON forest matrix. At the coarse, landscape-level scale, forest management guides provide direction on maintaining or enhancing natural landscape structure, composition and patterns ultimately resulting in healthy, productive forest ecosystems. The *Forest Management Guide for Boreal Landscapes* (Ontario Ministry of Natural Resources 2014c) includes management guidance specific to the boreal forest, such as prescribing the size and shape of clear-cuts, residual patch retention measures, residual tree, snag and downed woody debris retention measures, and approaches to prescribed burning and salvage logging. The *Stand and Site Guide* (Ontario Ministry of Natural Resources 2010a) complements the Landscape Guide, providing finer-scale direction for planning and forest operations at the stand and site level (i.e., 10s of m^2 to 100s of km^2). It meets specific societal, economic or ecological goals not well addressed by application of the coarse-level direction within the Landscape Guide.

The direction provided in the Landscape Guide seeks to emulate natural disturbance and landscape patterns, as required by the Act. In many forested ecosystems, natural disturbances such as fire and blow-downs create variability, in space and time, of forest characteristics. Silvicultural practices in Ontario assume that this variability is a desirable trait, and seek to manage forests within the Simulated (or Estimated) Range of Natural Variability. The Landscape Guide uses long-term simulation models and historical records to estimate the range of natural

variation in major forest parameters (e.g., forest composition, age class distribution and landscape pattern; Ontario Ministry of Natural Resources 2002; 2014c) at the eco-region scale that would be expected under a regime of natural disturbance. The impact of landscape pattern effects on landbird populations in forested landscapes such as BCR 8 ON is not well understood (Voigt et al. 2000), and it is assumed that managing forests to be within this range of natural variation will support the maintenance of or a return to the desired abundances of forest birds.

At a smaller spatial scale, the *Stand and Site Guide* (Ontario Ministry of Natural Resources 2010a) provides specific direction to modify forest management operations to benefit birds and encourage biodiversity. Guidelines seek to maintain tree species diversity, retain wildlife trees and downed woody material, preserve hydrologic function by minimizing soil compaction and rutting, and avoid disturbing nests or habitat of specific bird species of interest, such as birds of prey or Species at Risk. Collectively, guidelines at the stand and site level, the landscape level, and other policies and guidelines related to forest management offer an effective framework for the conservation of priority birds in BCR 8 ON. Actions to address forestry-related threats in this region recommend working collaboratively with forest planning initiatives to ensure guidance for priority species addresses conservation needs, promoting the development and use of beneficial management practices, establishing a network of protected areas, and evaluating key assumptions and improving the scientific knowledge-base that underpins forest management guidelines and policies. Implementing and refining these actions will require participation of a variety of stakeholders, including provincial government and industry representatives.

In the boreal forests of BCR 8 ON and further north, by signing the Canadian Boreal Forest Agreement, forestry companies have demonstrated a willingness to work collaboratively and proactively in order to minimize environmental impacts. This agreement between 21 major Canadian forest product companies and leading environmental non-government organizations covers over 70 million hectares of boreal forest across the full breadth of the country. The agreement seeks to achieve a balance between environmental protection and the competitiveness of Canada's forestry sector, for example through the suspension of forestry activities in key habitats for Boreal Caribou (a Species at Risk) and by seeking market recognition for progress towards sustainable forestry practices (Canadian Boreal Forest Agreement 2010). This historic agreement demonstrates an unprecedented commitment to habitat protection on the part of the forestry sector, and could offer a model for collaboration throughout other forested regions in Ontario and in Canada.

Emerging Issue: Mineral Exploration and Mining

The discovery of some of the richest deposits of chromite in the world in 2007–2008 sparked an intense rush to stake claims in an area dubbed the "Ring of Fire" mineral deposit, which straddles the border between BCR 7 ON and BCR 8 ON. The number of unpatented mining claims nearly tripled from 35,386 in 2007 to 90,579 in 2010 (Far North Science Advisory Panel, 2010). The supply of chromite, an important ingredient in stainless steel, is controlled by a small number of countries, all outside of North America. The Ring of Fire also holds other deposits of nickel, copper, platinum, palladium, vanadium, titanium, gold and diamond-bearing kimberlites. Because of its strategic importance, and because of the world-class grade and tonnage of the chromite deposit, there is significant interest in developing this resource (Far North Science Advisory Panel 2010).

At the time of writing, intensive exploration, drilling and bulk sampling in the region is ongoing. The first of several proposals within the area will extract ore from a vertically oriented deposit bearing nickel, copper, platinum, palladium via an underground (shaft) mine in the McFauld's Lake area, just inside the boundary of BCR 7 ON. Processing facilities at the mine would produce a nickel-copper-platinum-palladium concentrate transported by a 300-km all-season road linking the Ring of Fire mineral deposits southwest to Pickle Lake in BCR 8 ON. Other proposals, including those using open-pit mining methods to extract and process ore-bearing chromite, would require a rail or heavy-duty road to move products, possibly to Nakina, 300 km to the south, also in BCR 8 ON. Creation of the significant infrastructure necessary to support the chromite mine's operations may make subsequent mine developments economically feasible. The northwest portion of BCR 8 ON also has significant deposits of gold and other metals, and is the site of current and past producing gold mines such as Musselwhite and Golden Patricia. This is also the site of the past-producing copper mine at Thierry Lake, currently in the advanced exploration phase for a new development. Although impacts of any single development may be modest, the cumulative effects on the priority birds and habitats of BCR 8 ON may be substantial.

Mining activities can affect a variety of habitat types, and open-pit mining and its associated infrastructure leads directly to the loss and/or degradation of these habitats. For example, the disruption of permafrost and surface water flow from resource extraction or exploration activities can adversely affect hydrological characteristics of wetland habitats (Blodgett and Kuipers 2002). Diamond-bearing kimberlite pipes are sometimes underneath shallow lakes, which must be drained to access the deposit. The diamond mine at Victor Lake (BCR 7 ON), which began production in 2008, involves large-scale pumping of water from the open pits, disrupting local hydrology and potentially leading to the release of mercury stored in the peatlands (AMEC 2007; Far North Science Advisory Panel 2010). Mining and processing of gold and other metals can result in the release of harmful levels of metals into watersheds, acid drainage and a variety of other issues related to contamination of water and food chains (Kwong et al. 1997).

Habitats can also be degraded by the road dust and disturbance that mining creates; however, studies to document the severity of these effects show mixed results. Vegetation characteristics and schedules of snowmelt can be noticeably altered by road dust (Auerbach et al. 1997), but a study in the Northwest Territories documented few negative effects of mining activities on birds beyond 1 km of the mine footprint (Smith et al. 2005). Some birds of prey nest on rock faces or infrastructure from mining activities, and appear resilient to moderate levels of human disturbance (Swem 1996). Indeed, some birds of prey may benefit from the artificial lighting, food subsidies and nesting substrate offered by resource extraction infrastructure. Further study is needed to better understand the effects of disturbance and habitat degradation related to mining at local and regional scales.

Significant mining developments require large-scale infrastructure including roads, rail lines and electrical transmission corridors. Indeed, the lack of an all-weather road network is perceived as a major impediment to the economic development of northern Ontario (Far North Science Advisory Panel 2010). However, these linear features act as ecological barriers, disrupt surface water flows, and provide new corridors of transport for diseases and invasive species. Also, birds frequently collide with vehicles or power lines. Importantly, roads and electrical transmission corridors open a region to numerous forms of resource development that may be economically unfeasible without the infrastructure in place. Large-scale infrastructure projects commonly lead to cascading, often unpredictable, cumulative environmental effects. In BCR 8 ON, major infrastructure projects that are in advanced stages of planning include: (1) a 430-km-long Northwest Transmission Expansion Project from the Nipigon area to the Pickle Lake area; (2) a 300-km all-season road linking the Ring of Fire mineral deposits south-west to Pickle Lake; (3) a 350-km rail and/or road corridor linking the Ring of Fire mineral deposits south to Nakina; and (4) an all-season road linking communities along James Bay (in BCR 7 ON) south to Highway 11, passing through the eastern part of BCR 8 ON.

Emerging Issue: Renewable Energy

Within BCR 8 ON, over 750 sites have been identified with varying degrees of waterpower potential, the majority of which range from 0.01 MW to 50 MW (Ontario Ministry of Natural Resources 2014a). At least 26 hydroelectric generating stations are already operational in BCR 8 ON (Ontario Ministry of Natural Resources 2014a), with others being developed to increase capacity (e.g., Lower Mattagami River stations: additional 440 MW), and other entirely new projects (e.g., Little Jackfish River: 78 MW) have been proposed (Ontario Power Generation 2014). Although there is considerable interest in developing sources of renewable energy, development has been constrained by a lack of infrastructure to bring the electricity to market (Far North Advisory Panel 2010).

The construction and operation of dams with reservoirs and the associated regulation of discharges can affect both upstream and downstream ecosystems. Dams alter water temperatures and chemistry, increase sedimentation, and create barriers to the upstream/downstream movement of nutrients and organisms. They can also affect riparian and aquatic habitat availability through the alteration of the timing and magnitude of downstream

water levels (McAllistar et al. 2000; Environment Canada 2004). Water level regulation can have deleterious effects on nesting success of waterbirds; increasing water levels can inundate nests while lowering water levels can strand nests, enhancing losses to predation (Poole 2009). For example, between 2010 and 2012, waterbird surveys undertaken by Environment Canada's Canadian Wildlife Service of Lake St. Joseph in BCR 8 ON, a regulated lake managed by the Lake of the Woods Control Board, found evidence of flooding and nest losses for three species: Common Tern, Ring-billed and Herring Gull (R. Weeber, pers comm. 2014). Large-scale hydroelectric developments can affect bird populations through direct loss of habitat due to dam construction, flooding, erosion and scouring of river channels, and altered sediment dynamics (Drinkwater et al. 1994). However, in northern Ontario, information on the consequences of these effects on bird populations is poorly understood.

At present, threats to priority species from mining activities (sub-category 3.2) and renewable energy (sub-categories 3.3 – construction of hydroelectric dams; and 7.2 – water level management) were determined to have low-magnitude effects on priority species in the various habitats of BCR 8 ON, due in large part to the low density of industrial development and human settlements, particularly in the northwestern portion of the BCR. Indeed, much of the northern extent of Ontario's BCR 8 remains a somewhat intact ecological system, free from large-scale anthropogenic disturbance, and this presents a unique opportunity to pursue development in the context of conservation, rather than vice versa. The "conservation matrix" approach advocated by the Far North Science Advisory panel holds significant promise to achieve this. The conservation matrix model suggests that carefully planned and managed development areas are needed within a matrix of conservation lands, in an effort to protect conservation values across the entire landscape (Far North Advisory Panel 2010). As part of this model, and in an effort to respond to these emerging threats for the benefit of birds and their habitats, the establishment of a network of protected areas is paramount. To support this outcome, an improved baseline of information is needed and forms the focus of the majority of conservation objectives and actions in this strategy. Estimates of relative abundance within and outside proposed development areas are lacking for most species, so that determining the scale of environmental effects would be difficult. The Ontario Breeding Bird Atlases and BBS provide valuable information for a small portion of the region, but many of the areas considered for resource development are remote and well outside the areas covered by large-scale surveys. To implement the provincial *Far North Act*'s vision of responsible and sustainable development, the environmental impacts of development must be carefully considered. Moreover, designating a network of protected areas identified through community-based land-use plans requires a detailed understanding of the distribution of natural heritage features. For birds and their habitats, an enhanced understanding of distribution and abundance is needed.

Emerging Issue: Invasive Non-native Species

Invasive species affect ecosystem composition and structure by displacing native species and altering ecological processes (Canadian Food Inspection Agency 2008). The relatively extreme climate, low population density, low biodiversity and poor resource availability of the Boreal Shield have resisted invasions of non-native species relative to other ecozones (Liebhold et al.

1995). Most invasive species occur in southern Ontario within the Boreal Hardwood Transition (BCR 12 ON) and the Lower Great Lakes–St. Lawrence Plain (BCR 13 ON). While some invasive species have been invading the boreal forest from southern Quebec and Ontario, climate change and resource exploitation are expected to intensify the arrival and establishment of non-native species in the north (Turcotte in prep.).

Invasive non-native species were determined to have low-magnitude effects on priority species (sub-category 8.1) in forest and aquatic habitats in BCR 8 ON. Outbreaks of invasive non-native forest pests and tree diseases can adversely affect forest health and habitat value. For example, the pine shoot beetle (*Tomicus piniperda*), which is established in southern Ontario, attacks pine trees of all ages and can cause whole tree mortality in only two years (Ontario Ministry of Natural Resources 2010b). This species has recently moved from pine plantations to nearby forests in southern Ontario, and while it is not yet known as a threat in BCR 8 ON, along with other species such as the European wood wasp (*Sirex noctilio*), it has the potential to devastate the province's forest ecosystems (Sanderson et al. 2012). The emerald ash borer (*Agrilus planipennis*) is an alien beetle from China and eastern Asia that has invaded Ontario and Québec. It has been observed as far north as Sault Ste. Marie (BCR 12 ON; Natural Resources Canada 2014). This highly destructive invasive non-native species was first observed in North America in 2002, and in the absence of control measures it is expected to spread across the entire range of ash, killing even healthy individuals of all ash species, including the black ash (*Fraxinus nigra*) found in southern portions of BCR 8 ON (Ontario Ministry of Natural Resources 2010c).

Climate change can increase the risk of outbreaks of these and other forest pests by increasing overwinter survival. For example, milder winters could facilitate further range expansion of the mountain pine beetle (*Dendroctonus ponderosae*). Projections suggest that this species, which has caused widespread devastation of western forests, could reach Ontario's pine forests by 2050 (Colombo 2008). Longer-term effects of climate change could include effects on disturbance regimes (especially fire) and tree growth rates, as local climate conditions become unsuitable for previously site-adapted species (Colombo 2008).

Purple loosestrife (*Lythrum salicaria*) was introduced to North America from Eurasia in the early 1800s and has become a serious threat to wetland habitats by outcompeting native vegetation and decreasing plant and vertebrate diversity. It also affects nutrient cycling and causes drying, which ultimately reduces the quality of wetlands for birds and other wildlife (Federal, Provincial and Territorial Governments of Canada 2010). While habitat loss and/or degradation of wetlands from this invasive non-native herbaceous perennial is higher in southern Ontario, it has spread northward to scattered locations around cities and towns such as Timmins, Geraldton, Sioux Lookout and as far west as Rainy River (Ontario Federation of Anglers and Hunters 2011).

With growing interest in accessing and developing the region's mineral, energy and forest resources, the associated infrastructure (roads, rail lines and electrical transmission corridors) will enhance access to the north, thereby elevating the potential for the introduction of invasive

non-native species (Far North Advisory Panel 2010). While the status and ecological effects of invasive species in the boreal forests of North America are generally poorly understood, potential prevention measures including undertaking risk assessment of species likely to reach and establish in the boreal forest as well as the strategic setting aside of roadless areas to conserve and protect the ecological integrity of boreal habitats in BCR 8 ON could be explored (Sanderson 2012; Far North Advisory Panel 2010).

Habitat-specific Issues and Actions

Coniferous

According to the United Nations Food and Agriculture Organization's (UN-FAO) Land Cover Classification System (LCCS; Food and Agriculture Organization 2000), coniferous habitats are defined as forest dominated by evergreen trees whose foliage is typically needle-shaped. Coniferous forests, especially those dominated by black spruce, are the most widespread habitat type in BCR 8 ON, accounting for 42% of the region's land cover (Fig. 9; Table 1). Lowland coniferous forests predominate in the eastern portion of the region, while upland forests of spruce and Jack pine occur throughout. Stands of red and white pine, more characteristic of BCR 12 ON, occur only along the region's southern edge. The major disturbance mechanisms also vary across the region, with large, natural fires most common in the northwest. Elsewhere in the region, fire suppression activities have reduced the occurrence of natural fire, and thus forestry activities have become the major disturbance mechanism, followed by blow-down and outbreaks of native insects (e.g., spruce budworm and jack pine budworm; Wedeles 2010a; Turcotte in prep.).

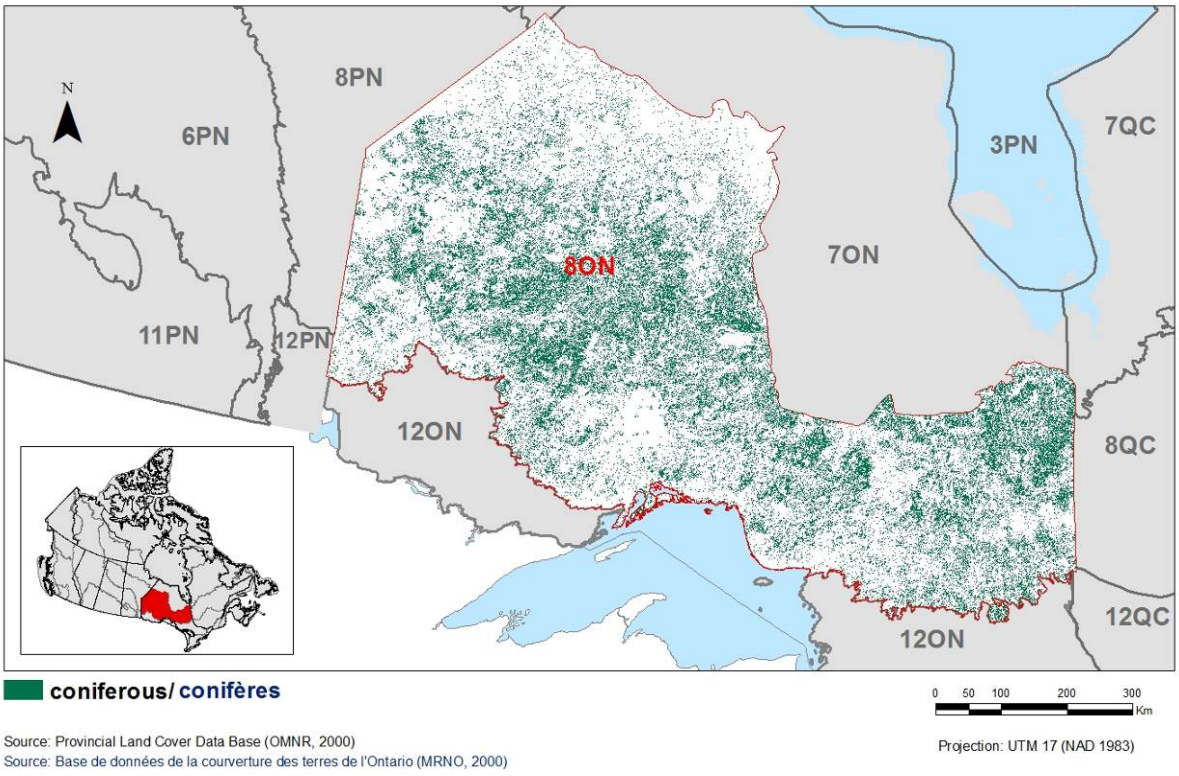

Figure 9. Map of coniferous forests in BCR 8 ON.

This habitat is used extensively by 22 priority species, all landbirds (Table 6), including 3 species at risk: the Canada Warbler, the Common Nighthawk and the Olive-sided Flycatcher, all listed federally and provincially. Among these, 13 species are included due to regional stewardship needs. The region supports a particularly high proportion of the global breeding populations of Bay-breasted Warbler (44%) and Black-throated Green Warbler (24%), along with greater than 10% of the breeding populations of Cape May and Blackburnian Warbler, Evening Grosbeak and Purple Finch. In winter, the region supports more than 20% of the global populations of Evening Grosbeak and Black-backed Woodpecker (Ontario Partners in Flight 2008).

Table 6. Priority species that use coniferous habitat in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Table 6 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Bay-breasted Warbler	Mature spruce-fir forest; spruce budworm specialist	Maintain current					Y	Y	
Black-backed Woodpecker	Mature and old black spruce, tamarack and jack pine forest; recent burns	Assess/Maintain					Y		Y
Blackburnian Warbler	Mature to old growth coniferous forest with spruce or pine	Maintain current						Y	Y
Black-throated Green Warbler	Mature coniferous forest with complex vertical layers	Maintain current					Y	Y	Y
Blue-headed Vireo	Mature coniferous forest with well- developed understorey	Maintain current							Y
Boreal Owl	Dense coniferous forest	Assess/Maintain					Y		
Canada Warbler	Relatively open stands of coniferous forest	Recovery objective[7]	Y	Y	Y	Y	Y	Y	Y
Cape May Warbler	Mature coniferous forest; spruce budworm specialist	Maintain current					Y		Y
Common Nighthawk	Relatively open stands of coniferous forest; open, young regenerating forest, clearcuts and burns	Recovery objective[7]	Y	Y	Y	Y		Y	
Connecticut Warbler	Mature lowland coniferous forest (tamarack-spruce bogs and fens) with well-developed understory; regenerating	Maintain current				Y	Y	Y	Y

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and in most cases follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Canada Warbler: Maintain current; Common Nighthawk: Assess/Maintain; Olive-sided Flycatcher: Increase.

Table 6 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
	cutovers and young jack pine forest								
Magnolia Warbler	Dense, mid-successional coniferous forest; coniferous forest openings and edges with spruce and balsam fir	Maintain current						Y	Y
Nashville Warbler	Open second-growth mixed and coniferous forest, with predominantly black spruce	Maintain current					Y		Y
Northern Goshawk	Mature coniferous forest with high canopy closure, and generally low ground and shrub cover	Assess/Maintain				Y		Y	
Olive-sided Flycatcher	Open coniferous-dominated forest; cutovers and burns	Recovery objective[7]	Y	Y	Y	Y		Y	
Pine Grosbeak	Coniferous forest with openings	Assess/Maintain				Y		Y	
Purple Finch	Coniferous forest with openings; Spruce budworm specialist	Maintain current				Y	Y		
Ruby-crowned Kinglet	Coniferous forest	Maintain current					Y		
Sharp-shinned Hawk	Coniferous forest	Assess/Maintain					Y		
Tennessee Warbler	Early successional coniferous forest with openings; spruce budworm specialist	Assess/Maintain							Y
White-throated Sparrow	Coniferous forest with openings and low dense vegetation; areas of second growth after logging or fires	Maintain current						Y	Y
Winter Wren	Mature moist coniferous forest with low dense groundcover	Maintain current					Y		
Yellow-bellied Flycatcher	Damp coniferous forest with complex vertical layers	Maintain current					Y		Y

Forestry and fire suppression were determined to be overall medium-magnitude threats to priority species in coniferous habitats (threat sub-categories 5.3 and 7.1; Fig. 10), primarily through effects on habitat supply and quality. Past forest harvesting practices, coupled with fire-suppression activities have altered landscape structure and composition across Ontario,

compared with naturally disturbed landscapes (Ontario Ministry of Natural Resources 2014c). For example, boreal forests in northwestern Ontario currently contain more mixed wood forest than was found in the late 1800s (Ontario Ministry of Natural Resources 2014c). Current forestry management guidelines and practices (e.g., protection of stick nests, maintaining old-growth forest) are designed to ensure that harvest activities do not negatively affect birds and other wildlife. Factors identified of importance to achieving conservation objectives (from Ontario Partners in Flight 2008):

- Current forest harvesting prescriptions, especially choice of harvest method, harvest area size and configuration, and rotation cycles;
- Pre- and post-harvest silvicultural treatments (prescription fires, brush management) that affect conifer regeneration and forest structure;
- Frequency and control of budworm and other insect outbreaks;
- Age-class distribution, particularly the amount and distribution of mature and old-growth forest;
- Supply of conifer trees capable of producing a seed crop regularly;
- Predicted impacts of climate change, including short-term impacts of weather patterns that affect insect and disease populations, and longer-term impacts on disturbance regimes and forest composition;
- Impact of atmospheric pollutants, including acid precipitation, that have direct effects on forest health and also indirect effects on bird populations (e.g., leaching of base cations affecting availability of calcium-dependent invertebrates).

The proposed actions to counteract threats from forestry operate at a variety of spatial scales, from the landscape scale down to that of individual wildlife trees (Table 7). This multi-scale approach is consistent with the approach followed under the *Crown Forest Sustainability Act, 1994* (Statutes of Ontario 1994), and acknowledges that variability in stand ages, condition and other factors across a landscape scale is a natural characteristic of forest habitats. Research and monitoring actions (action sub-categories 8.1 and 8.2) were also identified, which focus on gathering ecological and demographic information for specific priority species in the region. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

As forestry operations have increased in coverage and intensity, active suppression of forest fires has also become more widespread. Today, forest fires are suppressed across much of BCR 8 ON, and large fires spread naturally only in the far northwestern portion of the region, beyond the limit of intensive forestry operations (Ontario Partners In Flight 2008). Fire suppression can reduce the amount and limit the distribution of burned forest habitat available to priority species such as the Black-backed Woodpecker, which forages opportunistically on wood-boring beetles in recently burned habitats (Ontario Partners in Flight 2008). For Common Nighthawks, there is evidence that birds nesting in harvested habitats experience significantly lower breeding success than those nesting in natural (e.g., burned) openings (COSEWIC 2007). Recommended actions to mitigate this threat to priority species include developing prescribed

burn protocols to promote and retain high-value burned forest within the natural fire-return interval (Table 7).

Low-magnitude threats affecting priority species in coniferous habitats relate to the detrimental effects to boreal forest habitats from the introduction and/or spread of invasive non-native forest insects and tree diseases (e.g., white pine blister rust; sub-category 8.1) and the control of spruce budworm outbreaks, which can reduce an important food source for specialist birds (sub-category 9.3). Collisions with vehicles (sub-category 4.1) are also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are presented in the Widespread Issues section of this strategy rather than in Table 7 of this section.

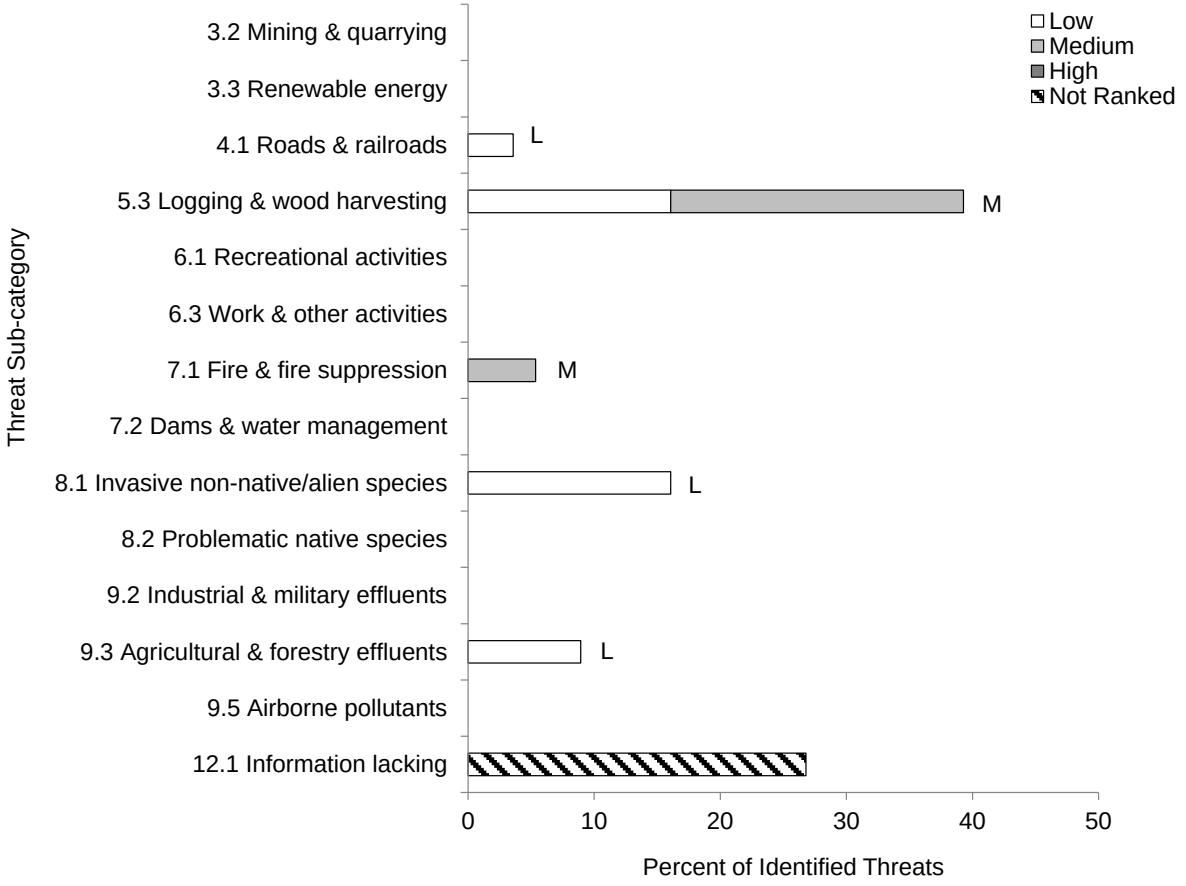

Figure 10. Percent of identified threats to priority species in coniferous habitats in each threat sub-category.

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 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in coniferous habitat is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 7. Threats, conservation objectives, recommended actions and list of priority species affected in coniferous habitats in BCR 8 ON.
Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
5.3 Logging & wood harvesting	Loss and/or alteration of coniferous forest habitat due to logging practices (e,g, conversion of coniferous to mixed and deciduous forest types).	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Maintain coniferous forest habitat supply, composition, pattern and structure within the estimated range of natural variation under natural disturbance regime.	1.2 Resource and habitat protection	Complete a protected areas network in accordance with Far North Land Use Planning Initiatives (Far North Advisory Panel, 2010).	Bay-breasted Warbler, Black-backed Woodpecker, Blackburnian Warbler, Black-throated Green Warbler, Blue-headed Vireo, Boreal Owl, Canada Warbler,[2] Cape May Warbler, Connecticut Warbler, Northern Goshawk, Pine Grosbeak, Winter Wren, Yellow-bellied Flycatcher
				4.3 Awareness and communications	Promote the development and use of forest management guides (i.e., Silviculture, Landscape, Stand and Site Guides) that protect habitat (e.g., maintaining old growth) and important habitat features (e.g., snag retention) for coniferous forest birds.	
				5.2 Policies and regulations	Support/encourage the ongoing consideration of the needs of priority species in forest management planning on Crown land and other land use planning efforts.	
				5.3 Private sector standards and codes	Forest management practices should consider forest regeneration to conifer where conifer-dominated stands are harvested/discourage disproportionate regeneration to mixed wood and deciduous stands. Implement accredited beneficial forest management practices (e.g., Forest Stewardship Council Canada 2004. National Boreal Standard; Canadian Standards	

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.
[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 7 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
					Association; Sustainable Forestry Initiative).	
				7.2 Alliance and partnership development	Work collaboratively with forest management planning initiatives to ensure that the use of the provincial forest management guides adequately addresses the conservation needs of coniferous forest birds (Ontario Partners in Flight 2008).	
				8.1 Research	Research the effects of current forest conditions including landscape level (forest patch size, configuration and heterogeneity), stand level (age, structure, composition, health), and site level (snags, downed woody debris) on the abundance, distribution and demographics of priority coniferous birds (Ontario Partners in Flight 2008).	
				8.2 Monitoring	Encourage an adaptive management approach to the conservation of priority species, with ongoing monitoring and research to evaluate the effectiveness of forest management guidelines and outcomes (Ontario Partners in Flight 2008). Maintain or improve forest habitat mapping across BCR 8 ON, including regularly updating the Forest Resource Inventory data across the region and collecting data describing stand- and site-level features so that habitat change over time can be assessed (Ontario Partners in Flight 2008).	
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler
7.1 Fire & fire	Fire suppression	1.3 Ensure the	Maintain/restore	4.3 Awareness and	Promote awareness of the ecological	Black-backed

Table 7 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
suppression	reduces the amount and limits the distribution of burned forest habitat.	continuation of natural processes that maintain bird habitat	adequate amounts of post-fire forest habitat.	communications	benefits and correct misconceptions regarding the role of fire in natural landscapes.	Woodpecker, Common Nighthawk,[2] Olive-sided Flycatcher[2]
				5.2 Policies and regulations	Within managed landscapes, develop prescribed burn protocols to promote and retain high-value burned forest within the natural fire-return interval, distributed both spatially and temporally.	
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Olive-sided Flycatcher
12.1 Information lacking	Lack of knowledge on the biological or demographic parameters for management of populations.	7.1 Improve population/ demographic monitoring	Improve knowledge of breeding ecology and population dynamics to inform conservation and management.	8.1 Research	Increase understanding of population demography and breeding ecology; determine effects of forest management practices on abundance and distribution of this priority species.	Connecticut Warbler
					Study population demographics in years and/or areas with no spruce budworm outbreaks.	Bay-breasted Warbler
	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Black-backed Woodpecker, Boreal Owl, Canada Warbler, [2]Common Nighthawk,[2] Northern Goshawk, Olive-sided Flycatcher,[2] Pine Grosbeak, Sharp-shinned Hawk, Tennessee Warbler
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler, Common Nighthawk, Olive-sided Flycatcher

Table 7 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine cause(s) of population declines.	8.1 Research	Determine factors driving population declines; investigate the effect of forest management treatments on breeding density, productivity and survival (Ontario Partners in Flight 2008).	Canada Warbler[2]
					Investigate potential causes of population decline including studying population demographics across a range of nesting sites and management regimes (Ontario Partners in Flight 2008).	Olive-sided Flycatcher[2]
					Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Common Nighthawk[2]
					Research needed on ecology, cause of decline and irruptive movements.	Purple Finch
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler, Common Nighthawk, Olive-sided Flycatcher

Deciduous

Dense forest dominated by deciduous tree species is a relatively rare habitat type in BCR 8 ON, accounting for only 4% of the region's land cover (Fig. 11; Table 1). Forests dominated by poplars or white birch are most common in the eastern portion of the region, and black ash occurs at the southern edge (Ontario Ministry of Natural Resources 2002). Eight priority species (all landbirds) make extensive use of deciduous forest in BCR 8 ON, including one species at risk, Canada Warbler (Table 8).

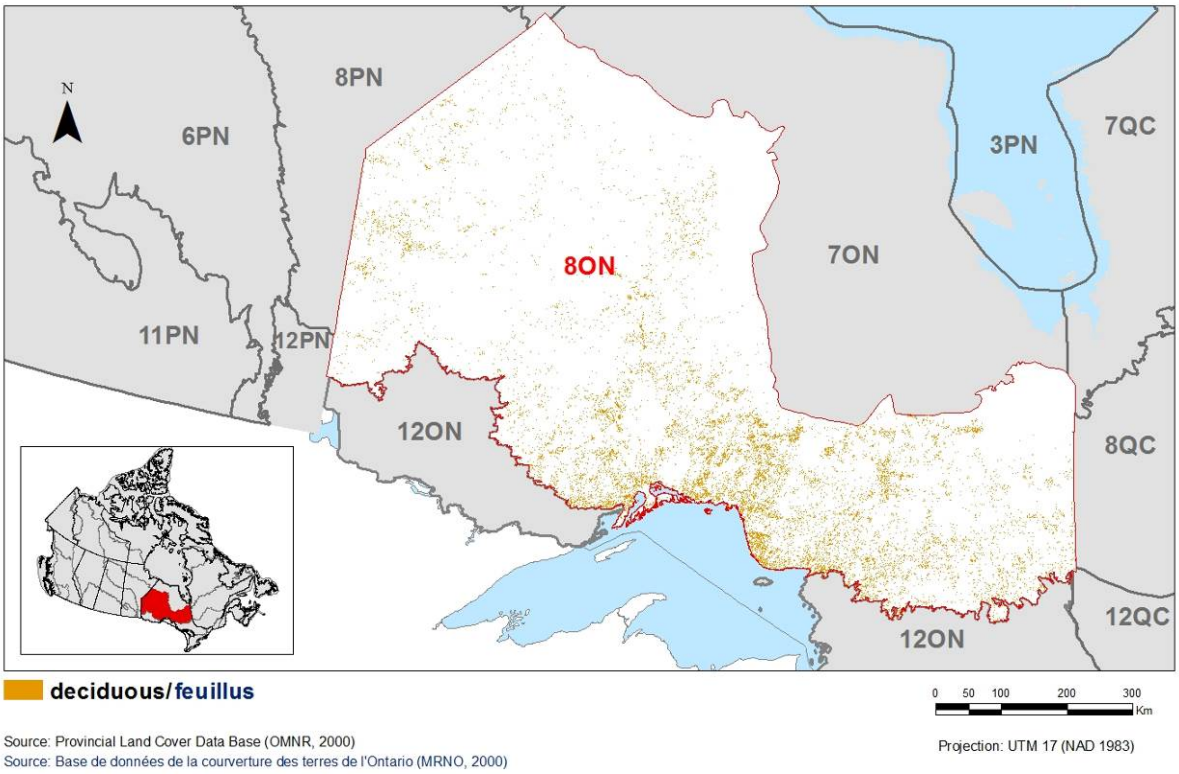

Figure 11. Map of deciduous forests in BCR 8 ON.

Table 8. Priority species that use deciduous habitat in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Black-and-white Warbler	Mature and second growth deciduous forest	Maintain current					Y		
Canada Warbler	Relatively open deciduous stands	Recovery objective[7]	Y	Y	Y	Y	Y	Y	Y
Northern Flicker	Open forest and forest edges with large snags	Maintain current					Y		
Northern Goshawk	Mature deciduous forest with high canopy closure, and generally low ground and shrub cover	Assess/Maintain				Y		Y	
Ovenbird	Mature, closed-canopy deciduous forest (no understory) (ground nester)	Maintain current					Y		
Ruffed Grouse	Young early-successional deciduous forest (with poplar or birch)	Assess/Maintain					Y		
Tennessee Warbler	Early successional deciduous forest; regenerating forest patches	Assess/Maintain							Y
Yellow-bellied Sapsucker	Early successional deciduous forest (with poplar and birch)	Maintain current					Y		Y

Forestry in deciduous habitats of BCR 8 ON was determined to be an overall medium-magnitude threat to some priority species, primarily through effects on habitat supply and quality (threat sub-category 5.3; Fig. 12). Forest management guidelines already consider the

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and in most cases follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objective for Canada Warbler in BCR 8 ON is: Maintain current.

needs of birds, and many of the factors affecting coniferous forest landbirds described in the coniferous habitat section above also affect deciduous forest birds. Ongoing work to design forest management guidelines that benefit biodiversity should further benefit priority birds and their deciduous forest habitat. In designing new guidelines, the impact of pre- and post-harvest silvicultural treatments (thinning, brush management) that affect forest structure and composition require particular consideration (Ontario Partners in Flight 2008). The proposed actions to counteract threats from forestry operate at a variety of spatial scales, from the landscape scale down to that of individual wildlife trees (Table 9). This multi-scale approach is consistent with the approach followed under the *Crown Forest Sustainability Act*, *1994* (Statutes of Ontario 1994), and acknowledges that variability in stand ages, condition and other factors across a landscape scale is a natural characteristic of forest habitats. Research and monitoring actions (action sub-categories 8.1 and 8.2) were also identified, which focus on gathering ecological and demographic information for specific priority species in the region. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

Low-magnitude threats affecting priority species in deciduous habitats relate to the detrimental effects to boreal forest habitats from the introduction and/or spread of invasive non-native forest insects (e.g., emerald ash borer) and tree diseases (sub-category 8.1). Collisions with vehicles (sub-category 4.1) is also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are presented in the Widespread Issues section of this strategy rather than in Table 9 of this section.

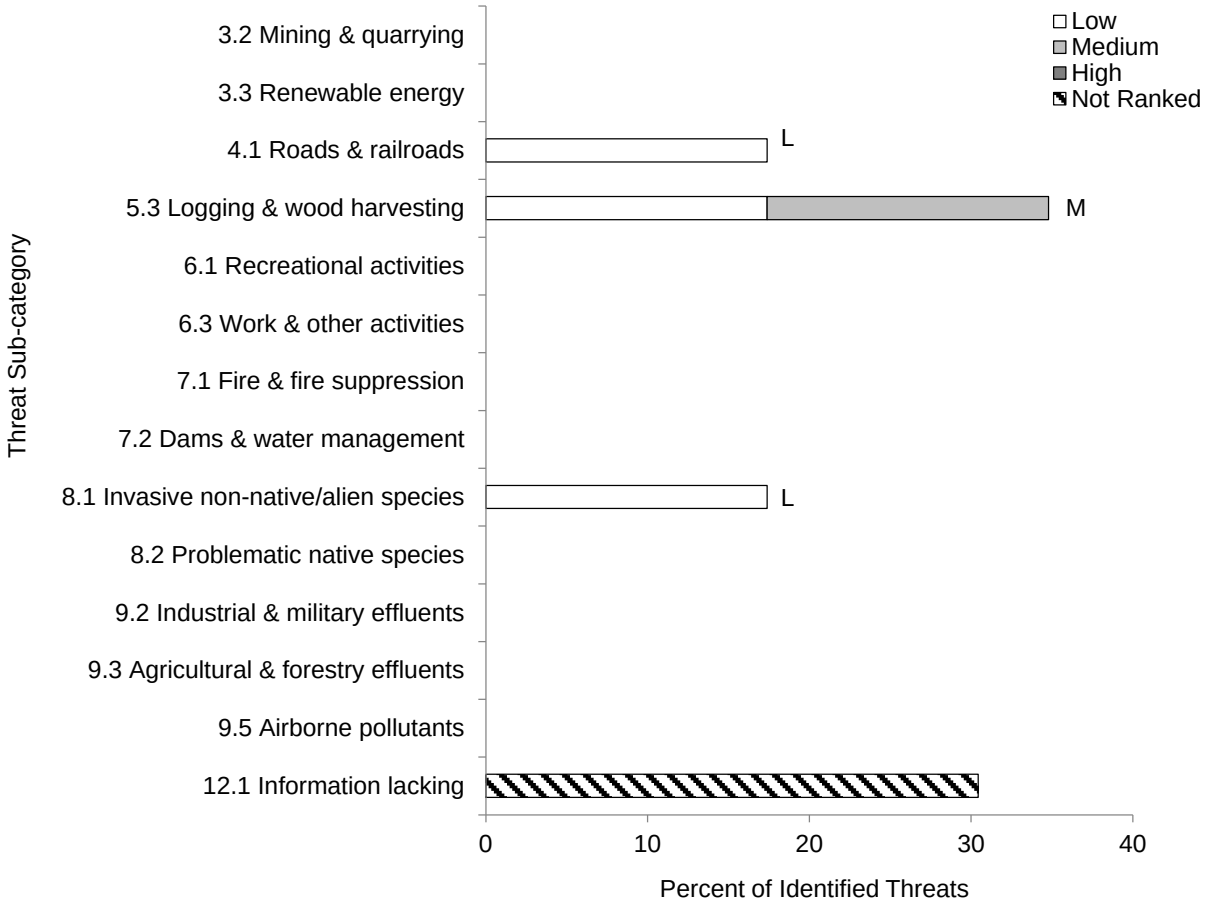

Figure 12. Percent of identified threats to priority species in deciduous habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in deciduous habitat (for example, if 100 threats were identified in total for all priority species in deciduous habitat, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in deciduous habitat is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 9. Threats addressed, conservation objectives, recommended actions and list of priority species affected in deciduous habitats in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
5.3 Logging & wood harvesting	Loss and/or alteration of mature deciduous forest habitat due to logging practices.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Maintain deciduous forest habitat supply, composition, pattern and structure within the estimated range of natural variation under natural disturbance regime.	1.2 Resource and habitat protection	Complete a protected areas network in accordance with Far North Land Use Planning Initiatives (Far North Advisory Panel, 2010).	Black-and-white Warbler, Northern Goshawk, Ovenbird, Yellow-bellied Sapsucker
				4.3 Awareness and communications	Promote the development and use of forest management guides (i.e., Silviculture, Landscape, Stand and Site Guides) that protect habitat (e.g., maintaining old growth) and important habitat features (snag retention) for deciduous forest birds.	
				5.2 Policies and regulations	Support/encourage the ongoing consideration of the needs of priority species in forest management planning on Crown land and other land use planning efforts.	
				5.3 Private sector standards and codes	Implement accredited beneficial forest management practices (e.g., Forest Stewardship Council Canada 2004 – National Boreal Standard; Canadian Standards Association; Sustainable Forestry Initiative).	
				7.2 Alliance and partnership development	Work collaboratively with forest management planning initiatives to ensure that the use of the provincial forest management guides adequately addresses the conservation needs of deciduous forest	

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 9 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
					birds (Ontario Partners in Flight 2008).	
				8.1 Research	Research the effects of current forest conditions including landscape level (forest patch size, configuration and heterogeneity), stand level (age, structure, composition, health), and site level (snags, downed woody debris) on the abundance, distribution and demographics of priority deciduous birds (Ontario Partners in Flight 2008).	
				8.2 Monitoring	Encourage an adaptive management approach to the conservation of priority species, with ongoing monitoring and research to evaluate the effectiveness of forest management guidelines and outcomes (Ontario Partners in Flight 2008). Maintain or improve forest habitat mapping across BCR 8 ON, including regularly updating the Forest Resource Inventory data across the region and collecting data describing stand- and site-level features so that habitat change over time can be assessed (Ontario Partners in Flight 2008).	
12.1 Information lacking	Lack of knowledge on the biological or demographic parameters for management of populations.	7.1 Improve population/ demographic monitoring	Improve knowledge of breeding ecology and population dynamics to inform conservation and management	8.1 Research	Investigate causes of apparent population fluctuations (Ontario Partners in Flight 2008).	Yellow-bellied Sapsucker
	Lack of knowledge (trend, population size, and/or		Improve monitoring efforts to increase reliability of population	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Canada Warbler,[2] Northern Goshawk, Ruffed Grouse, Tennessee Warbler, Yellow-bellied Sapsucker

Table 9 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
	distribution range).		status/trend.			
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler

Mixed Wood

Although less common than pure coniferous forests, mixed forests of poplar, birch, spruce, pine and fir are widespread throughout the region (Ontario Ministry of Natural Resources 2002), and account for 18% of the land cover (Fig. 13; Table 1).

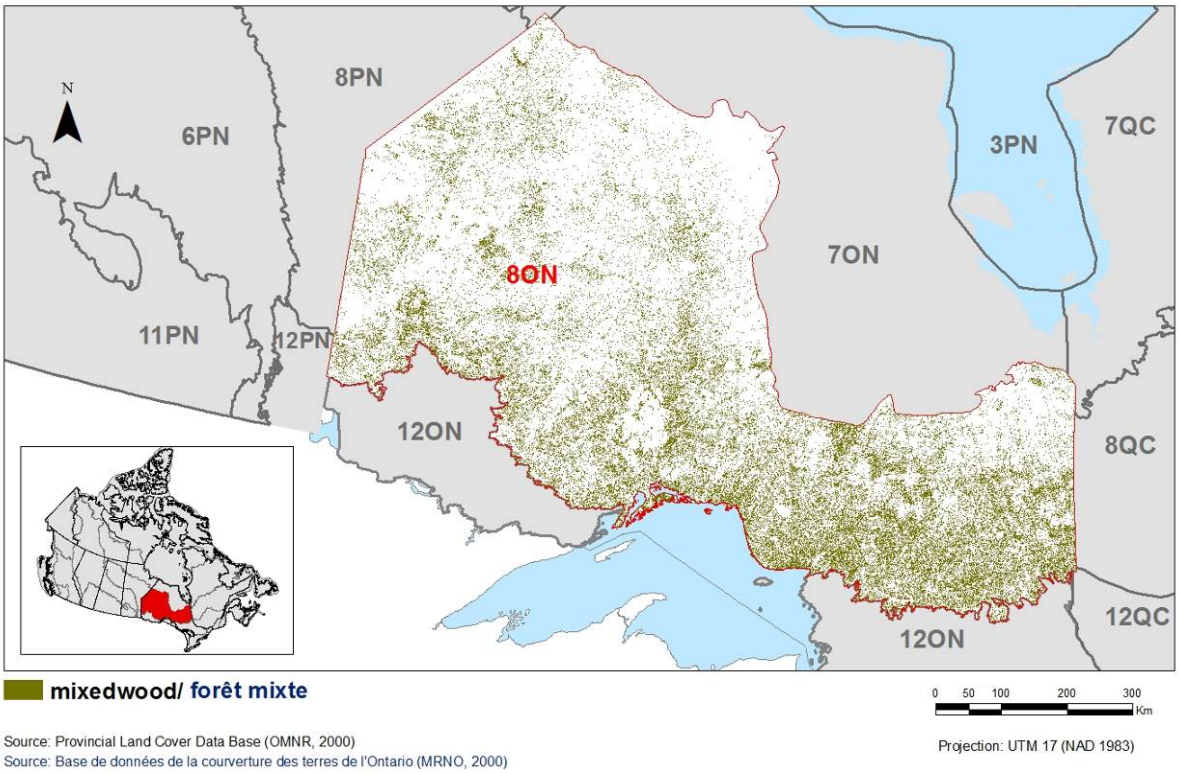

Figure 13. Map of mixed wood forests in BCR 8 ON.

These habitats are used extensively by 23 priority species (all landbirds; Table 10), including 4 species at risk: Canada Warbler, Common Nighthawk, Eastern Whip-poor-will and Olive-sided Flycatcher.

Among the priority species using mixed forest are the Common Nighthawk and Eastern Whip-poor-will. These species move to open habitats at dusk and dawn (crepuscular species) to forage on the wing for flying insects (Poole, A. 2009). Like other aerial insectivores, these species have declined significantly in abundance and distribution in Ontario in recent decades. However, declines may have been less pronounced in BCR 8 ON than elsewhere. For example, BBS results suggest a decline of 1.5% per year for Common Nighthawk between 1966–2004, and the Breeding Bird Atlas suggests an approximately stable distribution for Eastern Whip-poor-will between the two atlas surveys (Ontario Partners in Flight 2008), in contrast to declines of more than 50% for both species in BCR 12 ON (see BCR strategy for BCR 12 ON; Environment Canada 2014a). As for all aerial insectivores, the causes of these declines remain largely unknown but could be related to a reduction in the availability of their insect prey in more southerly parts of their range (Nebel et al. 2010). Threats, objectives and actions related

to the conservation of these and other aerial insectivores appear in other Ontario BCR strategies (e.g., BCR 12 ON and BCR 13 ON; Environment Canada 2014a; 2014b), where they face threats of a greater magnitude.

Table 10. Priority species that use mixed wood habitat in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Black-and-white Warbler	Mature and second growth mixed forest	Maintain current					Y		
Black-backed Woodpecker	Mature and old growth mixed forest; recent burns	Assess/Maintain					Y		Y
Blackburnian Warbler	Mature mixed forest	Maintain current						Y	Y
Black-throated Green Warbler	Mature mixed forest with complex vertical layers	Maintain current					Y	Y	Y
Boreal Owl	Mature, dense mixed forest (cavity nester)	Assess/Maintain					Y		
Canada Warbler	Mature mixed forests with well-developed understorey	Recovery objective[7]	Y	Y	Y	Y	Y	Y	Y
Cape May Warbler	Mature mixed forest	Maintain current					Y		Y
Common Nighthawk	Mixed forest openings created by clearcuts and burns.	Recovery objective[7]	Y	Y	Y	Y		Y	

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and in most cases follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Canada Warbler: Maintain Current; Common Nighthawk: Assess/Maintain; Eastern Whip-poor-will: Assess/Maintain; Olive-sided Flycatcher: Increase.

Table 10 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Eastern Whip-poor-will	Early-mid successional mixed forest with openings	Recovery objective[7]	Y	Y	Y	Y		Y	
Evening Grosbeak	Mature mixed forest with openings	Assess/Maintain					Y		
Magnolia Warbler	Dense mid-successional mixed forest	Maintain current						Y	Y
Mourning Warbler	Regenerating mixed forest with dense understorey	Maintain current					Y	Y	Y
Nashville Warbler	Open second-growth mixed and coniferous forest, with predominantly black spruce	Maintain current					Y		Y
Northern Goshawk	Mature mixed forest with high canopy closure, and generally low ground and shrub cover	Assess/Maintain				Y		Y	
Olive-sided Flycatcher	Open, coniferous-dominated mixed forests; cutovers and burns	Recovery objective[7]	Y	Y	Y	Y		Y	
Ovenbird	Mature, closed-canopy mixed forest (no understorey; ground nester)	Maintain current					Y		
Purple Finch	Mixed forest with openings; Spruce budworm specialist	Maintain current				Y	Y		
Ruby-crowned Kinglet	Mixed forest	Maintain current					Y		
Ruffed Grouse	Early-successional mixed forest	Assess/Maintain					Y		
Sharp-shinned Hawk	Dense mixed forest	Assess/Maintain					Y		
Tennessee Warbler	Early successional mixed forest with openings; Spruce budworm specialist	Assess/Maintain							Y
White-throated Sparrow	Mixed forest with openings and low dense vegetation	Maintain current						Y	Y

Table 10 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Yellow-bellied Sapsucker	Early successional mixed forest	Maintain current					Y		Y

Forestry and fire suppression were determined to be overall medium-magnitude threats to priority species in mixed wood habitats (threat sub-categories 5.3 and 7.1; Fig. 14), primarily through effects on habitat supply and quality. Past forest harvesting practices coupled with fire suppression have altered landscape structure and composition across Ontario compared with naturally disturbed landscapes (Ontario Ministry of Natural Resources 2014c). For example, boreal forests in northwestern Ontario currently contain more mixed wood forest than was found in the late 1800s (Ontario Ministry of Natural Resources 2014c). However, some priority species with more specialized habitat needs (e.g., mature forest with complex vertical structures, snags, and live residual trees) may be influenced by the long term persistence of these features across the landscape. As in other forest habitats in Ontario, current forestry management guidelines already consider the needs of many birds, but some factors meriting additional consideration are proposed in Table 11. Research and monitoring actions (action sub-categories 8.1 and 8.2) were also identified that focus on gathering ecological and demographic information for specific priority species in the region. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

As forestry operations have increased in coverage and intensity, active suppression of forest fires has also become more widespread. Today, forest fires are suppressed across much of BCR 8 ON and large fires spread naturally only in the far northwestern portion of the region, beyond the limit of intensive forestry operations (Ontario Partners In Flight 2008). Fire suppression can reduce the amount and limit the distribution of burned forest habitat available to priority species such as the Black-backed Woodpecker, which forages opportunistically on wood-boring beetles in recently burned habitats (Ontario Partners In Flight 2008). For Common Nighthawks, there is evidence that birds nesting in harvested habitats experience significantly lower breeding success than those nesting in natural (e.g., burned) openings (COSEWIC 2007). Recommended actions to mitigate this threat to priority species include developing prescribed burn protocols to promote and retain high-value burned forest within the natural fire-return interval (Table 11).

Low-magnitude threats affecting priority species in mixed wood habitats relate to the detrimental effects to boreal forest habitats from the introduction and/or spread of invasive non-native forest insects (e.g., emerald ash borer, pine shoot beetle) and tree diseases (sub-category 8.1). Collisions with vehicles (sub-category 4.1) is also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are

presented in the Widespread Issues section of this strategy rather than in Table 11 of this section.

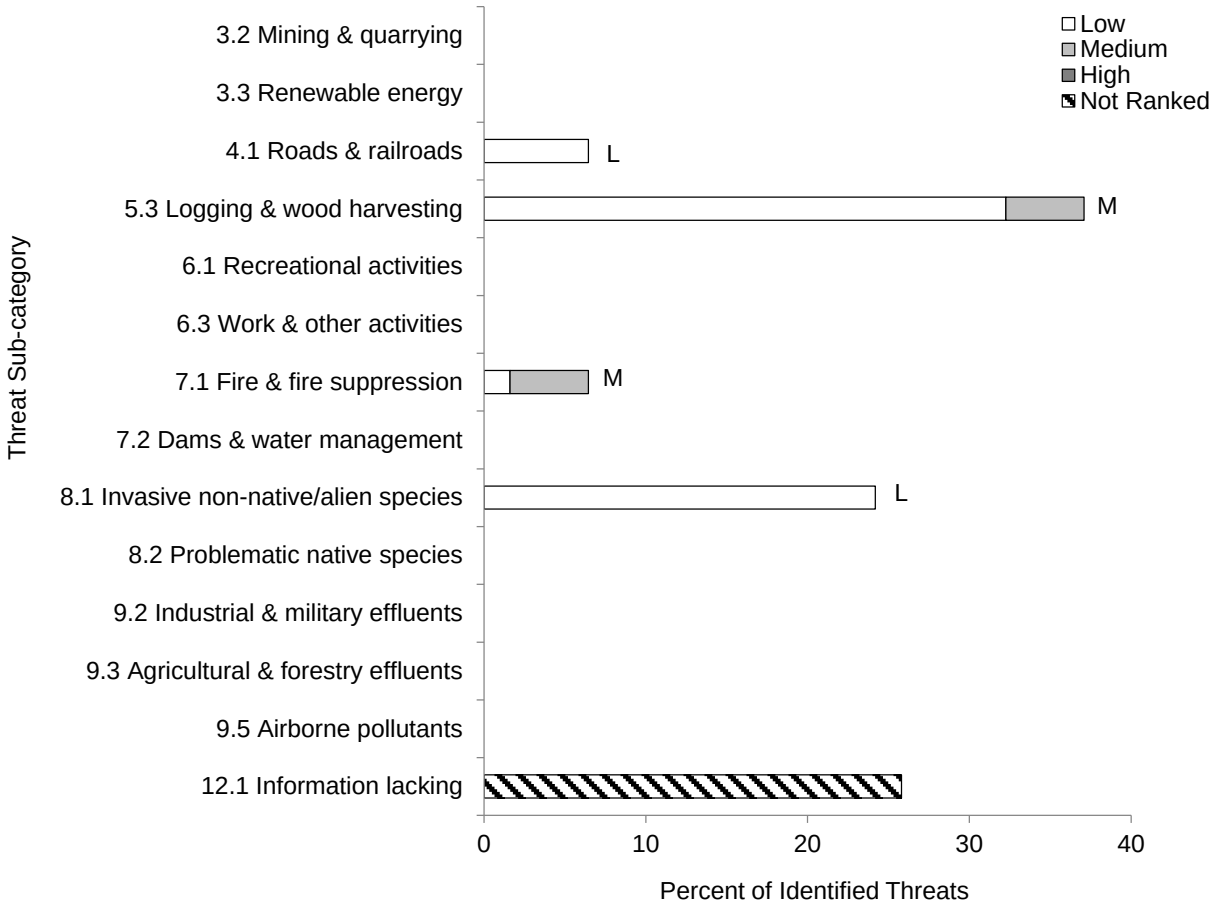

Figure 14. Percent of identified threats to priority species in mixed wood habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in mixed wood habitat (for example, if 100 threats were identified in total for all priority species in mixed wood habitat, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in mixed wood habitat is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 11. Threats addressed, conservation objectives, recommended actions and list of priority species affected in mixed wood habitats in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
5.3 Logging & wood harvesting	Loss and/or alteration of mature mixed forest habitat due to logging practices.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Maintain mixed wood forest habitat supply, composition, pattern and structure within the estimated range of natural variation under natural disturbance regime.	1.2 Resource and habitat protection	Complete a protected areas network in accordance with Far North Land Use Planning Initiatives (Far North Advisory Panel, 2010).	Black-throated Green Warbler, Northern Goshawk, Ruby-crowned Kinglet
				4.3 Awareness and communications	Promote the development and use of forest management guides (i.e., Silviculture, Landscape, Stand and Site Guides) that protect habitat (e.g., maintaining old growth) and important habitat features (snag retention) for mixed forest birds.	
				5.2 Policies and regulations	Support/encourage the ongoing consideration of the needs of priority species in forest management planning on Crown land and regional municipal planning efforts.	
				5.3 Private sector standards and codes	Implement accredited beneficial forest management practices (e.g., Forest Stewardship Council Canada 2004–National Boreal Standard; Canadian Standards Association; Sustainable Forestry Initiative).	
				7.2 Alliance and partnership development	Work collaboratively with forest management planning initiatives to ensure that the use of the Ontario Ministry of Natural Resources forest management guides adequately addresses the needs of mixed forest birds (Ontario Partners in Flight 2008).	
				8.1 Research	Undertake research to increase understanding of the effects of current forest conditions including landscape level (forest patch size, configuration and heterogeneity), stand level (age, structure, composition, health), and site level (snags) on the abundance, distribution and demographics of priority species (Ontario Partners in Flight 2008).	

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

Table 11 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
				8.2 Monitoring	Encourage an adaptive management approach to the conservation of priority species, with ongoing monitoring and research to evaluate the effectiveness of forest management guidelines and outcomes (Ontario Partners in Flight 2008). Maintain or improve forest habitat mapping across BCR 8 ON, including regularly updating the Forest Resource Inventory data across the region and collecting data describing stand- and site-level features so that habitat change over time can be assessed (Ontario Partners in Flight 2008).	
7.1 Fire & fire suppression	Fire suppression reduces the amount and limits the distribution of burned forest habitat.	1.3 Ensure the continuation of natural processes that maintain bird habitat	Maintain/ restore adequate amounts of post-fire forest habitat.	4.3 Awareness and communications	Promote awareness of the ecological benefits and correct misconceptions regarding the role of fire in natural landscapes.	Black-backed Woodpecker, Common Nighthawk,[2] Olive-sided Flycatcher[2]
				5.2 Policies and regulations	Within managed landscapes, develop prescribed burn protocols to promote and retain high-value burned forest within the natural fire-return interval, distributed both spatially and temporally.	
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Olive-sided Flycatcher
12.1 Information lacking	Lack of knowledge on the biological or	7.1 Improve population/ demographic monitoring	Improve knowledge of breeding ecology and	8.1 Research	Investigate causes of apparent population fluctuations (Ontario Partners in Flight 2008).	Yellow-bellied Sapsucker

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 11 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
	demographic parameters for management of populations.		population dynamics to inform conservation and management.			
	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine cause(s) of population declines.	8.1 Research	Determine factors driving population declines; investigate the effect of forest management treatments on breeding density, productivity and survival (Ontario Partners in Flight 2008).	Canada Warbler[2]
					Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Common Nighthawk,[2] Eastern Whip-poor-will[2]
					Research needed on ecology, cause of decline and irruptive movements.	Purple Finch
					Investigate potential causes of population decline including studying population demographics across a range of nesting sites and management regimes (Ontario Partners in Flight 2008).	Olive-sided Flycatcher[2]
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler, Common Nighthawk, Eastern Whip-poor-will, Olive-sided Flycatcher

Table 11 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Black-backed Woodpecker, Canada Warbler,[2] Common Nighthawk,[2] Evening Grosbeak, Northern Goshawk, Olive-sided Flycatcher,[2] Ruffed Grouse, Sharp-shinned Hawk, Tennessee Warbler, Yellow-bellied Sapsucker
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for a federal/ provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Canada Warbler, Common Nighthawk, Olive-sided Flycatcher

Shrub and Early Successional

Shrub and early successional habitat is defined by provincial land cover classes, including recently cut (less than 10 years), recently burned and regenerating forest depletion, and accounts for less than 10% of the land cover (Fig. 15; Table 1). Shrub and early successional habitats are generally transient, occurring where disturbance has removed the tree cover and the vegetation is dominated by shrubby, early seral[10] forms. Habitat availability is an important factor for all priority species in this habitat type, given its inherently short-lived or dynamic nature.

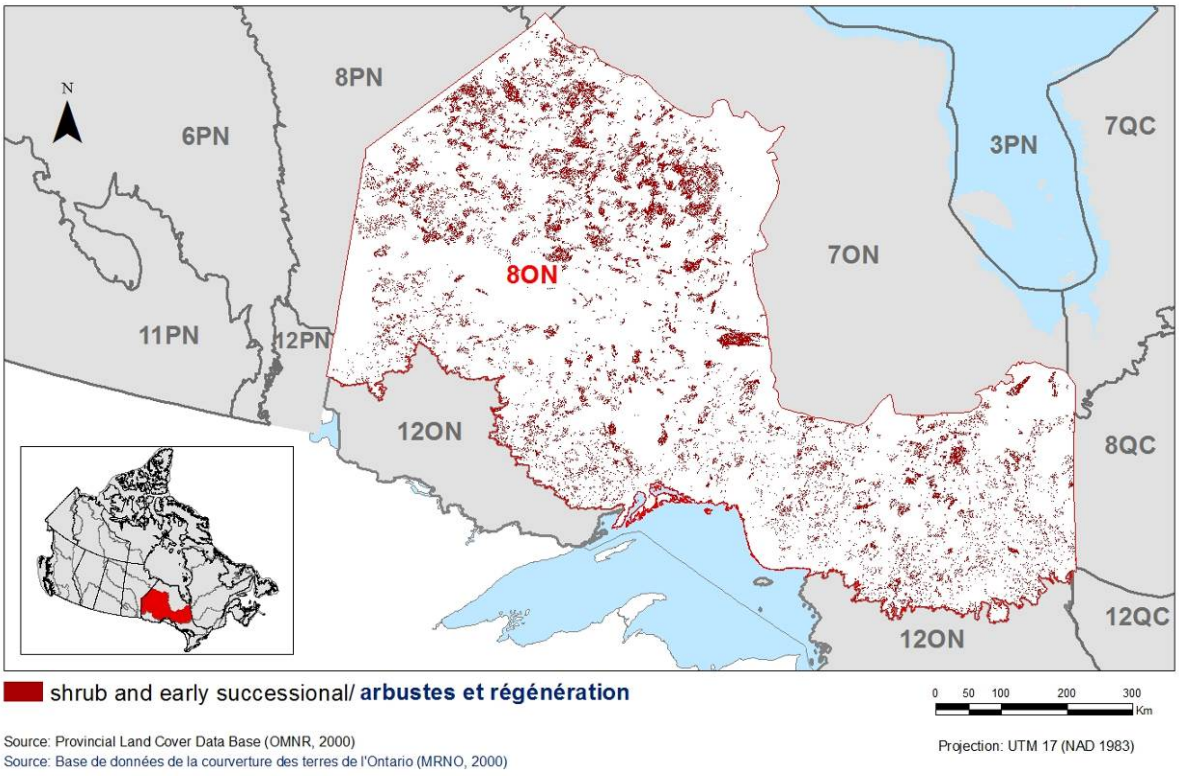

Figure 15. Map of shrub and early successional habitat in BCR 8 ON.

Ten priority species use shrub and early successional habitats extensively (Table 12). All are landbirds, except the Greater Yellowlegs, a shorebird. Included in this list are two species at risk: the Common Nighthawk and the Olive-sided Flycatcher, both of which are listed federally and provincially.

Activities that alter the natural disturbance regime affect the amount and quality of these habitats available to priority birds in the region. While fire is the major cause of forest disturbance in the northern part of BCR 8 ON, forest fires are effectively suppressed throughout much of BCR 8 ON, potentially reducing the amount of post-fire habitat available to birds. As

[10] An intermediate stage found in ecological succession in an ecosystem advancing towards its climax community.

such, fire suppression (threat sub-category 7.1) was assessed as an overall medium-magnitude threat to priority species (Fig.16). Some species prefer post-fire successional habitats (e.g., Nashville Warbler, Common Nighthawk), while others prefer post-harvest stands (e.g., White-throated Sparrow), but preferences are unknown or not apparent for most species (Ontario Partners in Flight 2008).

Regulators are increasingly attempting to implement forestry practices that mimic natural patterns of disturbance at a landscape scale; once fully realised, the availability of early successional habitats should reflect historical (e.g., pre-industrial) conditions. However, inadequate knowledge about historical conditions and uncertainty about the quality of post-harvest habitats versus those following natural disturbances mean that some uncertainty remains about how priority bird populations will respond (Ontario Partners in Flight 2008). A key recommended action is to undertake research to understand how differences between natural and anthropogenic disturbances (e.g., fire versus logging) affect the resulting successional forest habitat and successional forest bird populations (Table 13). The full list of information needs (sub-category 12.1) for priority species in shrub and early successional habitats of BCR 8 ON as well as the objectives and recommended conservation actions are presented in Table 13.

Low-magnitude threats affecting priority species in shrub/early successional habitats relate to habitat loss and/or degradation due to the use of herbicides (sub-category 9.3) to suppress herbaceous and woody plant species that compete with planted seedlings (i.e., Intensive Forest Management; Betts et al. 2013). Collisions with vehicles (sub-category 4.1) is also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are presented in the Widespread Issues section of this strategy rather than in Table 13 of this section.

Table 12. Priority species that use shrub and early successional habitats in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Alder Flycatcher	Regenerating clearcuts	Maintain current					Y		Y
Chestnut-sided Warbler	Shrubby, early successional deciduous; forest edges, small clearings, regenerating forests in burns and cutovers	Maintain current					Y	Y	Y
Common Nighthawk	Regenerating forests, shrubby forest edges, cutovers and burns	Recovery objective[7]	Y	Y	Y	Y		Y	
Magnolia Warbler	Open medium high shrubland (shrubland)	Maintain current						Y	Y
Mourning Warbler	Early successional open mixed or deciduous forests, burns and cutovers	Maintain current					Y	Y	Y
Nashville Warbler	Regenerating mixed forests with shrubby undergrowth	Maintain current					Y		Y
Olive-sided Flycatcher	Regenerating forests, shrubby forest edges; cutovers and burns	Recovery objective[7]	Y	Y	Y	Y		Y	
Philadelphia Vireo	Early to mid-successional deciduous or mixed forest; closed medium high shrubland (thicket)	Maintain current					Y		Y
Tennessee Warbler	Regenerating forests; shrubby forest edges; Spruce budworm specialist	Assess/Maintain							Y
White-throated Sparrow	Regenerating forests, burns and cutovers; shrubby forest edges	Maintain current						Y	Y

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005 and, in most cases follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR) while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Common Nighthawk: Assess/Maintain; Olive-sided Flycatcher: Increase.

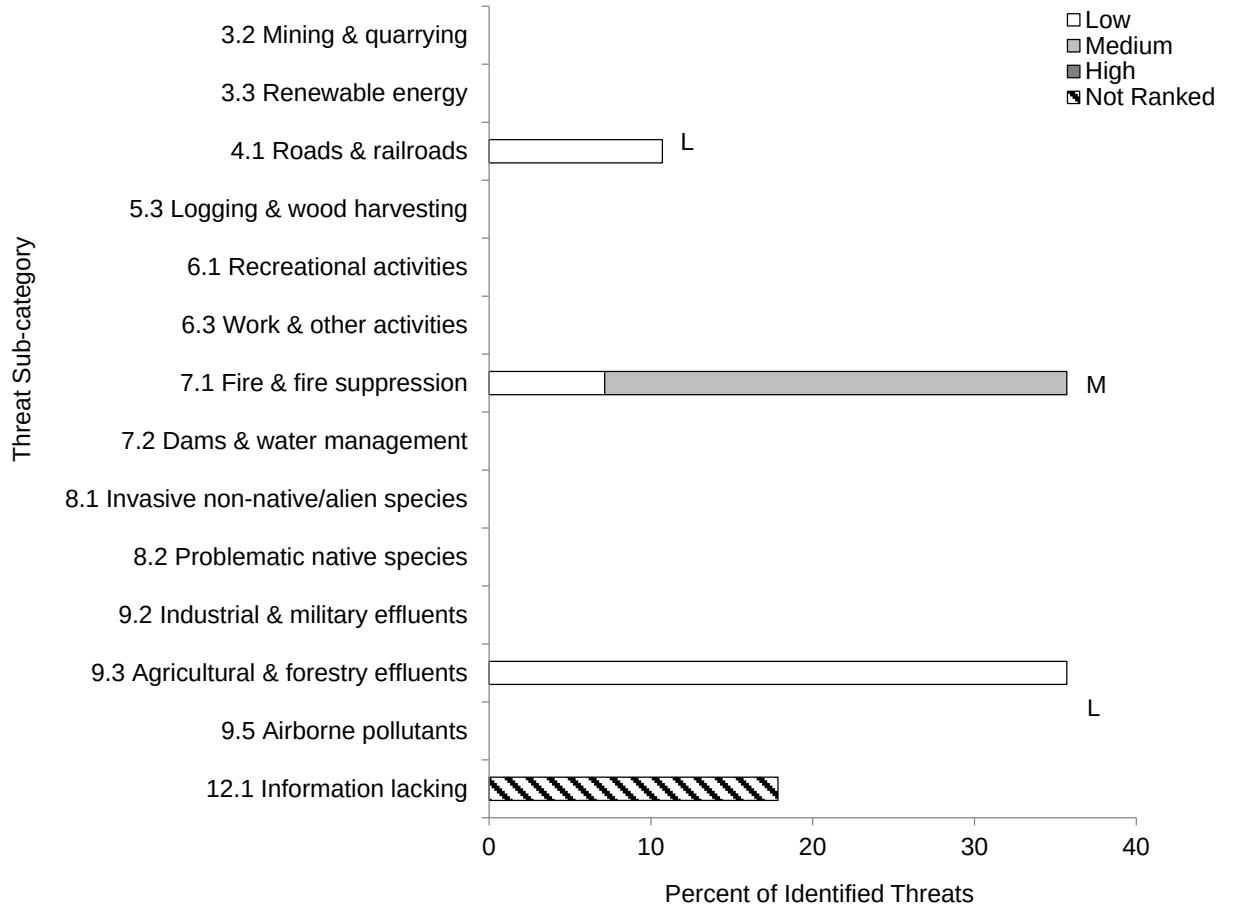

Figure 16. Percent of identified threats to priority species in shrub and early successional habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in shrub and early successional habitats (for example, if 100 threats were identified in total for all priority species in shrub and early successional habitats, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in shrub and early successional habitats is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 13. Threats addressed, conservation objectives, recommended actions and list of priority species affected in shrub and early successional habitats in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
7.1 Fire & fire suppression	Fire suppression practices may limit the amount of successional habitat created by natural disturbance processes.	1.2 Maintain the size, shape and configuration of habitat within the natural range of variation	Maintain shrub/early successional habitat composition, pattern and structure within the estimated natural range of variation.	2.3 Habitat and natural process restoration	In managed landscapes, emulate natural disturbances where appropriate (e.g., controlled burns), to maintain a range of successional states. Avoid burns during nesting and brood-rearing periods.	Chestnut-sided Warbler, Common Nighthawk,[2] Magnolia Warbler, Mourning Warbler, Nashville Warbler, Olive-sided Flycatcher,[2] Tennessee Warbler, White-throated Sparrow
				8.1 Research	Research how differences between natural and anthropogenic disturbances (e.g., fire versus logging) affect the resulting successional forest habitat and successional forest bird populations and develop silvicultural guidelines that better emulate natural disturbance regimes (Ontario Partners in Flight 2008).	
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Olive-sided Flycatcher
12.1 Information lacking	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine cause(s) of population declines.	8.1 Research	Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Common Nighthawk[2]
					Investigate potential causes of population decline including studying population demographics across a range of nesting sites and management regimes (Ontario Partners in Flight, 2008).	Olive-sided Flycatcher[2]

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 13 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Olive-sided Flycatcher
	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Common Nighthawk,[2] Olive-sided Flycatcher,[2] Tennessee Warbler
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Olive-sided Flycatcher

Cultivated and Managed Areas

Cultivated and managed areas, including pastures (open grassland with sparse shrubs in rural land) and cropland (row crops and fallow fields) are extremely rare in BCR 8 ON, accounting for only 0.01% of the land cover (Fig. 17; Table 1). Yet despite their rarity, the habitat type is used by eight priority species in BCR 8 ON for breeding and/or foraging (Table 14), including four species at risk: Common Nighthawk and Short-eared Owl (federally listed) and Bobolink and Golden Eagle (provincially listed).

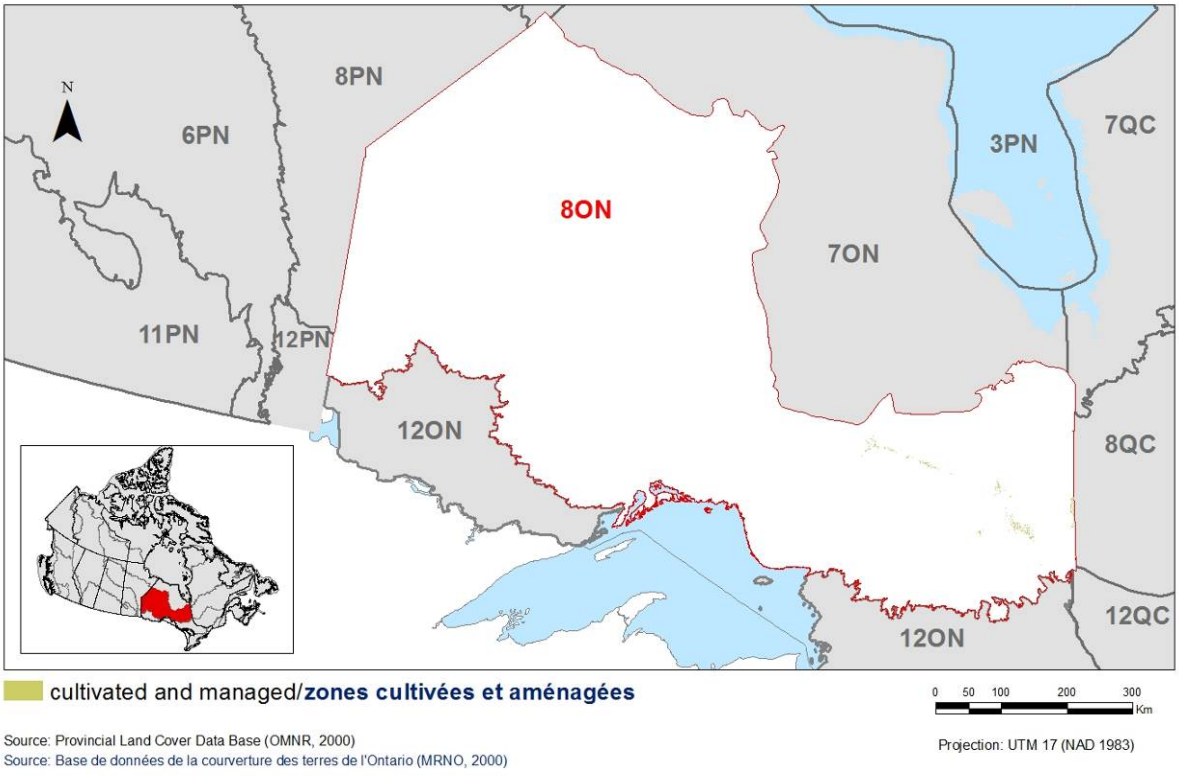

Figure 17. Map of cultivated and managed habitat in BCR 8 ON.

Table 14. Priority species that use cultivated and managed habitats in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
American Black Duck	Agricultural fields; cropland	Increase				Y		Y	
Bank Swallow	Graminoid crops; old fields, hay fields, fallow fields	Assess/Maintain	Y			Y			
Barn Swallow	Old fields, hay fields, pasture, fallow fields	Recovery objective	Y		Y	Y			
Bobolink	Large open agricultural grasslands, older hayfields, meadows, fallow fields	Recovery objective	Y		Y	Y		Y	
Common Nighthawk	Agricultural fields; graminoid crops; pastures	Recovery objective[7]	Y	Y	Y	Y		Y	
Golden Eagle	Graminoid crops; non-graminoid crops	Recovery objective			Y	Y			
Mallard	Agricultural fields; cropland	Maintain current				Y		Y	
Short-eared Owl	Agricultural fields; cultivated fields, hayfields	Recovery objective[7]	Y	Y	Y	Y		Y	

Among these priority species are a number of aerial insectivores, species of high conservation concern owing to pronounced recent declines in abundance (North American Bird Conservation Initiative 2012). Insectivorous birds in agricultural areas can encounter harmful levels of pesticides (e.g., Mora et al. 2006), but the limited extent of agriculture in this region means that

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and, in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR) while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Common Nighthawk: Assess/Maintain; Short-eared Owl: Assess/Maintain.

threats from pesticides (threat sub-category 9.3; Fig. 18), and indeed most other threats in this restricted habitat, confined primarily to the Great Clay Belt region, have, at most, modest effects at the population level.

Aerial insectivores and waterfowl use cultivated and managed habitats primarily for foraging, but other priority species nest in the vegetation of managed grasslands and croplands, including the Short-eared Owl and Bobolink. Agricultural practices such as mowing of hay during the breeding season may inadvertently kill and disturb nesting adults and young birds and destroy eggs and nests (threat sub-category 6.3). Cutting hay often coincides with the time that young birds are in the nest and are not able to fly. In addition, the quality of nesting habitat has likely declined over time due to the availability of earlier maturing seed mixtures and shorter crop harvesting cycles. A variety of changes in land management and the implementation of beneficial management practices could benefit these and other priority species (Table 15).

The remaining conservation actions identified relate to research and monitoring (action sub-categories 8.1 and 8.2) which focus on gathering ecological and demographic information for specific priority species in the region. For example, the BBS adequately monitors populations of several species of aerial insectivores in southern Canada, but coverage is poor to non-existent across most of the boreal region. Addressing identified information gaps for these and other priority species are needed to inform conservation and management. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

Low-magnitude threats affecting priority species in cultivated and managed habitats relate to mortality, sub-lethal effects, reductions in prey populations, and habitat alteration caused by exposure to or use of pesticides (sub-category 9.3). Collisions with vehicles (sub-category 4.1) is also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are presented in the Widespread Issues section of this strategy rather than in Table 15 of this section.

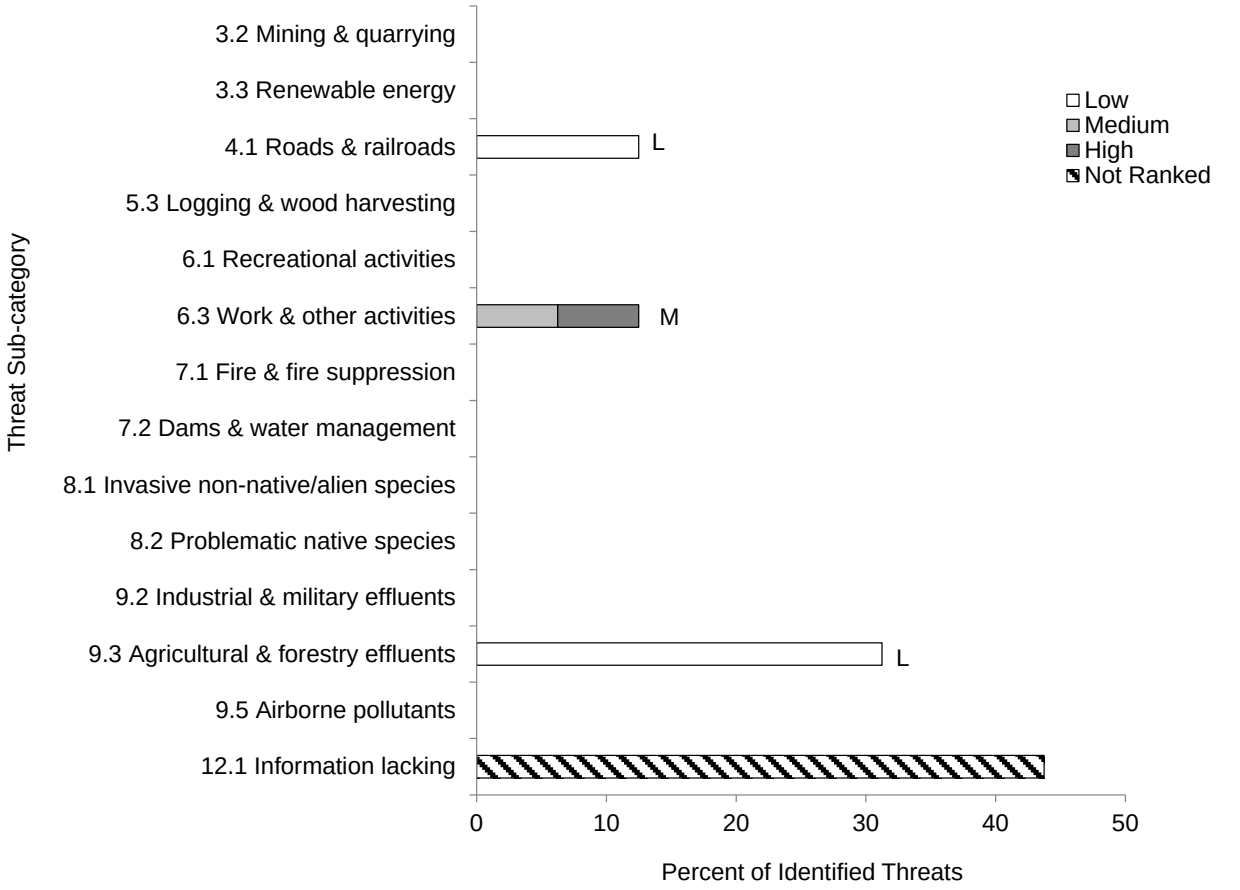

Figure 18. Percent of identified threats to priority species in cultivated and managed habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in cultivated and managed habitats (for example, if 100 threats were identified in total for all priority species in cultivated and managed habitats, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in cultivated and managed habitats is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 15. Threats addressed, conservation objectives, recommended actions and list of priority species affected in cultivated and managed areas in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
6.3 Work & other activities	Reduced or no productivity if disturbed during the nesting period.	4.2 Reduce disturbance from industrial or work activity	Reduce/eliminate human disturbance from work or other activities.	4.3 Awareness and communications	Raise awareness about the impact of human disturbances on priority bird species, especially during the breeding season, in agricultural/rural areas of the BCR.	Short-eared Owl[2]
				5.3 Private sector standards and codes	Develop and/or implement BMPs for agricultural landscapes as appropriate for the protection of priority grassland birds (e.g., Birds on the Farm: A Stewardship Guide, McGauley 2004).	
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Bobolink, Short-eared Owl
12.1 Information lacking	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine sources of mortality or population decline(s).	8.1 Research	Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Bank Swallow, Common Nighthawk[2]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Barn Swallow, Common Nighthawk
	Lack of knowledge (trend, population size, and/or	7.1 Improve population/ demographic	Improve monitoring efforts to increase reliability of population	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments for colonial nesters	Bank Swallow, Common Nighthawk,[2]

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 15 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
	distribution range).	monitoring	status/trend.		(Bank Swallow) and crepuscular species (Common Nighthawk) not well sampled by the BBS.	Short-eared Owl[2]
					Enhance monitoring efforts to increase the reliability of population status and trend assessments through periodic surveys of suitable habitat	Short-eared Owl[2]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk, Short-eared Owl
	Lack of knowledge of breeding ecology and habitat use.	7.1 Improve population/ demographic monitoring	Increase understanding of breeding ecology and habitat use.	8.1 Research	Research needed to increase understanding of breeding ecology and habitat use in BCR 8 ON (Ontario Partners in Flight 2008).	Short-eared Owl[2]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Short-eared Owl

Bare Areas

In BCR 8 ON, habitats classified as bare include open shorelines or coastal bare areas such as beaches and bare rock (including islands), exposed earthen banks, sand and gravel pits, mines and mine tailings. The region includes over 5,000 km of Lake Nipigon shoreline and the shores of northern Lake Superior. The beaches and innumerable islets near the shore offer bare habitats for priority species such as the Common Tern and Herring Gull. Although widespread, this habitat is typically restricted in area, and accounts for only 0.4% of the land cover (Fig. 19; Table 1).

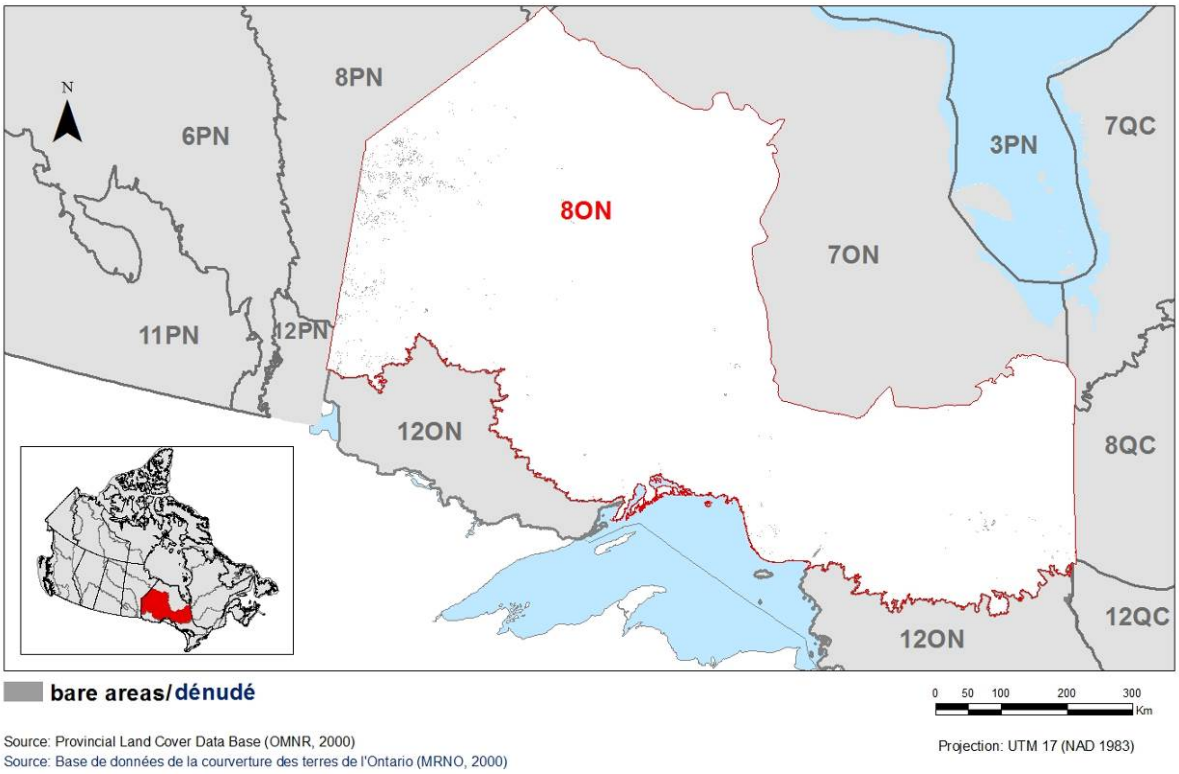

Figure 19. Map of bare areas in BCR 8 ON.

There are nine priority species identified as using bare habitats in BCR 8 ON, including four species at risk: Common Nighthawk and Peregrine Falcon (*anatum/tundrius;* listed both federally and provincially), and Bald Eagle and Golden Eagle (listed only provincially). The priority species using bare habitats in BCR 8 ON can be divided into several groups based on their specific use of the habitats (Table 16): Bank Swallows, Belted Kingfishers and Cliff Swallows nest in exposed earthen banks or on cliffs; Bald Eagle, Golden Eagle and Peregrine Falcon (*anatum/tundrius*) forage in coastal bare areas; while the Herring Gull and Common Tern nest on small islets to avoid terrestrial predators.

Table 16. Priority species that use bare areas in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Bald Eagle	Coastal bare areas	Recovery objective[7]			Y	Y			Y
Bank Swallow	Earthen banks; sand and gravel pits	Assess/Maintain	Y			Y			
Belted Kingfisher	Earthen banks near water; coastal bare areas	Maintain current					Y		
Cliff Swallow	Open canyons, foothills, escarpments	Increase				Y			
Common Nighthawk	Rock outcrops; sparsely vegetated rock, sand or gravel	Recovery objective[7]	Y	Y	Y	Y		Y	
Common Tern	Beaches; islands; offshore rocks	Assess/Maintain						Y	
Golden Eagle	Coastal bare areas	Recovery objective			Y	Y			
Herring Gull	Beaches; islands; offshore rocks	Assess/Maintain				Y		Y	
Peregrine Falcon *(anatum/tundrius)*	Bare areas	Recovery objective	Y	Y	Y	Y		Y	Y

At the scale of the BCR, many of the bare habitats in BCR 8 ON are relatively undisturbed, and as such, priority species in this habitat face few threats of a magnitude of medium or greater (Fig. 20). At present, most of the threats in bare areas are associated with mining activities, renewable energy, dams and water management (threat sub-categories 3.2; 3.3 and 7.2 respectively), and these have been assessed as low for priority species using bare habitats in BCR 8 ON. However, increasing development pressures in the Far North may elevate the effect

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005 and, in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern..
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Bald Eagle: Assess/Maintain;
Common Nighthawk: Assess/Maintain.

of these activities on priority species and the habitats upon which they rely and are discussed in further detail in the Emerging Issues section of this strategy.

Other low-magnitude threats affecting priority species in bare habitats relate to human activities causing disturbance to nesting birds, with primarily Peregrine Falcon (*anatum/tundrius*) and Golden Eagle being affected. Recommended actions to address these issues can be found in published provincial recovery strategies for these species at risk (Ontario Peregrine Recovery Team 2010; Wyshynski et al. 2014). Mortality, sub-lethal effects and/or habitat degradation from exposure to environmental contaminants such as heavy metals and pesticides (sub-category 9.2 and 9.3 respectively) are assessed as low-magnitude threats to species that are sensitive to contaminants such as Common Terns and Herring Gulls (Cornell Lab of Ornithology 2013). Collisions with vehicles (sub-category 4.1) is also a low-magnitude threat; however, given the wide-ranging nature of this threat, conservation objectives and actions are presented in the Widespread Issues section of this strategy rather than in Table 17 in this section.

The majority of recommended actions identified relate to research and monitoring (action sub-categories 8.1 and 8.2), which focus on gathering ecological and demographic information for specific priority species in the region (Table 17). For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

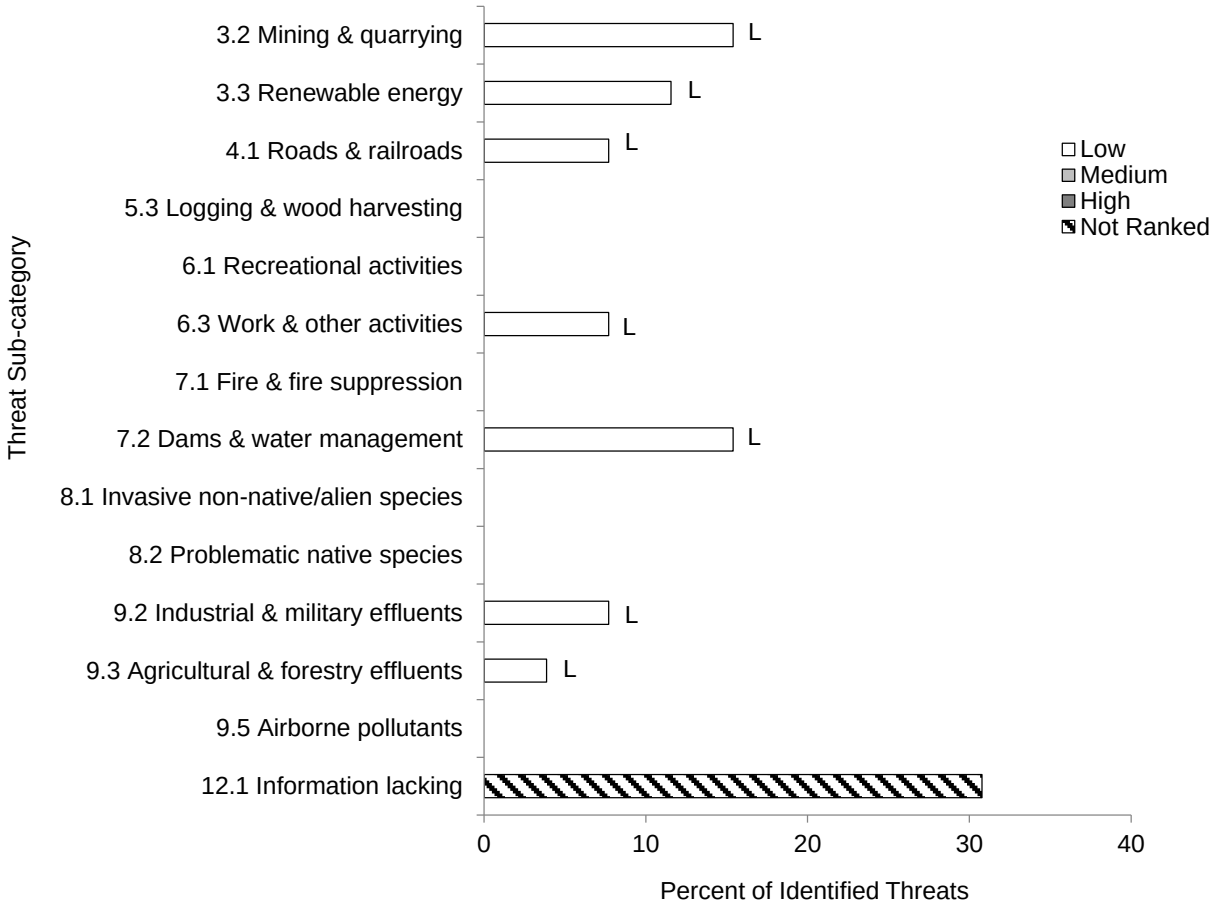

Figure 20. Percent of identified threats to priority species in bare areas in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in bare areas (for example, if 100 threats were identified in total for all priority species in bare areas, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in bare areas is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 17. Threats addressed, conservation objectives, recommended actions and list of priority species affected in bare areas in BCR 8 ON.
Note: Issues such as collisions with human-made structures and vehicles, and climate change and pollution, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
12.1 Information lacking	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine sources of mortality or population decline(s).	8.1 Research	Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Bank Swallow, Cliff Swallow, Common Nighthawk[2]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk
	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Bank Swallow, Common Nighthawk[2]
					Evaluate alternative monitoring strategies to fill gaps in coverage for colonial waterbirds.	Common Tern, Herring Gull
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Common Nighthawk

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.
[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Urban

BCR 8 ON is sparsely populated, and in 2012, the total population was less than 250,000 (Ontario Ministry of Finance 2013). Human settlement is limited, and as such, urban habitats are very rare in the region, accounting for only 0.16% of the land cover (Fig. 21; Table 1). The overall population of Northern Ontario is projected to remain stable over the next 20 years (Ontario Ministry of Finance 2013). There are approximately 77,000 hectares (less than 0.5%) of the provincial land cover class "settlement/infrastructure" in BCR 8 ON, and considering this category includes infrastructure such as major transportation corridors, it is an overestimate of the true extent of urban habitat.

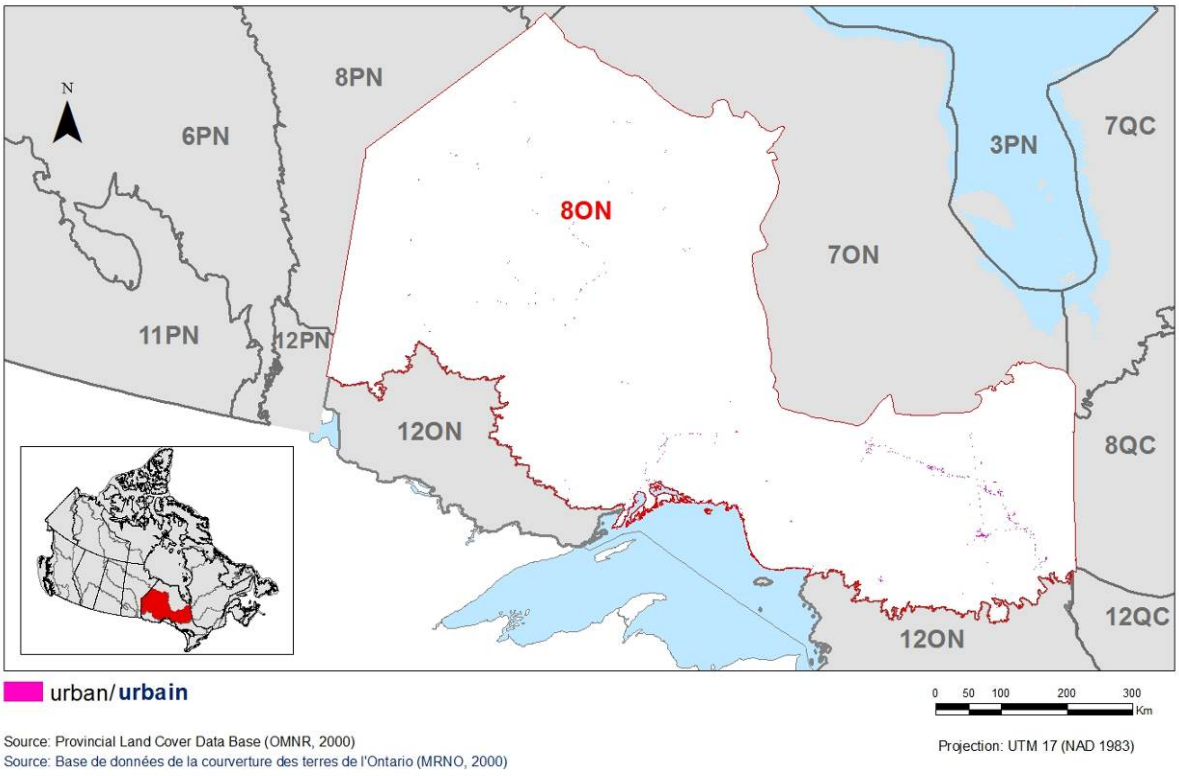

Figure 21. Map of urban habitats in BCR 8 ON.

The Barn Swallow, listed provincially as Threatened, is a priority species that has adapted to nesting on or in the artificial structures available in urban habitats (Table 18). In more populated regions, a key threat to breeding Barn Swallows is the disturbance or destruction of active nests built on human-made structures (Environment Canada 2012). No threats to Barn Swallow populations have been identified in urban landscapes of BCR 8 ON, and therefore there is no discussion here of conservation objectives and actions. Nevertheless, the implementation of this species' provincial recovery strategy is recommended (Heagy et al. 2014).

Table 18. Priority species that use urban habitats in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Barn Swallow	Rural and settled landscapes; artificial surfaces (barns, buildings and bridges)	Recovery objective	Y		Y	Y			

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).

Wetlands

Under the LCCS, wetlands include vegetated habitats that are aquatic or regularly flooded, such as bogs, fens, swamps, marshes and shallow water areas. Inland marshes represent a transitional zone in the provincial land cover data and cannot be effectively differentiated; as such, there is no corresponding area attributed to this class. Furthermore, swamp classes are routinely greatly underestimated as they are difficult to differentiate from forest classes (Spectranalysis Inc. 2004). Acknowledging these limitations, wetlands were determined to account for a minimum of 12% of the land cover of BCR 8 ON (Fig. 22; Table 1).

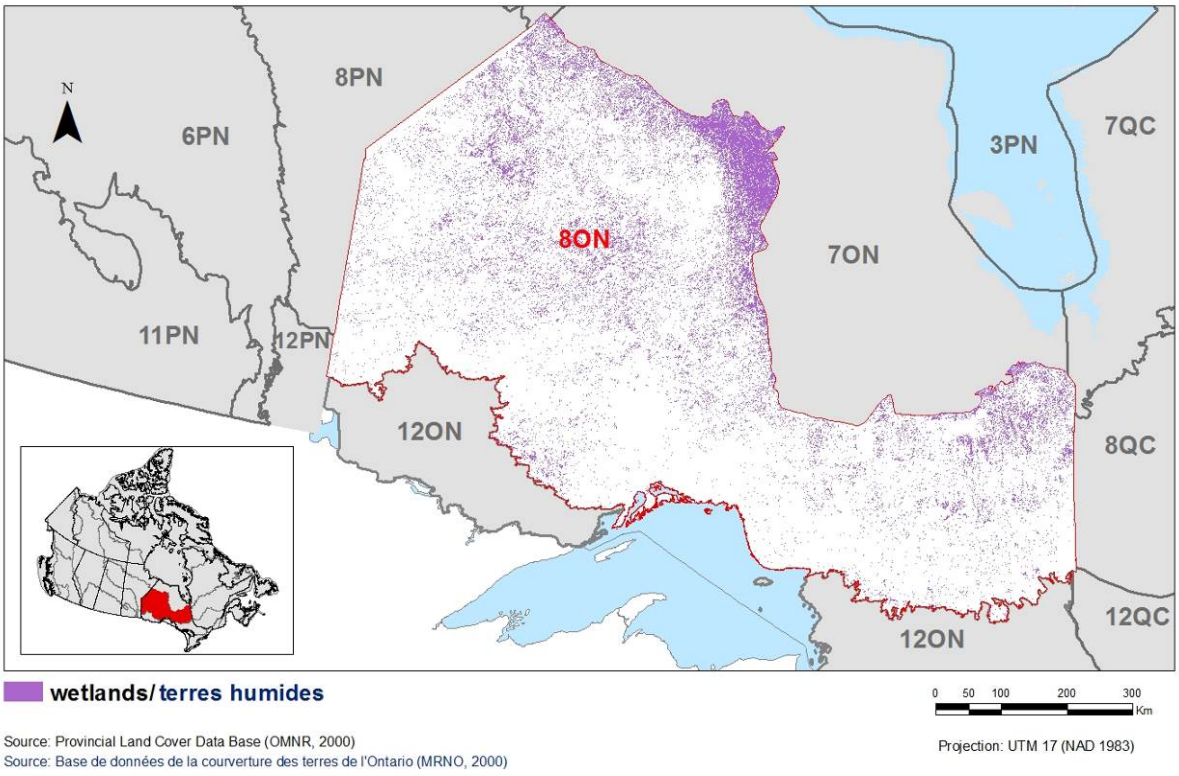

Figure 22. Map of wetlands in BCR 8 ON.

Wetlands in BCR 8 ON are used extensively (but not necessarily exclusively) by the greatest proportion of priority species (31%), with representatives from all four bird groups (Table 19). Five of the priority species are species at risk: Black Tern, Horned Grebe (western population), Olive-sided Flycatcher, Rusty Blackbird and Yellow Rail.

Table 19. Priority species that use wetland habitats in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
American Bittern	Marshes	Maintain current				Y		Y	
American Black Duck	Riverine marshes, bogs, swamps, beaver ponds	Increase				Y		Y	
American Wigeon	Large permanent marshes with open water	Maintain current				Y		Y	
Black Tern	Coastal marshes; large inland marshes	Recovery objective			Y	Y		Y	
Bufflehead	Small lakes and wetlands with forested shorelines (cavity nester)	Maintain current				Y			
Connecticut Warbler	Fairly open swamps; treed bogs; tamarack-spruce fens	Maintain current				Y	Y	Y	Y
Greater Yellowlegs	Open graminoid fens and peatlands interspersed with shrubs and trees	Assess/Maintain				Y		Y	
Green-winged Teal	Marshes, bogs, fens, beaver meadows	Maintain current				Y			
Horned Grebe (western population)	Marshes and shallow bays	Recovery objective[7]	Y		Y	Y		Y	
Lesser Scaup	Small seasonal and semi-permanent wetlands	Assess Maintain				Y		Y	

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Horned Grebe (western population): Assess/Maintain; Olive-sided Flycatcher: Increase; Rusty Blackbird: Increase.

Table 19 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Lesser Yellowlegs	Extensive peatlands with scattered trees and shrubs	Assess/Maintain				Y			
Mallard	Marshes, beaver ponds, swamps	Maintain current				Y		Y	
Olive-sided Flycatcher	Bogs, treed fens, swamps; tall trees in expansive bogs	Recovery objective[7]	Y	Y	Y	Y		Y	
Red-necked Grebe	Marshes and shallow bays	Assess/Maintain				Y			
Ring-necked Duck	Swamps, bogs, fens, beaver ponds	Maintain current				Y			
Rusty Blackbird	Wooded swamps; peat bogs, beaver ponds, marshes, treed bogs; fens	Recovery objective[7]	Y	Y		Y		Y	
Solitary Sandpiper	Marshes, beaver ponds	Assess/Maintain				Y		Y	
Swamp Sparrow	Marshes, wet bogs or fens with open water-dominated by sedges and low shrubs	Maintain current					Y	Y	Y
Tree Swallow	Marshes, wooded swamps (cavity nester)	Increase				Y			
Wilson's Snipe	Bogs; fens; willow swamps; wet meadows; marshes	Assess/Maintain				Y			
Yellow Rail	Marshes dominated by sedges	Recovery objective	Y	Y	Y	Y		Y	
Yellow-bellied Flycatcher	Mossy coniferous swamps, treed bogs, treed fens	Maintain current					Y		Y

While many of these species face significant conservation challenges elsewhere in their range, few priority species were found to be facing threats of a medium or greater magnitude in the wetlands of BCR 8 ON, due in large part to the low density of industrial development and human settlements, particularly in the northwestern portion of the BCR.

At present, threats associated with mining activities, renewable energy, dams and water management, and invasive non-native species (threat sub-categories 3.2; 3.3, 7.2 and 8.1 respectively) have been assessed as low for priority species using wetland habitats in BCR 8 ON. However, increasing development pressures in the Far North may elevate the effect of these activities to priority species and the habitats upon which they rely, and are discussed in further detail in the Emerging Issues section of this strategy.

The region's numerous wetlands are affected directly and indirectly by forestry activities in a number of ways that, in turn, adversely affect priority birds. Loss of cavity trees near wetlands for nesting (threat sub-category 5.3) disturbance from logging activities (sub-threat 6.3) were determined to have low population-level effects on various priority birds (Fig. 23). Direct sources of pollutants from forestry and industry (threat sub-categories 9.3 and 9.2) pose threats (low-magnitude) to priority birds in some portions of the region where these activities occur.

Many of the harmful pollutants that are released in large quantities elsewhere in the country, such as agricultural pesticides, are not used widely in BCR 8 ON. Industrial chemicals and harmful effluents may be released near communities and development sites, but the effects are localized, and in many cases, regulations governing release of these substances are in place. Degradation of wetland habitats due to acid precipitation (sub-category 9.5) was also assessed as an overall low threat within the BCR. Acid rain primarily affects sensitive bodies of water, which are located in watersheds whose soils have a limited ability to neutralize acidic compounds. Wetlands adjacent to or associated with acid-sensitive lakes, streams and rivers are also likely to be affected by acid deposition, degrading the quality of aquatic habitats and reducing the availability of prey (e.g., aquatic invertebrates) for some priority species.

The majority of actions identified relate to increasing the understanding of population status and limiting factors of many priority species through research and monitoring (action sub-categories 8.2 and 8.2; Table 20). For example, the Eastern Waterfowl Survey adequately monitors populations of several waterfowl species in the southeastern portion of the region; however, coverage is poor across most of the northwestern area of the BCR. Furthermore, there are no estimates of population size for boreal breeding shorebirds such as Greater and Lesser Yellowlegs and Solitary Sandpiper, as these species are widely dispersed in inaccessible areas during the breeding season (Ross et al. 2003). Addressing identified information gaps for these and other priority species are needed to inform conservation and management. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

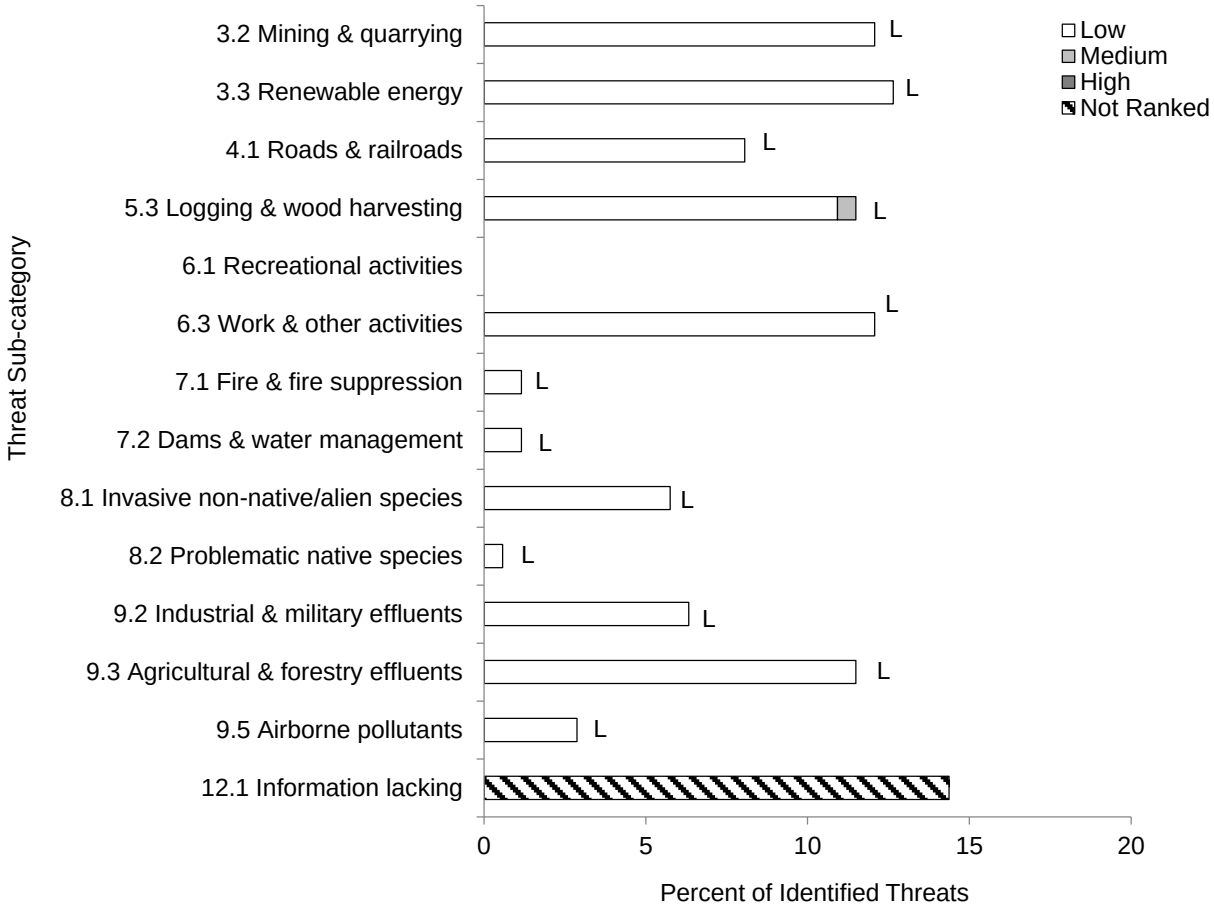

Figure 23. Percent of identified threats to priority species in wetland habitats in each threat sub-category.

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 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in wetland habitat is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 20. Threats addressed, conservation objectives, recommended actions and list of priority species affected in wetland habitats in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles, and climate change, are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
5.3 Logging & wood harvesting	Alteration of habitat quality/ loss of nesting trees and/or nesting cavities in some areas.	1.4 Maintain important bird features on the landscape	Maintain or restore important bird features in wetland habitat.	2.1 Site/area management	Maintain availability of suitable nest trees (e.g., cavity trees) as per the "wildlife tree direction" in the Forest Management Guide for Conserving Biodiversity at the Stand and Site Scale (Ontario Ministry of Natural Resources 2010).	Bufflehead
				5.3 Private sector standards and codes	Maintain a minimum 200 m wide vegetated area of concern around all wetlands to minimize changes to hydrology associated with adjacent land-uses and to provide upland habitat for nesting birds (Pearce 2011).	
				7.2 Alliance and partnership development	Ensure linkages are developed and maintained between bird conservation and forest management planning policies.	
12.1 Information lacking	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine sources of mortality or population decline(s).	8.1 Research	Investigate potential causes of the population decline including studying demographics across a range of nesting sites and management regimes (Ontario Partners in Flight 2008).	Olive-sided Flycatcher[2]
					Investigate potential causes of population decline and improve understanding of breeding and wintering ecology.	Rusty Blackbird[2]
					Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Tree Swallow
		3.4 Implement recovery plans for species at	Meet the legal requirements of federal/provincial	3.2 Species recovery	Develop and/or implement species at risk recovery strategies and management plans.	Olive-sided Flycatcher, Rusty Blackbird

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 20 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
		risk	Species at Risk legislation.			
	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments.	Connecticut Warbler, Olive-sided Flycatcher,[2] Rusty Blackbird,[2] Swamp Sparrow, Tree Sparrow, Yellow-bellied Flycatcher
					Evaluate alternative monitoring strategies to fill gaps in coverage for marsh birds, shorebirds and waterfowl.	American Bittern, American Black Duck, American Wigeon, Bufflehead, Greater Yellowlegs, Green-winged Teal, Horned Grebe (western population),[2] Lesser Scaup, Lesser Yellowlegs, Mallard, Red-necked Grebe, Ring-necked duck, Solitary Sandpiper, Wilson's Snipe
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies and management plans.	Black Tern, Horned Grebe (western population), Olive-sided Flycatcher, Rusty Blackbird, Yellow Rail

Waterbodies

BCR 8 ON borders Lake Superior and includes Lake Nipigon and innumerable other lakes and rivers of varying size. Open water habitats account for 13% of the region's land cover, excluding Lake Superior (Fig. 24; Table 1).

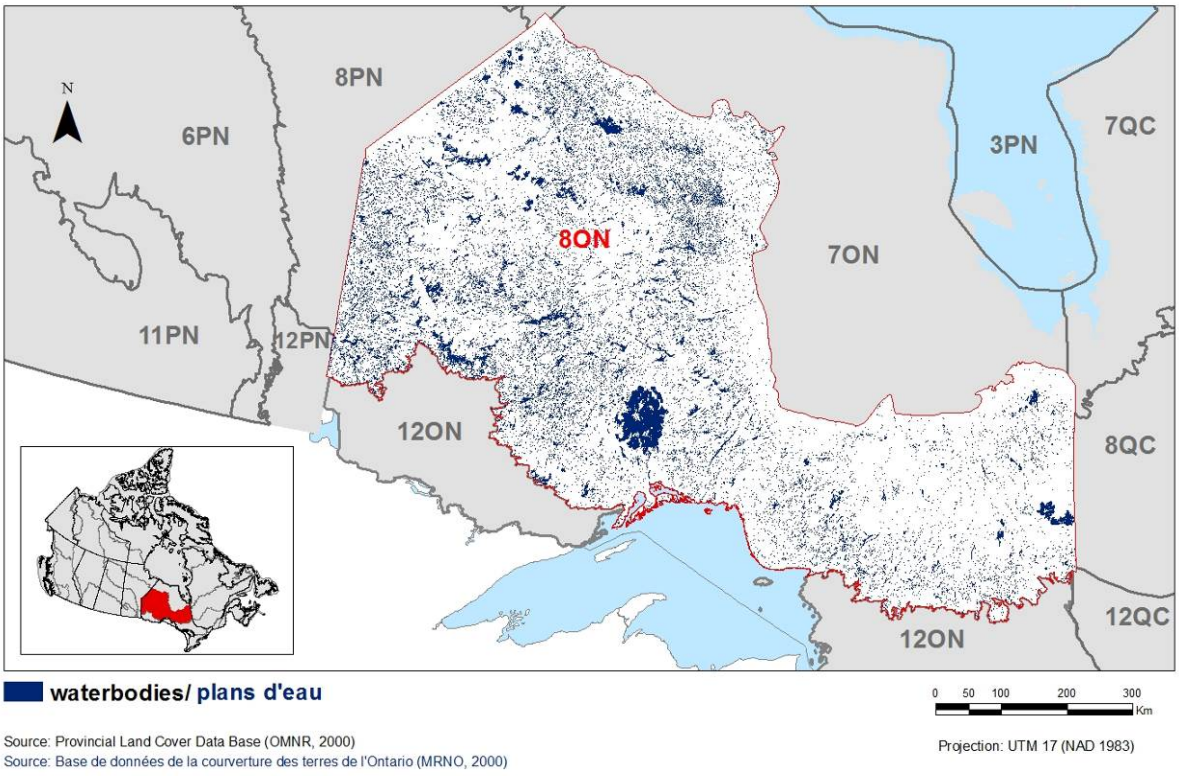

Figure 24. Map of waterbodies in BCR 8 ON.

Waterbodies in BCR 8 ON are used extensively by 17 priority species (24%; Table 21). Among these are 3 species that occur in the region's waterbodies during migration: the Black Scoter, the Long-tailed Duck and the Surf Scoter. Four of the priority species are federally and/or provincially at risk: the American White Pelican is listed provincially as Threatened; the Bald Eagle and the Horned Grebe (western population) are listed provincially as Special Concern, while the Peregrine Falcon *(anatum/tundrius)* is listed both federally and provincially as a species of Special Concern. Many gulls and terns breed on islands and use open water habitats to forage. Lakes and rivers are also important foraging habitat for several fish-eating species, such as the Belted Kingfisher, Common Loon and Common Merganser.

Table 21. Priority species that use waterbodies in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
American White Pelican	Lakes; rivers; isolated islands	Recovery objective			Y	Y		Y	
American Wigeon	Lakes and rivers	Maintain current				Y		Y	
Bald Eagle	Large lakes and rivers	Recovery objective[7]			Y	Y			Y
Belted Kingfisher	Lakes and rivers	Maintain current					Y		
Black Scoter	Large lakes for staging	Migrant (no BCR 8 ON population objective)				Y		Y	
Bufflehead	Lakes and rivers with forested shorelines (cavity nester)	Maintain current				Y			
Common Goldeneye	Lakes and rivers with forested shorelines (cavity nester)	Maintain current				Y		Y	
Common Loon	Lakes and rivers	Maintain current						Y	
Common Merganser	Lakes and rivers with forested shorelines (cavity nester)	Maintain current				Y			
Common Tern	Large lakes	Assess/Maintain						Y	
Herring Gull	Lakes and rivers	Assess/Maintain				Y		Y	
Horned Grebe (western population)	Lakes and rivers	Recovery objective[7]	Y		Y	Y		Y	

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005 and in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Bald Eagle: Assess/Maintain; Horned Grebe (western population): Assess/Maintain.

Table 21 continued

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Lesser Scaup	Small lakes with vegetated islands; large lakes for staging	Assess/Maintain				Y		Y	
Long-tailed Duck	Large lakes for staging	Migrant (no BCR 8 ON population objective)						Y	
Peregrine Falcon (*anatum/tundrius*)	Lakes and rivers	Recovery objective	Y	Y	Y	Y		Y	Y
Red-necked Grebe	Large lakes and bays (>2 ha)	Assess/Maintain				Y			
Surf Scoter	Large lakes for staging	Migrant (no BCR 8 ON population objective)				Y		Y	

Many of the waterbodies in this region are far removed from the direct effects of human development, and as such, there are few significant threats to priority species in these habitats. Within BCR 8 ON, the more widespread risk of pollution comes from chemicals transported over long distances, entering into the system through atmospheric deposition and surface water flows. Through the process of bioaccumulation, some pollutants may threaten species at high trophic levels in particular. Acid precipitation emerged as a medium-magnitude threat to priority birds using waterbodies in the southernmost region of BCR 8 ON (threat sub-category 9.5; Fig. 25; Turcotte in prep.). Acid precipitation affects priority species by degrading the quality of aquatic habitats or reducing the availability of prey (Table 22). BCR 8 ON is underlain by the granite of the Precambrian Shield, and the region's watersheds therefore have limited buffering capacity to neutralize acid precipitation, and some have been profoundly affected. In BCR 12 ON to the south, local effects of historic acid precipitation in the vicinity of Sudbury (from nickel-smelting emissions) were ecologically devastating, denuding the area of vegetation by the 1950s and leading to the near-total collapse of aquatic food webs in some the region's lakes. However, the risk is much more widespread than this. The emissions causing acid precipitation are transported over hundreds of kilometres or more, and the threat of acid precipitation affects any lakes in the region with inadequate buffering capacity. Emission levels contributing to acid precipitation have been reduced markedly in recent decades (Environment Canada 2010), but some lakes have yet to recover. Effects of acid precipitation include reduced abundance of invertebrates and fish, and in more severe cases, total absence of fish. Continued implementation of international air quality agreements that reduce acid precipitation is a critical conservation action for priority birds that forage in the waterbodies of BCR 8 ON (Table 22).

Disturbance caused by human activities and recreation in BCR 8 ON was assessed as a low-magnitude threat for the majority of breeding, staging and/or foraging priority birds, with the exception of the threatened American White Pelican (medium magnitude; sub-category 6.3). Recommended actions to conserve this species can be found in the published provincial recovery strategy for this species (American White Pelican Recovery Team 2011).

At present, threats associated with mining activities, renewable energy, dams and water management (sub-categories 3.2; 3.3 and 7.2 respectively) have been assessed as low overall for priority species using waterbodies in BCR 8 ON. However, increasing development pressures in the Far North may elevate the effect of these activities to priority species and the habitats upon which they rely, and are discussed in further detail in the Emerging Issues section of this strategy.

Degradation of aquatic habitats due to direct sources of pollutants from forestry and industry (sub-categories 9.3 and 9.2 respectively) poses a threat to priority birds in some portions of the region where these activities occur. Some persistent, bioaccumulative and toxic substances, such as polychlorinated biphenyls (PCBs), pesticides and polybrominated diphenyl ethers (PBDEs), can pose a significant threat to fish-eating birds, but the threshold levels and effects are not entirely understood. Further research to better understand these effects was identified as an important information need in BCR 12 ON, where these threats are more prevalent (Environment Canada 2014a).

The majority of recommended actions identified relate to research and monitoring (action sub-categories 8.1 and 8.2), which focus on gathering ecological and demographic information for specific priority species in the region (Table 22). For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

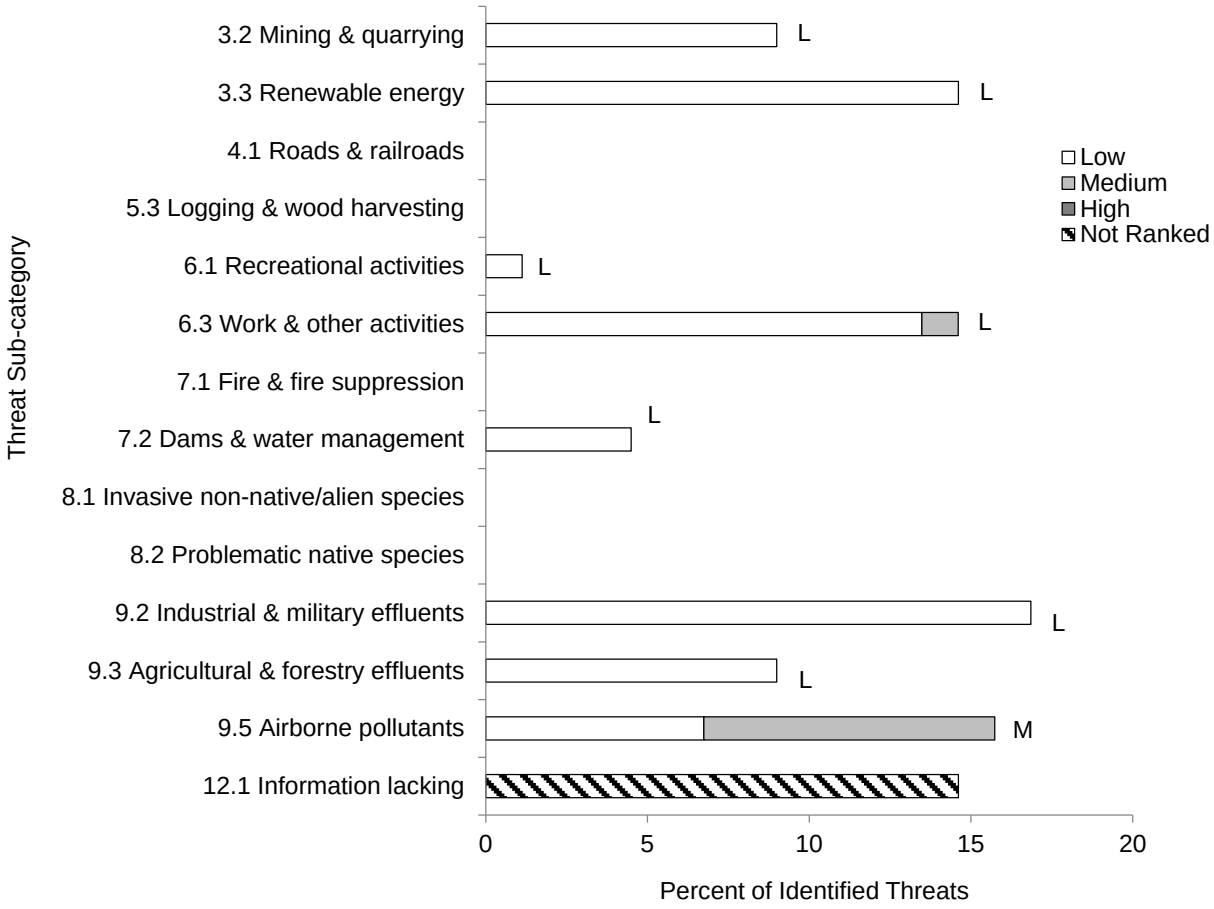

Figure 25. Percent of identified threats to priority species in waterbodies in each threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in waterbodies (for example, if 100 threats were identified in total for all priority species in waterbodies, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in waterbodies is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 22. Threats addressed, conservation objectives, recommended actions and list of priority species affected in waterbodies in BCR 8 ON.
Note: Issues such as collisions with human-made structures (threats sub-category 1.2 Commercial and industrial areas), climate change and pollution are not addressed in this table; instead, they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
6.3 Work & other activities	Disturbance to breeding, staging and/or foraging birds due to human recreation and human activity/access.	3.4 Implement recovery strategies for species at risk	Meet the legal requirements for federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	American White Pelican
9.5 Airborne pollutants	Acid precipitation affects the availability of prey items and reduces the quality of aquatic habitats.	1.5 Reduce habitat degradation from contaminants	Reduce emissions of air-borne pollutants.	5.4 Compliance and enforcement	Compliance promotion with existing air quality agreements.	Belted Kingfisher, Bufflehead, Common Goldeneye, Common Loon, Common Merganser, Herring Gull, Lesser Scaup, Red-necked Grebe
12.1 Information lacking	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend.	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments. Evaluate the potential to monitor species in conjunction with other aerial monitoring efforts.	Bald Eagle,[2] Belted Kingfisher
					Evaluate alternative monitoring strategies to fill gaps in coverage for waterfowl, marsh birds and waterbirds.	American Wigeon, Bufflehead, Common Loon, Common Goldeneye, Common Merganser, Common Tern, Herring Gull, Lesser Scaup, Horned Grebe (western population),[2] Red-necked Grebe

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude, or 2) they are migrants with no threats identified in this habitat.

Table 22 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
		3.4 Implement recovery strategies for species at risk	Meet the legal requirements for federal/provincial Species at Risk legislation	3.2 Species recovery	Develop and/or implement species at risk recovery strategies or management plans.	Bald Eagle, Horned Grebe (western population)
	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine sources of mortality or population decline(s).	8.1 Research	Investigate potential causes of population decline, including assessing effects of water quality, food availability on population demography at a variety of nesting sites. (Ontario Partners in Flight 2008).	Belted Kingfisher

Riparian

Riparian areas occur adjacent to standing or flowing water where the vegetation is influenced by the presence of water and is distinct from adjacent uplands. Riparian areas may be forested, shrubby or bare, depending on site conditions. While there are no available provincial land-cover estimates of the total area of riparian habitats in BCR 8 ON, they have been defined here as habitats within 30 m of water, and a map depicting the extent of derived riparian areas has been developed for illustrative purposes (Fig. 26). The depiction of riparian areas below is therefore an overestimate of the actual land area occupied by this habitat type.

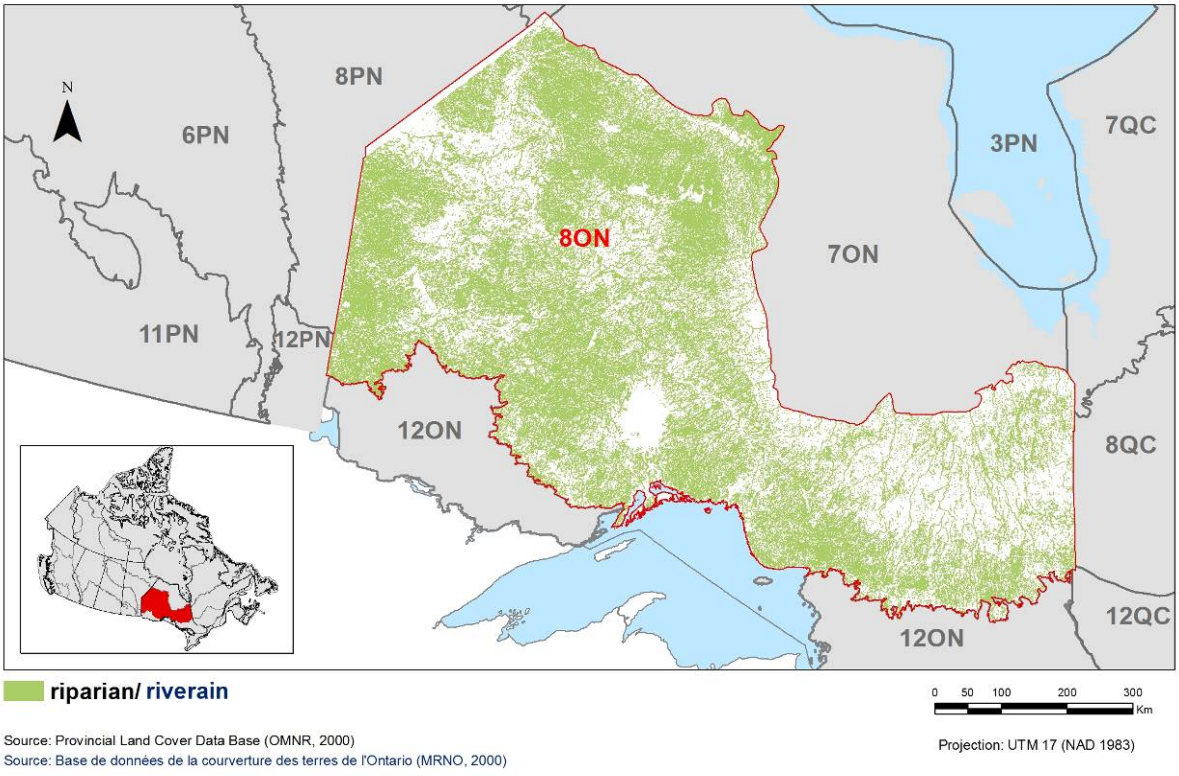

Figure 26. Map of riparian habitats in BCR 8 ON.

Riparian habitats in BCR 8 ON are used extensively by nine priority species (Table 23) and occur widely throughout the region. Two of the priority species using this habitat are species at risk: Bald Eagle (provincially listed) and Rusty Blackbird (federally listed).

Table 23. Priority species that use riparian habitats in BCR 8 ON, habitat description, population objectives and reasons for priority status.

Priority Species	Habitat Description[1]	Population Objective	COSEWIC[2]	SARA[3]	SARO[4]	Regional/Sub-regional Concern[5]	Regional/Sub-regional Stewardship[6]	National/Continental Concern	National/Continental Stewardship
Alder Flycatcher	Wet thickets	Maintain current					Y		Y
Bald Eagle	Riparian mixed forests	Recovery objective[7]			Y	Y			Y
Bank Swallow	Riparian slopes, banks and bluffs	Assess/Maintain	Y			Y			
Belted Kingfisher	Riparian slopes, banks and bluffs	Maintain current					Y		
Bufflehead	Riparian mixed forests (cavity nester)	Maintain current				Y			
Common Goldeneye	Riparian mixed forests (cavity nester)	Maintain current				Y		Y	
Common Merganser	Riparian mixed forests (cavity nester)	Maintain current				Y			
Eastern Kingbird	Riparian mixed forests; edges of lakes and rivers	Assess/Maintain				Y			
Rusty Blackbird	Riparian coniferous forests; shrubby thickets over or near water	Recovery objective[7]	Y	Y		Y		Y	

The priority species found in riparian habitats often use the terrestrial habitats for breeding and tend to forage within, above (aerial insectivores) or around the aquatic habitats. Consequently, threats to priority species in riparian habitats share elements with other terrestrial and aquatic habitats. For the suite of riparian species considered here, threats related to habitat loss or degradation from forestry were determined to have medium-magnitude effects (threat sub-category 5.3; Fig. 27), and the provision of buffers around watercourses was identified as an

[1] Habitat descriptions are based on information found in the Atlas of the Breeding Birds of Ontario, 2001–2005, and, in most cases, follow definitions under the LCCS (see Kennedy et al. 2012).
[2] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[3] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[4] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[5] Regional refers to BCR-wide (i.e., all jurisdictional data were used for the entire BCR), while sub-regional refers to the Ontario portion of the BCR only (i.e., Ontario BCR data were used).
[6] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[7] Species listed on Schedule 1 of SARA or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, the interim population objectives for these species in BCR 8 ON are: Bald Eagle: Assess/Maintain; Rusty Blackbird: Increase.

important management action to protect riparian birds (Table 24). In addition to protecting the terrestrial habitat from loss or disturbance, these buffers also serve to improve water quality, in turn benefitting priority riparian species that forage in aquatic habitats.

At present, threats associated with mining activities, renewable energy, dams and water management (threat sub-categories 3.2; 3.3 and 7.2 respectively) have been assessed as low overall for priority species using riparian habitats in BCR 8 ON. However, increasing development pressures in the Far North may elevate the effect of these activities to priority species and the habitats upon which they rely, and are discussed in further detail in the Emerging Issues section of this strategy.

Several actions identified relate to research and monitoring (action sub-categories 8.1 and 8.2) which focus on gathering ecological and demographic information for specific priority species in the region (Table 24). For example, the Eastern Waterfowl Survey adequately monitors populations of several waterfowl species in the southeastern portion of the region; however, coverage is poor across most of the northwestern area of the BCR. Addressing identified information gaps for these and other priority species are needed to inform conservation and management. For more discussion on these, please refer to the Research and Population Monitoring section of this strategy.

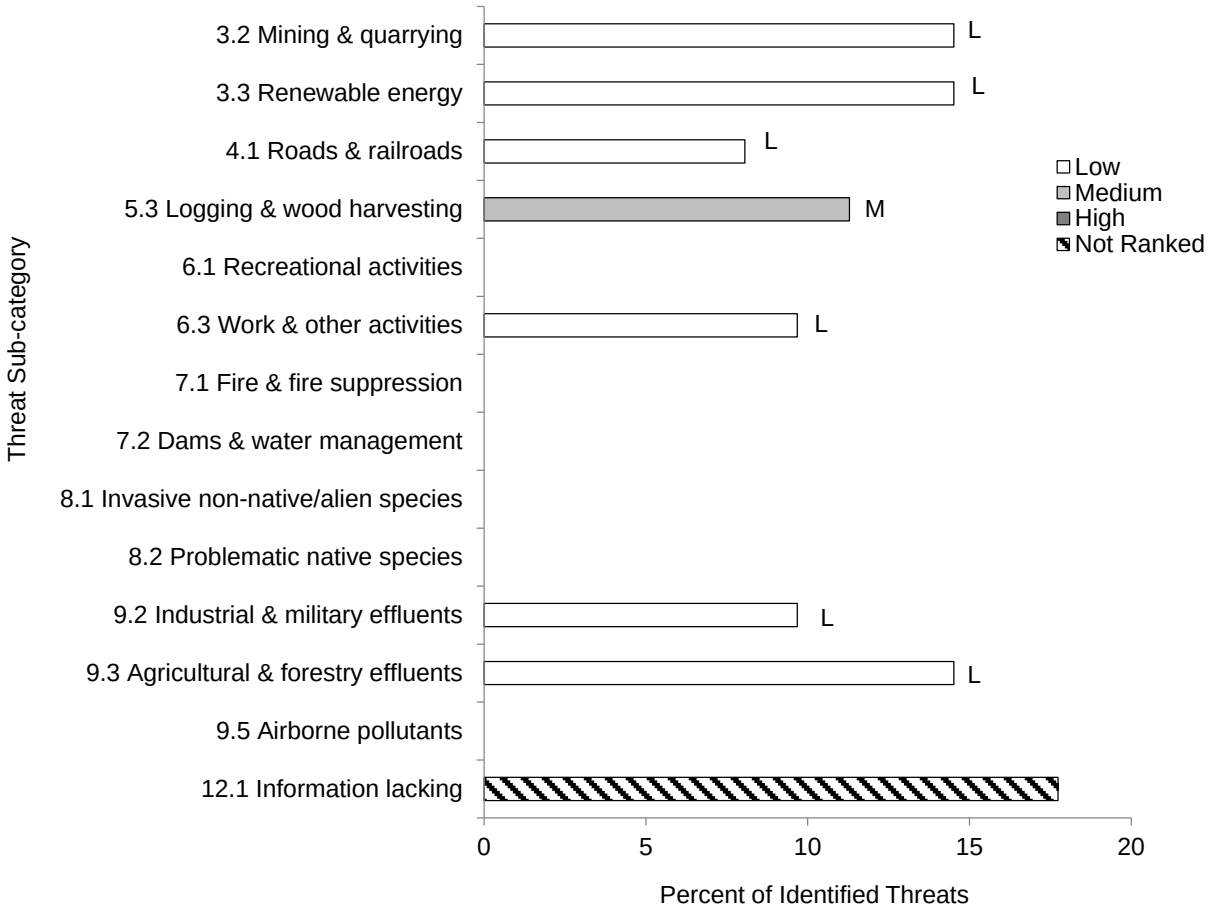

Figure 27. Percent of identified threats to priority species in riparian habitats in each threat sub-category.

Each bar represents the percent of the total number of threats identified in each threat sub-category in riparian habitat (for example, if 100 threats were identified in total for all priority species in riparian habitat, and 10 of those threats were in the category 3.2 Mining and quarrying, the bar on the graph would represent this as 10%). Threat sub-category 12.1 Information lacking was not ranked. The bars are divided to show the distribution of Low (L), Medium (M) and High (H) rankings of individual threats within each threat sub-category. For example, the same threat may have been ranked H for one species and L for another; the shading illustrates the proportion of L, M and H rankings in the sub-category. The overall magnitude of the threat in riparian habitat is shown at the end of each bar (also presented in Table 5). Only threats with a magnitude of medium or higher are typically assigned habitat-specific conservation objectives.

Table 24. Threats addressed, conservation objectives, recommended actions, and list of priority species affected in riparian habitat in BCR 8 ON.

Note: Issues such as collisions with human-made structures and vehicles and climate change are not addressed in this table; instead they are addressed in the Widespread Issues section.

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
5.3 Logging & wood harvesting	Modification of shoreline or riparian nesting habitat or nest trees due to logging.	1.1 Ensure land and resource-use policies and practices maintain or improve bird habitat	Maintain riparian habitat composition, pattern and structure within the estimated range of natural variation.	1.2 Resource and habitat protection	More than 75 % of stream length or lake perimeter should be naturally vegetated (Pearce 2011).	Bald Eagle,[2] Bank Swallow, Belted Kingfisher, Bufflehead, Common Goldeneye, Common Merganser, Rusty Blackbird[2]
				2.1 Site/area management	Ensure presence of important bird features (e.g., cavity nesting trees, natural vegetation cover, earthen banks) as appropriate to the priority species.	
					Avoid stabilizing banks containing Bank Swallow nests or banks that may be suitable nesting habitat for Bank Swallow or Belted Kingfisher.	Bank Swallow, Belted Kingfisher
				2.3 Habitat and natural process restoration	Maintain a > 30 m naturally vegetated zone around all lakes, ponds, rivers and streams to stabilize banks and minimize changes to water quality associated with adjacent land-uses. (Pearce 2011).	Bald Eagle,[2] Bank Swallow, Belted Kingfisher, Bufflehead, Common Goldeneye, Common Merganser, Rusty Blackbird[2]
				5.3 Private sector standards and codes	Include guidelines for the protection of riparian-nesting species in beneficial management practices in forest management planning.	

[1] While many priority species may benefit from proposed conservation actions, priority species not mentioned in this table are absent because 1) identified threats in this habitat are of low-magnitude or 2) they are migrants with no threats identified in this habitat.

[2] Species listed on Schedule 1 of SARA and/or on the SARO List, but there are no finalized recovery documents. Official documents related to SARA or SARO will prevail when they are published; however, interim conservation objectives and recommended actions are presented here.

Table 24 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
				7.2 Alliance and partnership development	Ensure linkages are developed and maintained between bird conservation and forest management planning policies.	
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies and management plans.	Bald Eagle, Rusty Blackbird
12.1 Information lacking	Lack of knowledge (trend, population size, and/or distribution range).	7.1 Improve population/ demographic monitoring	Improve monitoring efforts to increase reliability of population status/trend	8.2 Monitoring	Enhance monitoring efforts to increase the reliability of population status and trend assessments. Evaluate the potential to monitor Bald Eagles and Belted Kingfishers in conjunction with other aerial monitoring efforts.	Bald Eagle,[2] Bank Swallow, Belted Kingfisher, Common Goldeneye, Common Merganser, Eastern Kingbird, Rusty Blackbird[2]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies and management plans.	Bald Eagle, Rusty Blackbird
	Lack of information on factors causing population declines.	7.4 Improve understanding of causes of population declines	Determine sources of mortality or population decline(s).	8.1 Research	Identify factors causing population decline and/or limiting population growth of aerial-foraging insectivores.	Bank Swallow, Eastern Kingbird
					Investigate potential causes of population decline, including assessing effects of water quality, food availability on population demography at a variety of nesting sites. (Ontario Partners in Flight 2008).	Belted Kingfisher
					Investigate potential causes of population decline; improve understanding of breeding and wintering ecology. (Ontario Partners in Flight 2008).	Rusty Blackbird[2]

Table 24 continued

Threat Sub-category	Threat Addressed	Objective Category	Objective	Action Sub-category	Recommended Actions	Priority Species Affected[1]
		3.4 Implement recovery plans for species at risk	Meet the legal requirements of federal/provincial Species at Risk legislation.	3.2 Species recovery	Develop and/or implement species at risk recovery strategies and management plans.	Rusty Blackbird

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, vehicles, utility/telecommunications towers and lines)
- Expanding road networks
- Predation by domestic cats
- Pollution/pesticides/oil spills
- Climate change

Because the widespread issues do not fit into the standard presentation format used in the BCR strategies, they are presented separately here. Human-related avian mortality across all sectors was standardized and compared in Calvert et al. (2013).

Collisions

Buildings

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

Data from Canada and the northeastern United States reveal that 163 species of birds of 32 families are known to have been killed by buildings. Some families and species of birds are disproportionately affected by collisions with buildings. *Parulidae* (wood-warblers), *Fringillidae* (sparrows and allies) and *Regulidae* (kinglets) account for 70% of all bird deaths; the species most frequently killed are White-throated Sparrows (13.5% of all reported deaths), Golden-crowned Kinglets (10.2%), Dark-eyed Juncos (6.1%), Ovenbirds (5.3%) and Ruby-crowned Kinglets (5.3%). The population-level effects of bird mortality from building strikes are unknown. Collisions with buildings are a potential threat to a large number of priority landbirds, but the full extent of this source of mortality in BCR 8 ON is poorly understood. See Table 25 for conservation objectives and actions.

Wind Turbines

The 2,955 wind turbines in Canada as of 2011 have drawn considerable attention for their potential to cause mortality to birds and other species (notably bats). Two sources of mortality are typically associated with wind turbines: collisions with the turbines themselves, and the destruction of nests by turbine construction activities during the breeding season. On average, 5.9 birds are killed per turbine per year. Scaling up to a national level, an estimated 16,700 birds (ranging from 13,300–21,600) die from collisions with wind turbines each year (Table 25; Zimmerling et al. 2013).

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

Loons may have a higher risk of collision than many other waterbirds since they fly straight and fast, often at relatively low heights. There are legitimate concerns that they lack the manoeuvrability to avoid turbines that occur in their migratory flight paths. In BCR 8 ON, the risk of collisions could be significant in locations such as the proposed Lakehead Wind Park, east of Thunder Bay, or the proposed facilities on the eastern shore of Lake Nipigon.

Loons are diurnal migrants (Evers et al. 2010), and this may be an important factor in allowing them to detect the presence of turbines (foggy days may be an exception) and make adjustments to avoid collision. Behavioural studies describing loon flight patterns through a wind facility (pre- and post-construction) should be conducted if a project is proposed in an area where staging loons move northwards in large numbers (e.g., Thunder Bay). These studies would determine whether the birds make 'intentional' adjustments to avoid turbines. The peak spring migration of loons occurs in the 10-day period following ice-out of inland lakes, with the highest concentration of flights occurring early in the morning. If loon mortality is identified as an issue, turbine shutdown during all or part of this 10-day period may be an effective mitigation measure.

In addition to collision mortality, wind turbine construction and installation can result in the loss of habitat for birds. At the 43 wind farms in Canada for which data are available, total habitat loss per turbine is approximately 1.23 ha on average. Based on this average, the predicted total habitat loss for wind farms nationwide is 3,635 ha. Using published estimates of nest densities, the total number of affected nests, not accounting for construction that might occur outside the breeding season, is approximately 5,700 (Zimmerling et al. 2013). See Table 25 for conservation objectives and actions.

Priority species may also be vulnerable to disturbance from the presence of turbines or the sounds emanating from them. These disturbance effects of wind turbines on birds have not been well studied (National Research Council 2007). Swainson's Thrush, Red-eyed Vireo,

Ovenbird, Black-throated Blue Warbler and Canada Warbler have been observed to decline in abundance post-construction, in the vicinity of a wind facility near Searsburg, Vermont (Kerlinger 2002). Similar local declines may occur among priority species in BCR 8 ON, but the potential population-level effects of these local declines are unclear. Still, the cumulative effects of wind-energy development in BCR 8 ON, operating in conjunction with other anthropogenic changes to the landscape, could affect the region's bird populations.

Communication Towers

There are currently almost 8,000 communication towers in Canada greater than 60 m high (Longcore et al. 2012), each of which can pose a hazard to birds during migration. Birds are attracted to the lights of communication towers and are killed when they collide with the structures and guy wires. Mortality increases exponentially with tower height, in part because the use of guy wires also increases with tower height. Poor weather also plays a significant role in increasing migrant fatality; foggy and cloudy conditions increase the lit area around towers and block celestial clues used by migrating birds. The result is that birds circle to exhaustion in the halo of artificial light, or collide with each other, the tower or its guy wires (American Bird Conservancy 2012).

Avian mortality at towers is unequally distributed among species and regions, but estimates suggest that over 220,000 birds are killed in Canada each year (Longcore et al. 2012).

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

Power Lines

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

Vehicles

There are over 1.4 million km of roads and hundreds of airports in Canada (World Bank Indicators 2012), which are often bordered by fences and vegetation that provide convenient places for birds to perch, forage and nest. The paved surfaces can attract birds through the heat they emit, the puddles that form beside roads, and the salt and grit used for de-icing. Current estimates for one- and two-lane paved roads outside of major urban centres in Canada are that between 4.65 and 13.8 million birds are killed annually (Bishop and Brogan 2013).

Bird collisions with cars are influenced by the location of the road, proximity of vegetation and vehicle speed. Raptors and owls that hunt and forage near roads are particularly vulnerable, but many species that forage for grit and road salt or are otherwise attracted to roads have a high likelihood of being hit by vehicles. The population-level effects of this source of mortality are not known. See Table 25 for conservation objectives and actions.

The network of roads, transmission lines, communications towers and human settlements in BCR 8 ON is limited in comparison with other portions of the province, and accordingly, the population-level threats of collisions to priority birds are assumed to be modest. However, collisions with vehicles (e.g., logging trucks) can result in significant mortality of priority species that forage on or near roadsides. In BCR 8 ON, specific concern exists for the Common Nighthawk, Eastern Whip-poor-will, Evening Grosbeak and Pine Grosbeak.

Expanding Road Networks

Roads (highways, primary, secondary) required for the transport of goods and people are a source of human disturbance within BCR 8 ON, and road coverage is slowly intensifying to support economic development within this region (Environmental Commissioner of Ontario 2013). The construction of new and maintenance of both forest access roads and roads between and within urban centres can have both direct and indirect effects on birds and other wildlife, including mortality from collisions with vehicles, individual species disruption attributed to noise and dust, habitat loss, fragmentation and degradation (loss of suitable nest sites, destruction of nest sites, decline of prey species), indirect mortality from increased predator/prey contact, and increased exposure to invasive species. Physical effects include accelerating erosion from road surfaces, alteration of surface water flows and the timing of peak flows, erosion during flood events, increased landslides, and loss of soil productivity. For aquatic habitat, roads may introduce barriers to fish migration, cause changes in water temperature and alter stream flow regimes (Global Forest Watch 2000).

Several approaches can be used to mitigate the effects of expanding road networks. Restricting or limiting road access in key areas during critical times of year (e.g., breeding) can reduce disturbances during the most important periods. Access management outside of ungulate or big-game hunting seasons will likely be met with less public opposition and may be easier to implement (Gratson and Whitman 2000), although attempts should be made to restrict road access during seasons associated with specific life requisites such as courtship/mating, breeding/nesting, brood-rearing, staging and migration. New road networks should be designed in conjunction with other land-use activities (Integrated Landscape Management approaches)

to maximize coordination and emulate or simulate the region's natural disturbance regime (Miller et al. 1996). Finally, decommissioning of roads that are no longer required can restore habitat and prevent erosion. Road removal techniques include road ripping (decompacting road surface, addition of soil and re-vegetation), which decreases soil compaction; restoration of stream crossings, which also allows for natural water flows across roads; and full re-contours, which re-grade the land around the road and completely remove any trace of the road (Switalski et al. 2004).

Predation by Domestic Cats

Based on the number of pet cats in Canada and published kill rates by cats elsewhere, roughly 204 million birds (range 105–348 million) are killed by domestic and feral cats in Canada each year (Blancher 2013). The broad range on this estimate reflects imprecise information on the average number of bird kills per cat, especially for rural and feral cats, and a lack of information on the number of feral cats (versus owned or pet cats) in Canada.

The birds most susceptible to cat predation are those that nest or forage on or near the ground or spend substantial time in human-dominated landscapes (both rural and urban) where cats are abundant. The proportion of Canada's birds killed by cats is higher if additional cat predation when migrating through, or wintering in, the United States 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. Because the human (and hence domestic cat) population in BCR 8 ON is relatively low, it is unlikely that cat predation has significant effects on priority bird populations for the region as a whole. Nonetheless, actions to educate the public about the easily avoided mortality of birds from domestic cats, and to better understand whether individual species are significantly affected, would be of benefit (Table 25).

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 the chemical, DDT. See Table 25 for conservation objectives and actions.

Many of the harmful pollutants that are released in large quantities elsewhere in the country, such as agricultural pesticides, are not used widely in BCR 8 ON. Industrial chemicals and harmful effluents may be released near communities and development sites, but the effects are localized, and in many cases, regulations governing release of these substances are in place. Within BCR 8 ON, the more widespread risk of pollution comes from chemicals transported

over long distances, entering into the system through atmospheric deposition and surface water flows. Through the process of bioaccumulation, some pollutants may threaten species at high trophic levels in particular.

Pesticides

The most recent estimate suggests that 0.96–4.4 million birds are killed by pesticides annually in Canada (Mineau 2010). Provinces such as Saskatchewan, which have a large agricultural land base, account for the majority of the estimated kill, and pesticides are thought to be an important contributor to the decline in grassland bird species in Canada (Mineau 2010). Pesticides can kill birds rapidly following contact or may have sub-lethal effects such as suppressed immune function and reduced stress response. There may also be indirect effects of pesticides such as reduction in prey and changes in vegetation that reduce habitat quality. While the use of many toxic pesticides has been eliminated in Canada, migratory birds are still exposed while on wintering grounds in countries where their use is still permitted (Mineau 2010). See Table 25 for conservation objectives and actions.

The release of agricultural pesticides has a limited scope in BCR 8 ON owing to the very small area under agricultural production. In forested landscapes managed for harvest, in 2007–08, approximately 70,000 ha were treated with herbicides to support forest regeneration and by 2009–10, the area treated had declined to just over 58,000 ha (Ontario Ministry of Natural Resources 2011). Release of pesticides and other pollutants from forestry activities was determined to be a larger issue than agriculture but overall was still considered to have a low-magnitude effect on priority birds in the region (Fig. 6). The continued introduction of alien invasive species and increased frequency or severity of outbreaks of native pests is a predicted consequence of climate change (Colombo 2008, Sanderson et al. 2012). Both factors mean that use of pesticides in forested habitats could increase in the future.

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 had been exposed to these substances.

Currently, the release of industrial chemicals is not considered to be a significant threat to priority birds in BCR 8 ON (Fig. 6). In recent decades, significant progress has been made at

reducing the exposure of waterbirds in the Great Lakes to contaminants (Pekarik and Weseloh 1998). However, the long-range transport of air-borne pollutants and deposition of mercury and persistent organic pollutants (e.g., polychlorinated biphenlys; brominated organic compounds such as flame retardants) to surface waters is a growing concern in the Far North because of the toxic effects caused by the bioaccumulation of these substances in fish, wildlife and human tissues (Far North Advisory Panel 2010). The effects on bird populations or food webs for many of the "new" persistent organic pollutants remain poorly understood. See Table 25 for conservation objectives and actions.

In BCR 8 ON, an additional concern relates to the release of stored mercury from peatlands, wetlands and forests. Although the dynamics are complex and not completely understood, changes in temperature and hydrology could lead to elevated levels of methyl mercury in the rivers of BCR 8 ON (O'Driscoll et al. 2005), and potentially harmful levels of this heavy metal have already been identified in predatory fish such as the Northern Pike and Walleye (Far North Science Advisory Panel 2010). Fires also lead to the release of mercury stored in boreal forests and peatlands, and in severe fire years may equal the nationwide emissions from industrial sources (Sigler et al. 2003, Turetsky et al. 2006). Disruptions to temperature and fire regimes as a result of climate change, or alteration of hydrology as a result of mining or hydroelectric development, could lead to the release and methylation of mercury at levels potentially harmful to birds and other wildlife.

Oil Pollution

Oil may enter the environment either accidentally, through deliberate dumping, or in contained tailings ponds. It may be a single large event, as occurred in the Gulf of Mexico in 2010, or numerous smaller events. Annual estimates are that between 217,800 and 458,600 birds are killed by ship-source oil spills annually (Calvert et al. 2013). Typically, diving birds are most at risk of oiling; however, any birds that come into contact with oil are vulnerable. Oil can impact birds through direct effects such as hypothermia (resulting from lost waterproofing of feathers following oil contamination), toxicity (from ingesting oil as they preen or by inhaling volatile organic compounds) and indirect effects, such as reduced prey availability and decreased quality of habitat. While techniques exist to clean and rehabilitate oiled birds, many birds die before, during and after rescue attempts (Brown and Lock 2003). See Table 25 for conservation objectives and actions.

Table 25. General conservation objectives and actions associated with bird mortality from collisions and contaminants in BCR 8 ON.

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

Table 25 continued

Threats Addressed	Threat Sub-category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Species Affected
Collisions with communications towers cause bird mortality, particularly during migration.	1.2 Commercial and industrial areas	Reduce incidental mortality from collisions with man-made structures	2.7 Reduce incidental mortality from collisions.	Follow beneficial management practices for reducing mortality to birds when constructing new communications towers. Switch off solid lights on existing towers and ensure that remaining lights have a synchronized, complete dark phase. Take steps to ensure that new towers avoid guy wires and minimize height, and avoid topographic locations where migrating birds are likely to be found in abundance. Retrofit existing towers to adhere to as many guidelines as possible.	2.1 Site/area management 5.3 Private sector standards and codes	All species
Collisions with power lines and accidental electrocution cause bird mortality.	4.2 Utility and service lines	Reduce mortality from collisions with utility lines / transmission towers	2.7 Reduce incidental mortality from collisions.	In high-risk areas, retrofit power lines so that the risk of electrocution of raptors is minimized. In new developments, locate transmission lines underground. Use markers or paint to increase visibility of power lines in high-strike areas. Avoid siting lines over or near wetlands.	2.1 Site/area management	Waterfowl, herons, raptors
Collisions with vehicles cause bird mortality.	4.1 Roads and railroads	Reduce mortality from collisions with vehicles	2.7 Reduce incidental mortality from collisions.	Erect road signs or speed bumps to lower vehicle speeds where bird activity is frequent. Remove plants that attract birds from roadsides and medians. Landscape along roads using taller trees and bushes to cause birds to fly higher. Encourage the use of salt management plans to avoid unnecessary use of particulate salt (a bird attractant) on roads. Avoid locating roads in valuable bird habitat.	2.1 Site/area management 1.1 Site/area protection	Bald Eagle, Barn Swallow, Common Nighthawk, Evening Grosbeak, Pine Grosbeak

Table 25 continued

Threats Addressed	Threat Sub-category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Species Affected
Population effects of collisions are unknown.	12.1 Information lacking	Improve understanding of population effects of mortality from collisions	7.4 Improve understanding of causes of population declines.	Assess the biological importance of bird kills from all sources of collisions.	8.1 Research	All species
Predation by domestic cats						
Predation by domestic and feral cats.	8.1 Invasive non-native/alien species	Reduce mortality from domestic and feral cats.	2.4 Reduce incidental mortality	Implement a "Cats Indoors!" Campaign following the guidelines of the American Bird Conservancy. (http://www.abcbirds.org/abcprograms/policy/cats/index.html). Work to reduce feral cat overpopulation through cat control regulations.	5.3 Private sector standards and codes 5.2 Policies and regulations	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting rural, suburban or urban areas
Population effects of cat predation are unknown.	12.1 Information lacking	Improve understanding of population effects of cat predation.	7.4 Improve understanding of causes of population declines	Evaluate which species are most vulnerable to cat predation. Investigate the population-level effects of cat predation through better monitoring of kill rates and the number of feral cats. Continue to monitor bird populations so changes in numbers and distributions can be identified and management of cats can be altered to reflect these changes. Conduct effectiveness monitoring to evaluate if mitigation activities are achieving the desired results.	8.1 Research 8.2 Monitoring	Ground nesting or ground foraging species; species attracted to feeders; species inhabiting suburban or urban areas
Environmental Contaminants						
Mortality 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, Surf Scoter **PCBs:** Common Goldeneye **Other contaminants:**

Table 25 continued

Threats Addressed	Threat Sub-category	Objective	Objective Category	Recommended Actions	Action Category	Example Priority Species Affected
						Horned Grebe, Peregrine Falcon (*anatum/tundrius*)
Mortality of waterbirds from oil pollution.	9. Pollution	Reduce mortality from oil pollution	2.3 Reduce mortality and/or sublethal effects of oil pollution. 5.1 Maintain natural food webs and prey sources.	Improve monitoring and enforcement capacity to reduce chronic oil pollution from illegal dumping of bilge waste and cleaning of oil tanks. Improve education/outreach to make sure that the oil industry and its regulators are aware of the potential impacts on birds and take measures to prevent exposure of birds to oil.	5.4 Compliance and enforcement 4.3 Awareness and communications	**Lethal and sublethal effect of oil exposure:** Bald Eagle, Black Scoter, Common Goldeneye, Common Loon, Lesser Scaup, Surf Scoter
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 effects of PBDEs and other chemicals on vital rates in birds. Evaluate the extent to which pesticides are reducing prey availability for aerial insectivores. Improve the ability to monitor and understand the effects of contaminant concentrations in birds. Continue to acquire information on oiling of waterbirds through programs like Birds Oiled at Sea.	8.1 Research 8.2 Monitoring	All species

Climate Change

The effects of climate change are already measurable in many bird habitats and have resulted in range shifts and changes in the timing of migration and breeding in some species (National Audubon Society 2009; North American Bird Conservation Initiative, U.S. Committee 2009). Birds in all habitats will be affected by climate change. The most vulnerable are predicted to be those that are dependent on oceanic ecosystems and those found in coastal, island, grassland, arctic and alpine habitats (North American Bird Conservation Initiative, U.S. Committee 2010). Changing climate may also facilitate the spread of disease, the introduction of new predators and the invasion of non-native species that alter habitat structure and community composition (North American Bird Conservation Initiative, U.S. Committee 2009; Faaborg et al. 2010). See Tables 26 and 27 for a summary of impacts of climate change and conservation objectives.

A recent exercise used bioclimatic modelling to predict changes in bird species ranges based on anticipated climate change for different time periods and under different emissions scenarios (Lawler et al. unpublished, Lawler et al. 2009). Bioclimatic models use statistical associations between the current range of a species and a suite of climate variables to predict future ranges under new climate conditions. The study focused on priority bird species currently found within BCRs in Canada. The results suggest that priority bird species turnover in Canada will be highest in northern BCRs as species ranges continue to shift northward in the coming decades (Fig. 28). In BCR 8 ON, the model predicts a gain of 23 species and a loss of 10 species for a total turnover (species gains + species losses) of 18%.

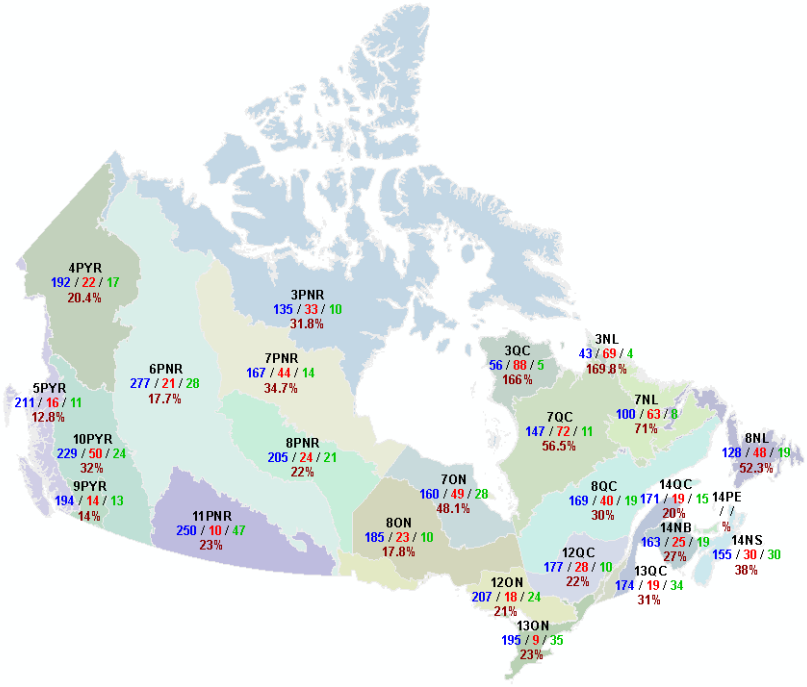

Figure 28. Number of species analyzed (blue), gained (red), lost (green), and the percent turnover (reddish brown) by Bird Conservation Sub-region.

Future climate effects may be pronounced in the forested habitats of BCR 8 ON. Predicted climatic conditions may promote increased severity of fire, insect outbreaks and drought (Colombo 2008), with positive and negative effects for priority bird species. Climate modelling suggests that the conditions currently prevailing in ecoregion 6E (i.e., to the south of BCR 8 ON, in BCR 13 ON) could migrate as far north as the coast of Lake Superior by 2100 (McKenney et al. 2010, Ontario Biodiversity Council 2011). These rapid shifts in climate conditions will have consequences for the habitat found here, and could outpace the ability of trees and other plant species, for example, to keep pace with this rate of shift in their preferred climatic conditions (McKenney et al. 2010).

The global scale of predicted climate effects means that conditions encountered elsewhere in the range of BCR 8 ON's priority species must also be considered. Those species breeding to the north and migrating through the region face the consequences of the accelerated climate and habitat change observed at high latitudes (ACIA 2005), such as the potential drying of moist tundra or inundation of key coastal staging habitats in BCR 7 ON (Environment Canada 2013b). To the south, sea-level rise may threaten the wintering habitats used by shorebirds (Galbraith et al. 2002), and populations of neotropical landbirds may be affected by changing climate and productivity on their wintering grounds (Wilson et al. 2011).

The highly complex interactions among ecosystem components and among the various stages in birds' annual cycles make precise predictions difficult. However, although uncertainty remains, it's clear that climate change and the associated habitat changes could significantly affect birds and other wildlife in BCR 8 ON. To maintain healthy bird populations in the face of a changing climate, conservation must be carefully planned and must be implemented so as to buffer birds from the negative effects of climate change wherever possible (Faaborg et al. 2010).

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

Note: The species shown here do not represent an exhaustive list, but instead provide examples of species where 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
Habitat loss as a result of ecosystem changes	Yellow Rail, Black Tern, Solitary Sandpiper
Increase in severe weather events	Bank Swallow, Barn Swallow, Common Nighthawk, Olive-sided Flycatcher
Introduction of new predators and competitors	Common Tern, Caspian Tern
Range shifts following shifting climate envelopes	Neotropical migrants

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

Threats Addressed	Threat Sub-category	Objective	Objective Category	Recommended Actions	Action Sub-category	Priority Species Affected
Climate change affects 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 Information lacking	Improve understanding of climate change on birds and their habitats	7.5 Improve understanding of potential effects of climate change	Evaluate which species are most vulnerable to climate change.	8.1 Research	All
				Investigate the cumulative effects of climate change.		
				Investigate behavioural responses to climate change (such as range shifts, changes in demographic rates, and changes in timing of breeding and migration) through long-term studies.		
				Continue to monitor bird populations so	8.2 Monitoring	

Table 27 continued

Threats Addressed	Threat Sub-category	Objective	Objective Category	Recommended Actions	Action Sub-category	Priority Species Affected
				changes in numbers and distributions can be identified. 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 PT score of 3 and an associated 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 information about certain species is not well captured by common monitoring designs and protocols in this BCR. 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.

Human settlements are sparsely distributed throughout BCR 8 ON, and road access ranges from fair in the southern extent of the region to non-existent in the North. Spatial coverage of bird surveys in the region is sparse, and limited primarily to those areas accessible by road. The BBS offers sparse coverage of the southern portion of the BCR, while the Ontario Breeding Bird Atlas provides more extensive spatial coverage but is predominantly constrained to road and canoe accessible sites. Both surveys have the potential for bias in population trend and distribution information because they offer very limited coverage in areas beyond roads and canoe networks. A variety of targeted surveys (e.g., the Eastern Waterfowl Survey, Great Lakes Colonial Waterbird Monitoring Surveys, Ontario Marsh Monitoring Program, Ontario Shorebird Survey) provide additional monitoring data for species not well covered by other surveys, but in general have very limited coverage in this region. Gaps in monitoring information are significant for some species, and even distribution and abundance are largely unknown for some species, especially waterbirds and shorebirds. Consequently, for 42 species (60% of priority species), a lack of information about population status (e.g., low reliability of status and trend estimates) was determined to be a conservation issue. Table 28 provides some suggestions for how these information gaps might be filled for the priority species of BCR 8 ON.

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

Landbirds

- develop options for on-the-ground monitoring across boreal Canada;
- evaluate the ability of migration monitoring and checklist surveys to contribute to Environment Canada's monitoring needs; and
- evaluate the feasibility and cost-effectiveness of improving demographic monitoring to help understand causes of population change.

Shorebirds

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

Waterbirds

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

Waterfowl

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

The key priorities for monitoring (Table 28) can be summarized (in ascending levels of investment) as:

- Baseline occurrence data on species at risk in BCR 8 ON are required to enable pre- and post-construction monitoring for environmental assessments.
- Improved estimates of species breeding distribution within the BCR.
- Status and trend monitoring for all priority species would improve assessment of population objectives and future management recommendations. This could be accomplished by:
    - Determining methods and designs that work for remote landscapes and the particular species requiring monitoring. For instance, it is not clear what protocols could be used to monitor some boreal-breeding shorebirds such as Solitary Sandpiper.
    - Considering survey program design in light of information gaps and risks at bird group and species levels in BCR 8 ON to inform population management.

Status and trends of species at risk are likely to be the most difficult to determine given typically low densities and discontinuous distributions (compared with more common species listed on the BCR priority list).

Table 28. Species groups for which incomplete monitoring information was considered a conservation concern, and suggested actions to address these gaps in monitoring information.

Action	Justification and Discussion	Priority Species
All Bird Groups		
Obtain accurate occurrence data for mapping species' 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). While the atlases have provided good information, the information may be biased because most sites visited are done so by road or by river (i.e., canoe routes) and less accessible habitats have been poorly covered. Information is also poor for early nesting species such as waterfowl, secretive birds or birds with clumped distributions (e.g., colonial waterbirds). However, this work should be useful for environmental assessments of species at risk and mitigation/monitoring recommendations for developments. Location data that are attributed to specific habitats would support development and refinement of habitat associations within the BCR, also important for environmental assessments and predicting impacts of habitat loss or conversion.	Priority species that are "at risk" in particular, require improved data. Current distribution data cannot be extrapolated with high confidence.
Landbirds		
Develop a monitoring program in boreal Canada, including representative sampling in BCR 8 ON 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. Work is needed to provide appropriate field data that could be used to design a monitoring program (e.g., information on logistics, species detectability, spatial and temporal variation).	All BCR 8 ON priority landbirds listed by PIF as having poor monitoring precision
Shorebirds and Waterbirds		
Develop a monitoring program for selected shorebird and waterbird species (including marsh birds)	Little information on boreal shorebirds and waterbird trends exists beyond the few species that can be covered by BBS methodology in other boreal BCRs. 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. Methods would need to be determined for several difficult-to-monitor species (Sinclair et al. 2004, Elliot et al. 2010). Work is needed to provide appropriate field data that could be used to design a monitoring program (e.g., information on logistics, species detectability, spatial and	All priority shorebird and waterbird species

Table 28 continued

Action	Justification and Discussion	Priority Species
	temporal variation).	
Waterfowl		
Increase monitoring effort for species with poor trend estimates.	Spring waterfowl plot surveys do not currently cover the northwestern portion 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 is warranted for continental harvest management of any waterfowl populations. Regional issues may require additional smaller programs (e.g., monitoring in protected areas, specific management questions related to threats or hunting pressures 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 recommendations for suitable conservation actions. Species or habitat-specific research recommendations are made in Section 2 of this strategy (by habitat). Research objectives presented here are big-picture questions and not necessarily a schedule of studies that are required to determine the needs of individual species. Undertaking research will facilitate 1) improvements to future iterations of BCR strategies; 2) focus future implementation; and 3) will also enable the development of new tools for conservation.

Limiting factors on populations are poorly understood for many species of birds in Canada, and several of the research needs below are intended to help understand the factors influencing population trends. These include the following (in no particular order):

- Research on species at risk to understand regional biology, status, trends (potentially), and the relationship of national trends and populations to local data.
- Research to understand and reverse the causes of population declines (e.g., aerial insectivores).
- Research that determines specific population connectivity and migration routes between breeding and wintering areas, using techniques such as genetic analysis, stable isotopes and geolocators.
- Research to determine and/or refine species habitat associations to help assess the effects of development activities and refine monitoring programs.
- Research to determine specific impacts of development activities (e.g., mining, expanding transportation corridors) on bird populations to properly understand the local and cumulative effects of these activities.

- Where they do not already exist, conduct research to support the development of sector-specific beneficial management practices documents, with an emphasis on bird and biodiversity conservation. Monitor adherence to these beneficial management practices and assess their effectiveness.
- Map land-cover changes that have occurred across the BCR since baseline time periods established in BCR strategies in order to assess the main types of habitat transitions that have occurred (wetland to urban development, old growth to managed forest, etc.). Investigate the influence potential of habitat change on species populations.
- Research to fill gaps in knowledge and make predictions about the impacts to birds of large stressors on habitats (e.g., acid rain, forest pests, climate change).

In addition, a general research and monitoring need in BCR 8 ON relates to the ongoing improvement of forest management practices for the benefit of birds and other species contributing to biodiversity. Current policies and guidelines for forest management attempt to mimic natural disturbance and maintain several forest parameters (e.g., forest composition, age class distribution and landscape pattern; Ontario Ministry of Natural Resources 2002) within the Estimated Range of Natural Variation. It is assumed that this pattern of disturbance, seemingly natural at the landscape scale, will support healthy ecological communities and processes, and healthy populations of birds and other biodiversity. Designing and implementing targeted studies to evaluate this assumption and refine forest management practices is an area of active research. Monitoring the outcome of these studies and using the results to refine forest management practices at multiple spatial scales is a critical need. Implementing and supporting these hypothesis-driven adaptive management and structured decision-making processes could ensure that forest management practices in BCR 8 ON achieve the desired outcomes for birds and other biodiversity components (Rempel 2009).

Threats Outside Canada

Many bird species found in Canada spend a large portion of their life cycle outside of the country (Fig. 29). 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 71 priority species in BCR 8 ON, 62 (87%) are migratory and spend part of their annual life cycle—up to half the year or more—outside Canada.

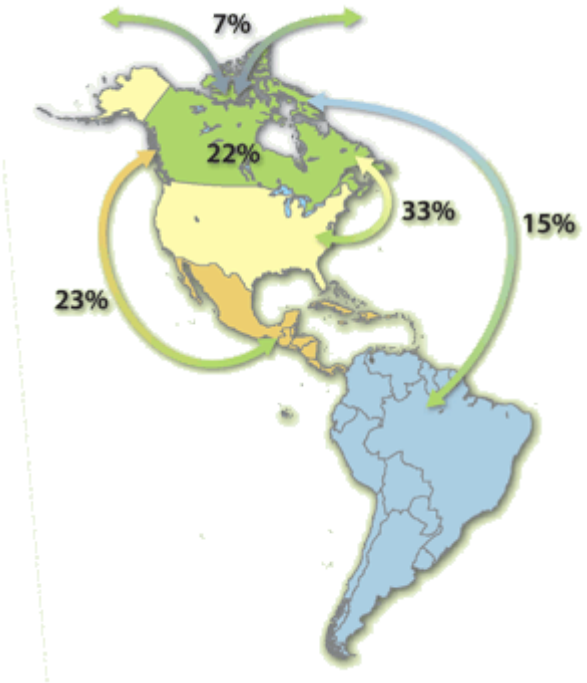

Figure 29. Percent of Canadian breeding birds that migrate to regions outside of Canada for part of their life cycle (North American Bird Conservation Initiative Canada 2012).

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 and Central and South America. While many of the threats identified in the United States likely affect species throughout their range, unique issues outside of the United States may have been missed. An absence of threats in a region may reflect that the necessary research has not yet been conducted (or may not be published in English). Because information on bird distributions during the non-breeding season

is limited, we were unable to assess the scope and severity of threats to priority species while they are outside of Canada.

Nevertheless, some information is available to inform conservation work outside Canada (Fig. 30). Priority birds from BCR 8 ON face the loss or degradation of key migration and wintering habitats. The primary sources of habitat loss and degradation are conversion of wetlands and coastal areas as a result of residential development (threat sub-category 1.1), conversion of wetland and forested habitat for cropland and livestock (sub-categories 2.1 and 2.3), and logging and wood harvesting (sub-category 5.3). The threat of loss and degradation of stopover or overwintering habitat is greater for species that have relatively small and concentrated wintering ranges.

In addition to habitat loss, priority birds from BCR 8 ON are also affected by increased mortality from human sources during migration and over-wintering. Collisions with structures such as TV towers were frequently reported (sub-category 1.2). Many priority bird species are affected by both legal and illegal hunting, and several priority birds from BCR 8 in Ontario are subject to lead poisoning (sub-category 5.1). Other sources of lethal and sub-lethal impacts to priority birds from BCR 8 in Ontario include exposure to industrial contaminants such as oil pollution and heavy metals (sub-category 9.2) and agricultural pesticides (sub-category 9.3).

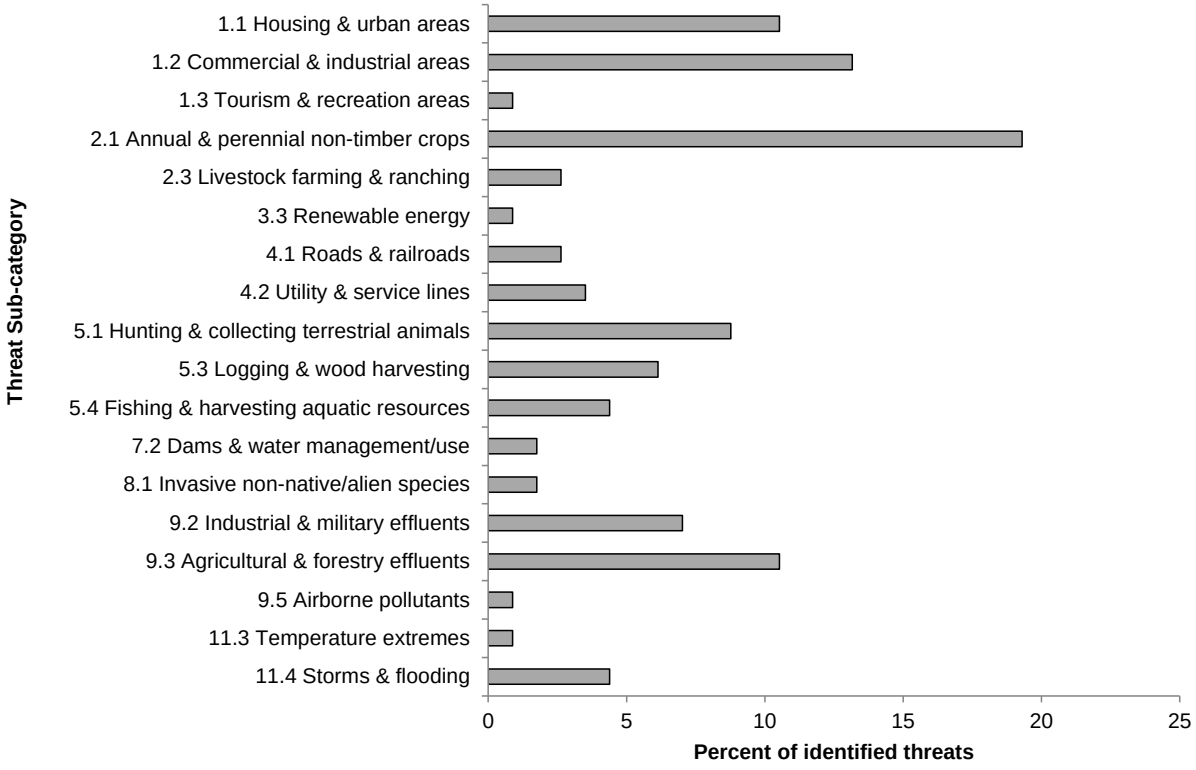

Figure 30. Percent of identified threats to BCR 8 Ontario's priority species while they are outside of Canada, by threat sub-category.

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

Next Steps

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

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

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Appendix 1

List of All Bird Species Occurring in BCR 8 Ontario

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

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Alder Flycatcher	*Empidonax alnorum*	Landbirds	Y			Y
American Crow	*Corvus brachyrhynchos*	Landbirds	Y			
American Goldfinch	*Spinus tristis*	Landbirds	Y			
American Kestrel	*Falco sparverius*	Landbirds	Y			
American Pipit	*Anthus rubescens*	Landbirds		Y		
American Redstart	*Setophaga ruticilla*	Landbirds	Y			
American Robin	*Turdus migratorius*	Landbirds	Y			
American Three-toed Woodpecker	*Picoides dorsalis*	Landbirds	Y		Y	
American Tree Sparrow	*Spizella arborea*	Landbirds		Y		
Bald Eagle	*Haliaeetus leucocephalus*	Landbirds	Y			Y
Baltimore Oriole	*Icterus galbula*	Landbirds	Y			
Bank Swallow	*Riparia riparia*	Landbirds	Y			Y
Barn Swallow	*Hirundo rustica*	Landbirds	Y			Y

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Barred Owl	*Strix varia*	Landbirds	Y		Y	
Bay-breasted Warbler	*Setophaga castanea*	Landbirds	Y			Y
Belted Kingfisher	*Megaceryle alcyon*	Landbirds	Y			Y
Black-and-white Warbler	*Mniotilta varia*	Landbirds	Y			Y
Black-backed Woodpecker	*Picoides arcticus*	Landbirds	Y		Y	Y
Black-billed Cuckoo	*Coccyzus erythropthalmus*	Landbirds	Y			
Blackburnian Warbler	*Setophaga fusca*	Landbirds	Y			Y
Black-capped Chickadee	*Poecile atricapillus*	Landbirds	Y		Y	
Blackpoll Warbler	*Setophaga striata*	Landbirds	Y			
Black-throated Blue Warbler	*Setaphaga caerulescens*	Landbirds	Y			
Black-throated Green Warbler	*Setophaga virens*	Landbirds	Y			Y
Blue Jay	*Cyanocitta cristata*	Landbirds	Y		Y	
Blue-headed Vireo	*Vireo solitarius*	Landbirds	Y			Y
Bobolink	*Dolichonyx oryzivorus*	Landbirds	Y			Y
Bohemian Waxwing	*Bombycilla garrulus*	Landbirds			Y	
Boreal Chickadee	*Poecile hudsonicus*	Landbirds	Y		Y	

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Boreal Owl	*Aegolius funereus*	Landbirds	Y		Y	Y
Brewer's Blackbird	*Euphagus cyanocephalus*	Landbirds	Y			
Broad-winged Hawk	*Buteo platypterus*	Landbirds	Y			
Brown Creeper	*Certhia americana*	Landbirds	Y		Y	
Brown Thrasher	*Toxostoma rufum*	Landbirds	Y			
Brown-headed Cowbird	*Molothrus ater*	Landbirds	Y			
Canada Warbler	*Cardellina canadensis*	Landbirds	Y			Y
Cape May Warbler	*Setophaga tigrina*	Landbirds	Y			Y
Cedar Waxwing	*Bombycilla cedrorum*	Landbirds	Y		Y	
Chestnut-sided Warbler	*Setophaga pensylvanica*	Landbirds	Y			Y
Chimney Swift	*Chaetura pelagica*	Landbirds	Y			
Chipping Sparrow	*Spizella passerina*	Landbirds	Y			
Clay-colored Sparrow	*Spizella pallida*	Landbirds	Y			
Cliff Swallow	*Petrochelidon pyrrhonota*	Landbirds	Y			Y
Common Grackle	*Quiscalus quiscula*	Landbirds	Y			
Common Nighthawk	*Chordeiles minor*	Landbirds	Y			Y

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Common Raven	*Corvus corax*	Landbirds	Y		Y	
Common Redpoll	*Acanthis flammea*	Landbirds			Y	
Common Yellowthroat	*Geothlypis trichas*	Landbirds	Y			
Connecticut Warbler	*Oporornis agilis*	Landbirds	Y			Y
Dark-eyed Junco	*Junco hyemalis*	Landbirds	Y		Y	
Downy Woodpecker	*Picoides pubescens*	Landbirds	Y		Y	
Eastern Bluebird	*Sialia sialis*	Landbirds	Y			
Eastern Kingbird	*Tyrannus tyrannus*	Landbirds	Y			Y
Eastern Phoebe	*Sayornis phoebe*	Landbirds	Y			
Eastern Whip-poor-will	*Antrostomus vociferus*	Landbirds	Y			Y
Eastern Wood-Pewee	*Contopus virens*	Landbirds	Y			
European Starling	*Sturnus vulgaris*	Landbirds	Y		Y	
Evening Grosbeak	*Coccothraustes vespertinus*	Landbirds	Y		Y	Y
Field Sparrow	*Spizella pusilla*	Landbirds	Y			
Fox Sparrow	*Passerella iliaca*	Landbirds	Y			
Golden Eagle	*Aquila chrysaetos*	Landbirds	Y		Y	Y

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Golden-crowned Kinglet	*Regulus satrapa*	Landbirds	Y			
Gray Catbird	*Dumetella carolinensis*	Landbirds	Y			
Gray Jay	*Perisoreus canadensis*	Landbirds	Y		Y	
Great Crested Flycatcher	*Myiarchus crinitus*	Landbirds	Y			
Great Gray Owl	*Strix nebulosa*	Landbirds	Y		Y	
Great Horned Owl	*Bubo virginianus*	Landbirds	Y		Y	
Gyrfalcon	*Falco rusticolus*	Landbirds			Y	
Hairy Woodpecker	*Picoides villosus*	Landbirds	Y		Y	
Hermit Thrush	*Catharus guttatus*	Landbirds	Y			
Hoary Redpoll	*Acanthis hornemanni*	Landbirds			Y	
House Sparrow	*Passer domesticus*	Landbirds	Y		Y	
House Wren	*Troglodytes aedon*	Landbirds	Y			
Indigo Bunting	*Passerina cyanea*	Landbirds	Y			
Lapland Longspur	*Calcarius lapponicus*	Landbirds		Y		
Le Conte's Sparrow	*Ammodramus leconteii*	Landbirds	Y			
Least Flycatcher	*Empidonax minimus*	Landbirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Lincoln's Sparrow	*Melospiza lincolnii*	Landbirds	Y			
Long-eared Owl	*Asio otus*	Landbirds	Y		Y	
Magnolia Warbler	*Setophaga magnolia*	Landbirds	Y			Y
Merlin	*Falco columbarius*	Landbirds	Y			
Mourning Dove	*Zenaida macroura*	Landbirds	Y			
Mourning Warbler	*Geothlypis philadelphia*	Landbirds	Y			Y
Nashville Warbler	*Oreothlypis ruficapilla*	Landbirds	Y			Y
Nelson's Sparrow	*Ammodramus nelsoni*	Landbirds	Y			
Northern Flicker	*Colaptes auratus*	Landbirds	Y			Y
Northern Goshawk	*Accipiter gentilis*	Landbirds	Y		Y	Y
Northern Harrier	*Circus cyaneus*	Landbirds	Y			
Northern Hawk Owl	*Surnia ulula*	Landbirds	Y		Y	
Northern Parula	*Setophaga americana*	Landbirds	Y			
Northern Saw-whet Owl	*Aegolius acadicus*	Landbirds	Y		Y	
Northern Shrike	*Lanius excubitor*	Landbirds			Y	
Northern Waterthrush	*Parkesia noveboracensis*	Landbirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Olive-sided Flycatcher	*Contopus cooperi*	Landbirds	Y			Y
Orange-crowned Warbler	*Oreothlypis celata*	Landbirds	Y			
Osprey	*Pandion haliaetus*	Landbirds	Y			
Ovenbird	*Seiurus aurocapilla*	Landbirds	Y			Y
Palm Warbler	*Setophaga palmarum*	Landbirds	Y			
Peregrine Falcon	*Falco peregrinus*	Landbirds	Y			Y
Philadelphia Vireo	*Vireo philadelphicus*	Landbirds	Y			Y
Pileated Woodpecker	*Dryocopus pileatus*	Landbirds	Y		Y	
Pine Grosbeak	*Pinicola enucleator*	Landbirds	Y		Y	Y
Pine Siskin	*Spinus pinus*	Landbirds	Y		Y	
Pine Warbler	*Setophaga pinus*	Landbirds	Y			
Purple Finch	*Haemorhous purpureus*	Landbirds	Y		Y	Y
Red Crossbill	*Loxia curvirostra*	Landbirds	Y		Y	
Red-breasted Nuthatch	*Sitta canadensis*	Landbirds	Y		Y	
Red-eyed Vireo	*Vireo olivaceus*	Landbirds	Y			
Red-tailed Hawk	*Buteo jamaicensis*	Landbirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Red-winged Blackbird	*Agelaius phoeniceus*	Landbirds	Y			
Rock Pigeon	*Columba livia*	Landbirds	Y		Y	
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	Landbirds	Y			
Ruby-crowned Kinglet	*Regulus calendula*	Landbirds	Y			Y
Ruby-throated Hummingbird	*Archilochus colubris*	Landbirds	Y			
Ruffed Grouse	*Bonasa umbellus*	Landbirds	Y		Y	Y
Rusty Blackbird	*Euphagus carolinus*	Landbirds	Y			Y
Savannah Sparrow	*Passerculus sandwichensis*	Landbirds	Y			
Scarlet Tanager	*Piranga olivacea*	Landbirds	Y			
Sedge Wren	*Cistothorus platensis*	Landbirds	Y			
Sharp-shinned Hawk	*Accipiter striatus*	Landbirds	Y			Y
Sharp-tailed Grouse	*Tympanuchus phasianellus*	Landbirds	Y		Y	
Short-eared Owl	*Asio flammeus*	Landbirds	Y			Y
Snow Bunting	*Plectrophenax nivalis*	Landbirds			Y	
Snowy Owl	*Bubo scandiacus*	Landbirds			Y	
Song Sparrow	*Melospiza melodia*	Landbirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Spruce Grouse	*Falcipennis canadensis*	Landbirds	Y		Y	
Swainson's Thrush	*Catharus ustulatus*	Landbirds	Y			
Swamp Sparrow	*Melospiza georgiana*	Landbirds	Y			Y
Tennessee Warbler	*Oreothlypis peregrina*	Landbirds	Y			Y
Tree Swallow	*Tachycineta bicolor*	Landbirds	Y			Y
Turkey Vulture	*Cathartes aura*	Landbirds	Y			
Veery	*Catharus fuscescens*	Landbirds	Y			
Vesper Sparrow	*Pooecetes gramineus*	Landbirds	Y			
Warbling Vireo	*Vireo gilvus*	Landbirds	Y			
Western Meadowlark	*Sturnella neglecta*	Landbirds	Y			
White-breasted Nuthatch	*Sitta carolinensis*	Landbirds	Y		Y	
White-crowned Sparrow	*Zonotrichia leucophrys*	Landbirds	Y			
White-throated Sparrow	*Zonotrichia albicollis*	Landbirds	Y			Y
White-winged Crossbill	*Loxia leucoptera*	Landbirds	Y		Y	
Willow Ptarmigan	*Lagopus lagopus*	Landbirds			Y	
Wilson's Warbler	*Cardellina pusilla*	Landbirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Winter Wren	*Troglodytes hiemalis*	Landbirds	Y			Y
Wood Thrush	*Hylocichla mustelina*	Landbirds	Y			
Yellow Warbler	*Setophaga petechia*	Landbirds	Y			
Yellow-bellied Flycatcher	*Empidonax flaviventris*	Landbirds	Y			Y
Yellow-bellied Sapsucker	*Sphyrapicus varius*	Landbirds	Y			Y
Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	Landbirds	Y			
Yellow-rumped Warbler	*Setophaga coronata*	Landbirds	Y			
American Golden-Plover	*Pluvialis dominica*	Shorebirds		Y		
American Woodcock	*Scolopax minor*	Shorebirds	Y			
Black-bellied Plover	*Pluvialis squatarola*	Shorebirds		Y		
Buff-breasted Sandpiper	*Tryngites subruficollis*	Shorebirds		Y		
Dunlin	*Calidris alpina*	Shorebirds		Y		
Eskimo Curlew	*Numenius borealis*	Shorebirds		Y		
Greater Yellowlegs	*Tringa melanoleuca*	Shorebirds	Y			Y
Hudsonian Godwit	*Limosa haemastica*	Shorebirds		Y		
Killdeer	*Charadrius vociferus*	Shorebirds	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Least Sandpiper	*Calidris minutilla*	Shorebirds		Y		
Lesser Yellowlegs	*Tringa flavipes*	Shorebirds	Y			Y
Long-billed Dowitcher	*Limnodromus scolopaceus*	Shorebirds		Y		
Marbled Godwit	*Limosa fedoa*	Shorebirds		Y		
Pectoral Sandpiper	*Calidris melanotos*	Shorebirds		Y		
Purple Sandpiper	*Calidris maritima*	Shorebirds		Y		
Red Knot (rufa)	*Calidris canutus rufa*	Shorebirds		Y		
Red-necked Phalarope	*Phalaropus lobatus*	Shorebirds		Y		
Ruddy Turnstone	*Arenaria interpres*	Shorebirds		Y		
Sanderling	*Calidris alba*	Shorebirds		Y		
Semipalmated Plover	*Charadrius semipalmatus*	Shorebirds		Y		
Semipalmated Sandpiper	*Calidris pusilla*	Shorebirds		Y		
Short-billed Dowitcher	*Limnodromus griseus*	Shorebirds		Y		
Solitary Sandpiper	*Tringa solitaria*	Shorebirds	Y			Y
Spotted Sandpiper	*Actitis macularius*	Shorebirds	Y			
Stilt Sandpiper	*Calidris himantopus*	Shorebirds		Y		

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Whimbrel	*Numenius phaeopus*	Shorebirds		Y		
White-rumped Sandpiper	*Calidris fuscicollis*	Shorebirds		Y		
Wilson's Phalarope	*Phalaropus tricolor*	Shorebirds	Y			
Wilson's Snipe	*Gallinago delicata*	Shorebirds	Y			Y
American Bittern	*Botaurus lentiginosus*	Waterbirds	Y			Y
American Coot	*Fulica americana*	Waterbirds	Y			
American White Pelican	*Pelecanus erythrorhynchos*	Waterbirds	Y			Y
Black Tern	*Chlidonias niger*	Waterbirds	Y			Y
Bonaparte's Gull	*Chroicocephalus philadelphia*	Waterbirds	Y			
Caspian Tern	*Hydroprogne caspia*	Waterbirds	Y			
Common Loon	*Gavia immer*	Waterbirds	Y			Y
Common Tern	*Sterna hirundo*	Waterbirds	Y			
Double-crested Cormorant	*Phalacrocorax auritus*	Waterbirds	Y			
Glaucous Gull	*Larus hyperboreus*	Waterbirds		Y		
Great Blue Heron	*Ardea herodias*	Waterbirds	Y			
Herring Gull	*Larus argentatus*	Waterbirds	Y			Y

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Horned Grebe	*Podiceps auritus*	Waterbirds	Y			Y
Pied-billed Grebe	*Podilymbus podiceps*	Waterbirds	Y			
Red-necked Grebe	*Podiceps grisegena*	Waterbirds	Y			Y
Red-throated Loon	*Gavia stellata*	Waterbirds		Y		
Ring-billed Gull	*Larus delawarensis*	Waterbirds	Y			
Sandhill Crane	*Grus canadensis*	Waterbirds	Y			
Sora	*Porzana carolina*	Waterbirds	Y			
Virginia Rail	*Rallus limicola*	Waterbirds	Y			
Yellow Rail	*Coturnicops noveboracensis*	Waterbirds	Y			Y
American Black Duck	*Anas rubripes*	Waterfowl	Y			Y
American Wigeon	*Anas americana*	Waterfowl	Y			Y
Black Scoter	*Melanitta americana*	Waterfowl		Y		Y
Blue-winged Teal	*Anas discors*	Waterfowl	Y			
Brant	*Branta bernicla*	Waterfowl		Y		
Bufflehead	*Bucephala albeola*	Waterfowl	Y			Y
Cackling Goose	*Branta hutchinsii*	Waterfowl		Y		

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Canada Goose (Southern James Bay)	*Branta canadensis*	Waterfowl		Y		
Canada Goose (Temperate-breeding in Eastern Canada)	*Branta canadensis*	Waterfowl	Y			
Canvasback	*Aythya valisineria*	Waterfowl	Y			
Common Goldeneye	*Bucephala clangula*	Waterfowl	Y		Y	Y
Common Merganser	*Mergus merganser*	Waterfowl	Y			Y
Gadwall	*Anas strepera*	Waterfowl	Y			
Greater Scaup	*Aythya marila*	Waterfowl	Y			
Green-winged Teal	*Anas crecca*	Waterfowl	Y			Y
Hooded Merganser	*Lophodytes cucullatus*	Waterfowl	Y			
Lesser Scaup	*Aythya affinis*	Waterfowl	Y			Y
Long-tailed Duck	*Clangula hyemalis*	Waterfowl		Y		Y
Mallard	*Anas platyrhynchos*	Waterfowl	Y			Y
Northern Pintail	*Anas acuta*	Waterfowl	Y			
Northern Shoveler	*Anas clypeata*	Waterfowl	Y			
Red-breasted Merganser	*Mergus serrator*	Waterfowl	Y			
Redhead	*Aythya americana*	Waterfowl	Y			

Table A1 continued

Common Name	Scientific Name	Bird Group	Breeding	Migrant	Wintering	Priority
Ring-necked Duck	*Aythya collaris*	Waterfowl	Y			Y
Ruddy Duck	*Oxyura jamaicensis*	Waterfowl	Y			
Snow Goose	*Chen caerulescens*	Waterfowl		Y		
Surf Scoter	*Melanitta perspicillata*	Waterfowl		Y		Y
Trumpeter Swan	*Cygnus buccinator*	Waterfowl	Y			
Tundra Swan	*Cygnus columbianus*	Waterfowl		Y		
White-winged Scoter	*Melanitta fusca*	Waterfowl		Y		
Wood Duck	*Aix sponsa*	Waterfowl	Y			

Appendix 2

General Methodology for Compiling the Six Standard Elements

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

1) identifying priority species – to focus conservation attention on species of conservation concern and those most representative of the region
2) attributing priority species to habitat classes – a tool for identifying habitats of conservation interest and a means of organizing and presenting information
3) setting population objectives for priority species – an assessment of current population status compared with 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 sub-region. 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.[11]

[11] Partners in Flight (landbirds), Wings Over Water (waterbirds), Canadian Shorebird Conservation Plan (shorebirds), NAWMP (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 priorities among birds.

For waterfowl, species that were identified within the Ontario Eastern Habitat Joint Venture Implementation Plan as being high priority, breeding or non-breeding within BCR 8 ON, were added to the all-bird priority species list (Ontario Eastern Habitat Joint Venture 2007). Similarly, species considered by North American Waterfowl Management Plan (NAWMP Plan Committee 2004) to have breeding or non-breeding needs of Moderately High, High or Highest for the Ontario portion of Waterfowl Conservation Region 8 or 8.1 were added. In some cases, additions and exclusions were made to the priority lists based on more recent Canadian Wildlife Service expert opinion (J. Hughes, S. Meyer, S. Badzinski, pers. comm. 2011).

For landbirds, species were included on the priority species list if they are considered to be of Continental Concern, Regional Concern, Continental Stewardship, or Regional Stewardship in the Ontario Partners in Flight Plan (2008). Again, in some cases, additions or exclusions were made to the list based on CWS expert opinion (M. Cadman, R. Russell, pers comm. 2012). Shorebirds that had been identified as high or medium priority in the Ontario Shorebird Conservation Plan (Ross et al. 2003) and verified by expert opinion (K. Ross, pers. comm. 2009, C. Friis, pers. comm. 2011) were included in the priority list, with those noted as low priority generally excluded. Priority waterbird species were those that were designated as Tier 1 or Tier 2 within BCR 8 in the Ontario Waterbird Conservation Plan (Zeran et al. unpublished), with some changes made based on recent expert opinion (D. Moore and D.V. Weseloh, pers. comm. 2011). Provincial and/or federal species at risk occurring in BCR 8 ON were also identified as priority species (current to January 2014).

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, or selection or avoidance; this could be a useful exercise to undertake in the future.

In order to link with other national and international land classification schemes and to capture the range of habitat types across Canada, habitat classes for all priority species are based, at the coarsest level, on the hierarchical approach of the international Land Cover Classification Scheme developed by the United Nations Food and Agriculture Organization (Food and Agriculture Organization 2000). Some modifications were made to the LCCS scheme to reflect habitat types that are important to birds not included in the classification (e.g., marine habitats). Species are often assigned to more than one of these coarse habitat classes. To retain the link to regional spatial data (provincial forest inventories, etc.) or to group species into regionally relevant habitat classes, individual BCR strategies may identify finer-scale habitat classes. Finer-scale habitat attributes and the surrounding landscape context were also captured when possible to better guide the development of specific conservation objectives and actions. For BCR 8 ON, habitat associations and descriptions were defined for priority species based largely on information in Cadman et al. (2007), Poole (2009) and the Birds of North America Online (Cornell Lab of Ornithology 2013). These habitat attributes include important nesting features (e.g., snags, cliffs) and habitat modifiers (e.g., burns, seral stage, riparian vegetation, structural complexity).

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, 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 North American Bird Conservation Initiative 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 (e.g., the Eastern Waterfowl Survey in Ontario began in the early- to mid-nineties). 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 to "assess and maintain" the population, and a monitoring objective is set. Harvested waterfowl and many stewardship species may already be at desired population levels and are thus given an objective of "maintain". For any species listed under the *Species at Risk* Act (SARA) and/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 yet finalized, interim objectives are noted, and then set using the same approach used for other species within that bird group. Once recovery objectives are available, they will replace the interim objectives identified in this strategy.

Shorebirds and Landbirds

Population objectives for landbirds in this strategy (other than for those at risk) were based on objectives published in the Ontario Partners in Flight (2008) plan, which were derived primarily from BBS counts. Ontario landbird objectives differ from those presented in the continental landbird plan (Rich et al. 2004). Continental goals reflect a return to levels of the late 1960s for species of Concern or the 1990s for Stewardship species. In contrast, the majority of population objectives in Ontario Partners in Flight (2008) reflect maintenance or restoration of populations to values within the expected range of normal fluctuations resulting from natural ecosystem processes (e.g., fire, insect and disease outbreaks). These objectives assume a link between abundance and habitat supply, and acknowledge that variability in habitat condition and supply is a natural characteristic of the forested habitats of BCR 8 ON.

Population objectives were not set for shorebird species that do not breed in BCR 8 ON. Objectives for these more northerly breeding species are provided in plans for other BCRs (especially BCR 3). For the four species that do breed in the region (Greater and Lesser Yellowlegs, Solitary Sandpiper and Wilson's Snipe), population data are largely lacking. Neither the provincial plan (Ross et al. 2003), nor the continental plan (Donaldson et al. 2000) provide quantitative population goals for these species. Goals were set to Assess/Maintain, pending improved knowledge of status and trends.

Waterfowl

Population objectives for waterfowl are taken from the Ontario Eastern Habitat Joint Venture Implementation Plan (2007). For breeding species, population goals for BCR 8 ON are derived from dedicated waterfowl surveys that have been flown across Eastern Canada since 1990, covering the eastern portion of the BCR only. The goals reflect the mean of the top three population counts from the surveys during the period 1996 to 2005 (for many species, these occur between 1999 and 2002; Bolduc et al. 2008). For this BCR, population goals were not established for migrant waterfowl. This differs from BCR 13, where regular surveys of the nearshore waters of Great Lakes provide the monitoring information necessary to establish and track progress towards objectives for migrants.

Waterbirds

Population objectives for waterbirds were based on observed population trends (Zeran et al. unpublished) and/or the species' conservation status (e.g., listed as a species at risk or ranked as provincially rare), as described in Table A2. Regionally specific population trend data from the Ontario Breeding Bird Atlas, the Ontario BBS, the Great Lakes Marsh Monitoring Program, and the Great Lakes Colonial Waterbird Monitoring Surveys (decadal census and annual surveys) were used where available.

Table A2. Relationship between waterbird population trend assessment and generic population objectives.

Population Trend and/or Conservation Status	BCR 8 Ontario Population Objective
Biologically significant population decline	Increase
Apparent population decline	Maintain current
Apparent population decline AND S4-S5[1]	Assess/Maintain
Apparently stable population	Maintain current
Apparent population increase	Maintain current
Apparently stable population OR Apparent population increase AND S1-S3[1]	Assess/Maintain
Biologically significant population increase	Maintain OR Decrease
Information lacking or information unreliable/unknown	Assess/Maintain
Species at Risk	Recovery Objective

Element 4: Threat Assessment for Priority Species

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

The threats assessment exercise included three main steps:

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

[1] Provincial (or regional) ranks are used by the Natural Heritage Information Centre to set protection priorities for rare species and natural communities. These ranks convey the degree of rarity of the species or community at the regional level and are not legal designations.
S1 Critically Imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province.
S2 Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines or other factors making it very vulnerable to extirpation from the nation or state/province.
S3 Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines or other factors making it vulnerable to extirpation.
S4 Apparently Secure: uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 Secure: common, widespread and abundant in the nation or state/province.

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 sub-region, for broad habitat categories.

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

For this strategy, threats were identified through literature reviews including the existing bird conservation plans that include BCR 8 ON:

- landbirds – Ontario Partners in Flight (2008);
- waterfowl – Ontario Eastern Habitat Joint Venture Implementation Plan (2007);
- waterbirds – Zeran et al. (unpublished);
- shorebirds – Ross et al. (2003) and local expert opinion; Wedeles and Mainguy (2010).

Supplementary data from Cadman et al. (2007), Poole (2009), Sandilands (2005, 2010) and Committee on the Status of Endangered Wildlife in Canada species assessments and various species accounts from Birds of North America Online (Cornell Lab of Ornithology 2013) were also used. Published recovery documents were consulted to compile threats for species listed under the federal SARA or Ontario's *Endangered Species Act 2007*. Each threat was categorized following the IUCN threat classification scheme. 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.

In BCR 8 ON, category 12 "Other direct threats" and sub-category 12.1 "Information lacking" was used to identify priority species that lack adequate biological or demographic information required for population conservation and management. Using this category in this manner facilitated the development of targeted research and monitoring conservation actions to address knowledge gaps for these species, but unlike the other threats, these were not ranked.

Element 5: Conservation Objectives

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

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

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

Conservation objectives generally fall into one of two broad categories:

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

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

Element 6: Recommended Actions

Recommended conservation actions are the strategies required to achieve conservation objectives. Recommended actions are usually made at the strategic level rather than being highly detailed and prescriptive. Actions were classified following the IUCN-CMP classification of conservation actions (Salafsky et al. 2008), with the addition of categories to address research and monitoring needs. When possible, more detailed recommendations can be included, for example if beneficial management practices, ecosystem plans or multiple recovery documents are available for a sub-region. However, actions should be detailed enough to provide initial guidance for implementation.

The objectives for research, monitoring and widespread issues may not have actions associated with them. These issues are often so multi-faceted that actions are best designed in

consultation with partners and subject-matter experts. Implementation teams will be better positioned to address these complex issues, drawing input from various stakeholders.

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

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