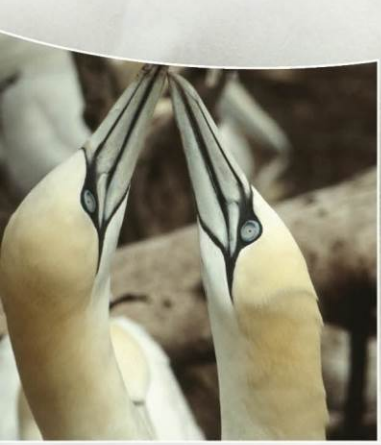
Environment Canada Environnement Canada

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

- Abridged Version -

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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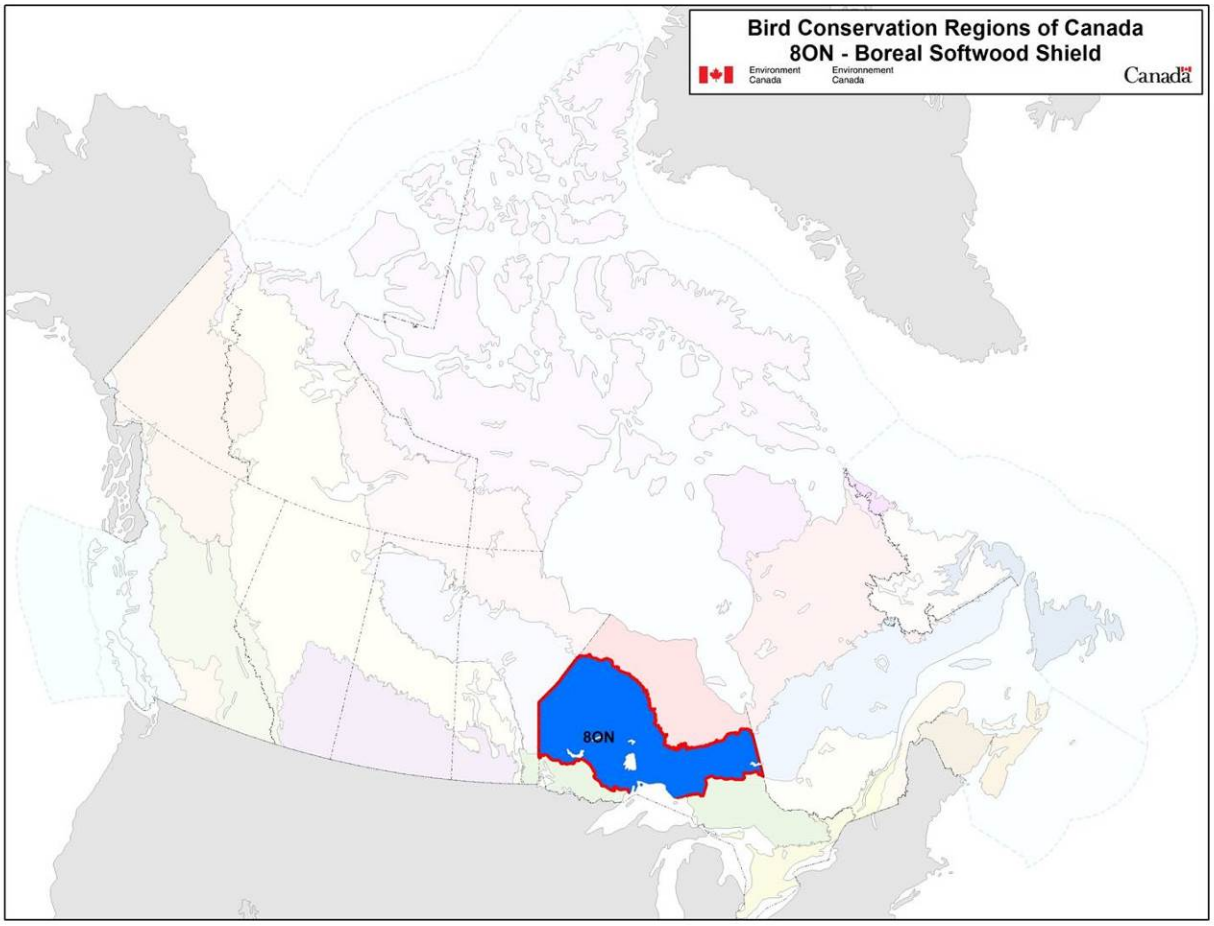

Executive Summary

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 of the full version of this strategy 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, also available in the full version of this strategy, presents additional widespread conservation issues that are not specific to a particular habitat or were not captured by the threat assessment for individual species, as well as research and monitoring needs, and threats to migratory birds while they are outside of Canada. The approach and methodology are summarized in the appendices, 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.

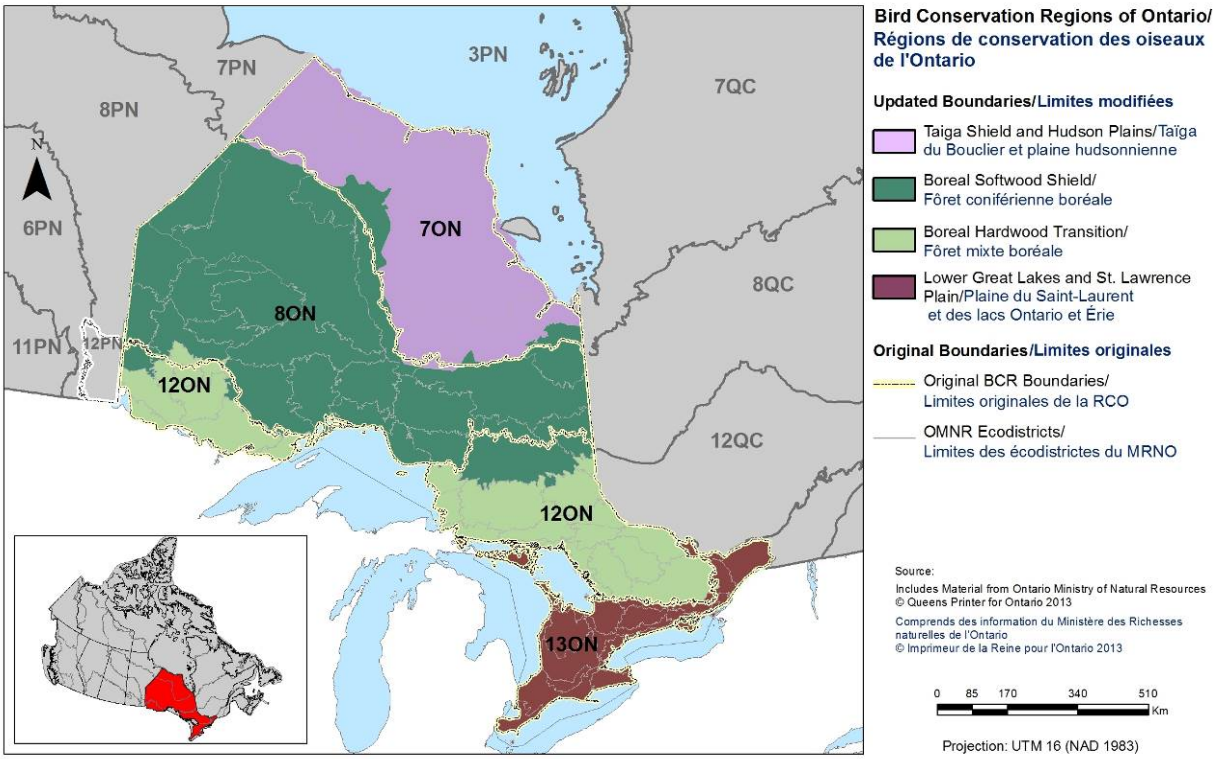

Figure 1. Map of Boundary Changes to BCR 8 ON: Boreal Softwood Shield.
Note: For conservation planning purposes, the original North American Bird Conservation Initiative-defined boundaries of Ontario's BCR boundaries have been slightly modified to align with the Ontario Ministry of Natural Resources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

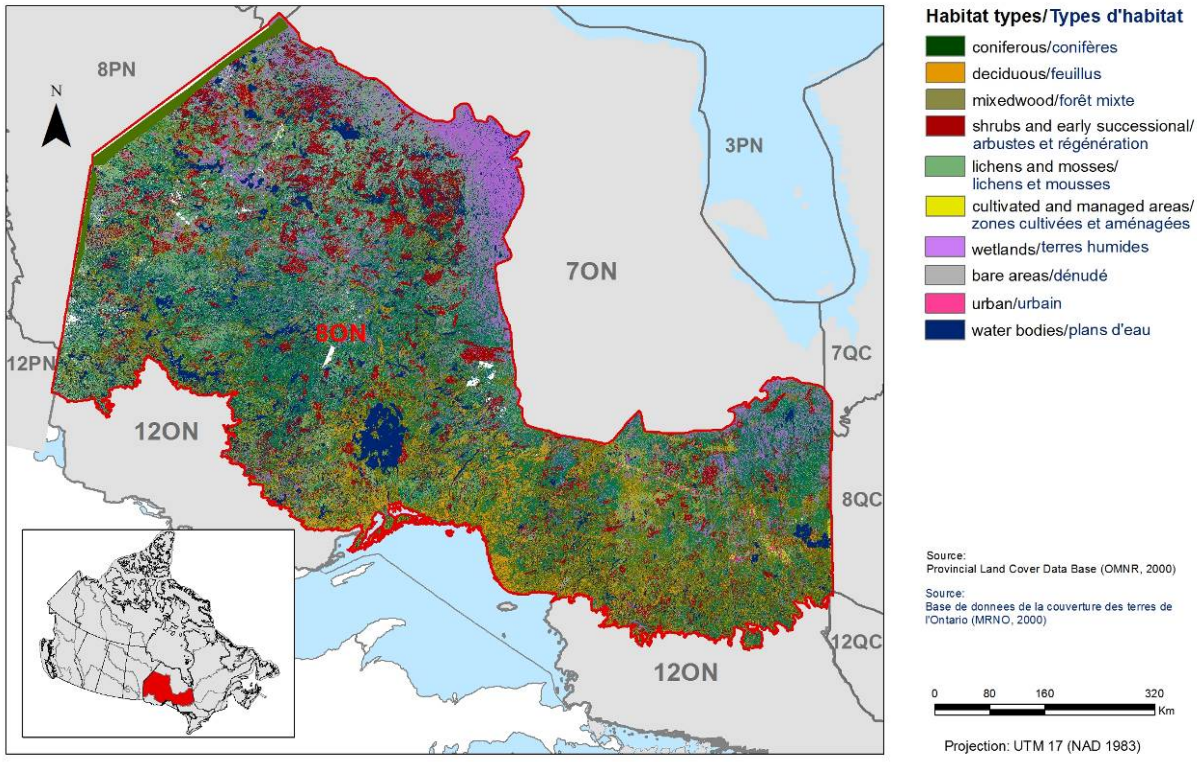

Figure 2. Map of land cover in BCR 8 ON.
Note: Riparian habitat areas are not depicted on this map because they represent a "zone" and are not a true land cover class. A map depicting the extent of derived riparian areas for illustration purposes can be found in the Riparian section of this strategy.

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 2014b). 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 2014a). 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.

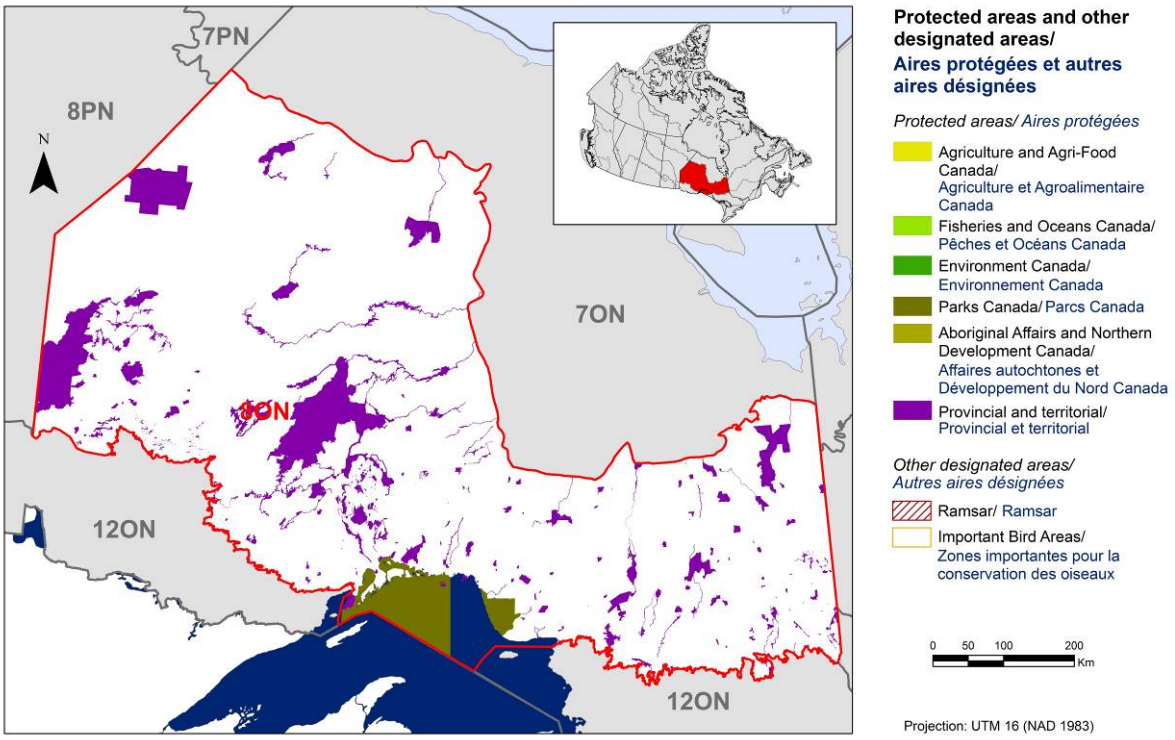

Figure 3. Map of protected and designated areas in BCR 8 ON.

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. 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.

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 2014c).

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[6]	SARA[7]	SARO[8]	Regional/Sub-regional Concern[9]	Regional/Sub-regional Stewardship[10]	National/Continental Concern	National/Continental Stewardship
Landbirds								
Alder Flycatcher	Maintain current					Y		Y
Bald Eagle	Recovery objective[11]			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
Cape May Warbler	Maintain current					Y		Y

[6] Assessed by COSEWIC as E, Endangered; T, Threatened; SC, Special Concern.
[7] Species listed on Schedule 1 of SARA as E, Endangered; T, Threatened; SC, Special Concern.
[8] Species listed as E, Endangered; T, Threatened; SC, Special Concern on the SARO List.
[9] 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).
[10] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[11] 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[6]	SARA[7]	SARO[8]	Regional/Sub-regional Concern[9]	Regional/Sub-regional Stewardship[10]	National/Continental Concern	National/Continental Stewardship
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		
Short-eared Owl	Recovery objective[6]	SC	SC	SC	Y		Y	

Table 2 continued

Priority Species	Population Objective	COSEWIC[6]	SARA[7]	SARO[8]	Regional/Sub-regional Concern[9]	Regional/Sub-regional Stewardship[10]	National/Continental Concern	National/Continental Stewardship
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[6]	SARA[7]	SARO[8]	Regional/Sub-regional Concern[9]	Regional/Sub-regional Stewardship[10]	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[12]	Landbird	Shorebird	Waterbird	Waterfowl
COSEWIC[13]	10	0	2	0
SARA[14]	7	0	1	0
SARO[15]	10	0	4	0
National/Continental Concern	19	2	8	8
National/Continental Stewardship[16]	20	N/A	N/A	N/A
Regional/Sub-regional Concern[17]	19	4	7	11
Regional/Sub-regional Stewardship	25	N/A	N/A	N/A

[12] A single species can be on the priority list for more than one reason.
[13] Assessed by COSEWIC as Endangered, Threatened or Special Concern.
[14] Species listed on Schedule 1 of SARA as Endangered, Threatened or Special Concern.
[15] Species listed as Endangered, Threatened or Special Concern on the SARO List.
[16] Only the landbird group distinguishes stewardship species from other priority species (see Panjabi et al. 2005).
[17] 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. 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.

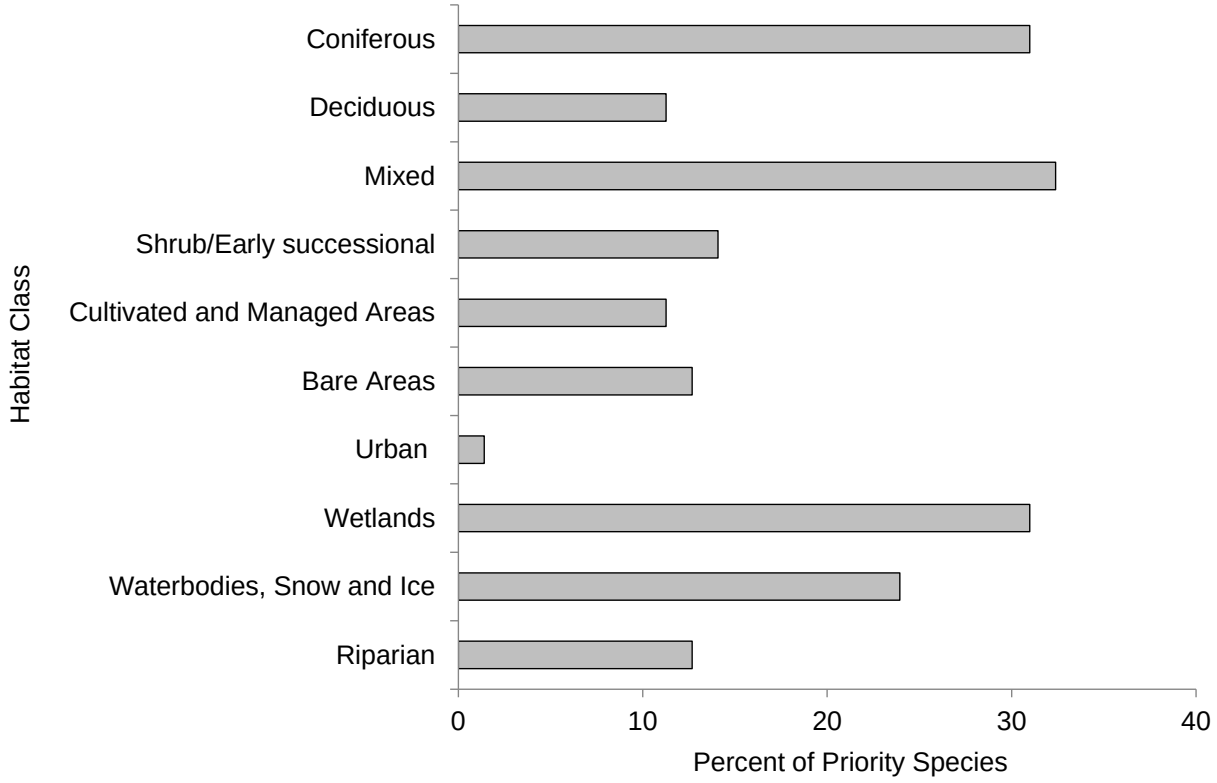

Figure 4. Percent of priority species that are associated with each habitat type in BCR 8 ON.
Note: The total exceeds 100% because each species may use more than one habitat.

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. 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 of the complete strategy. 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.

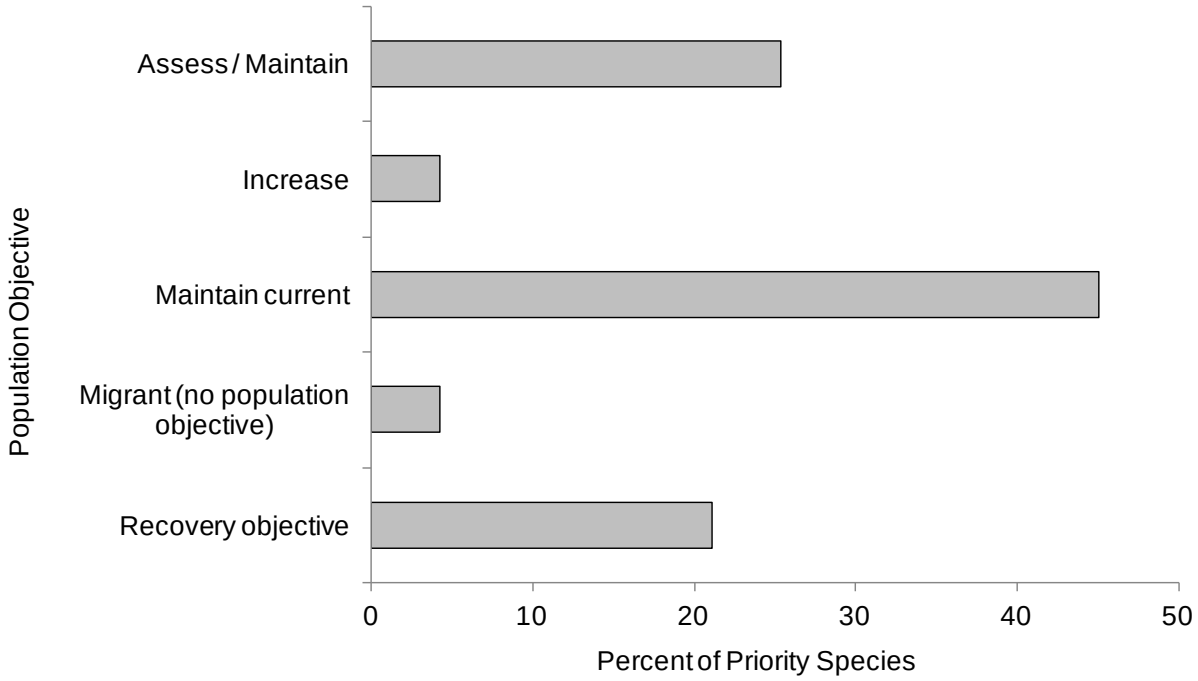

Figure 5. Percent of priority species that are associated with each population objective category in BCR 8 ON.

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 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 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.

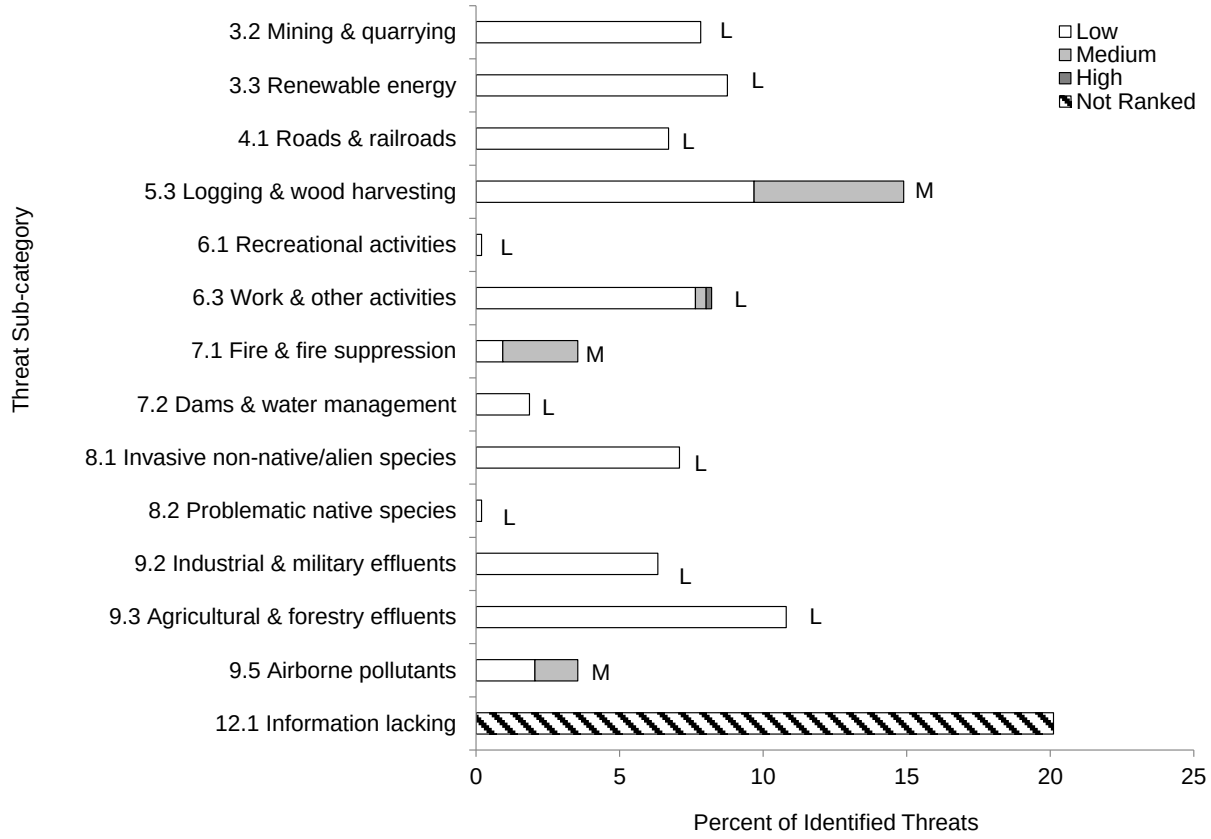

Figure 6. Percent of identified threats to priority species within BCR 8 ON by threat sub-category. Each bar represents the percent of the total number of threats identified in each threat sub-category in BCR 8 ON (for example, if 100 threats were identified in total for all priority species in BCR 8 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.

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.

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).

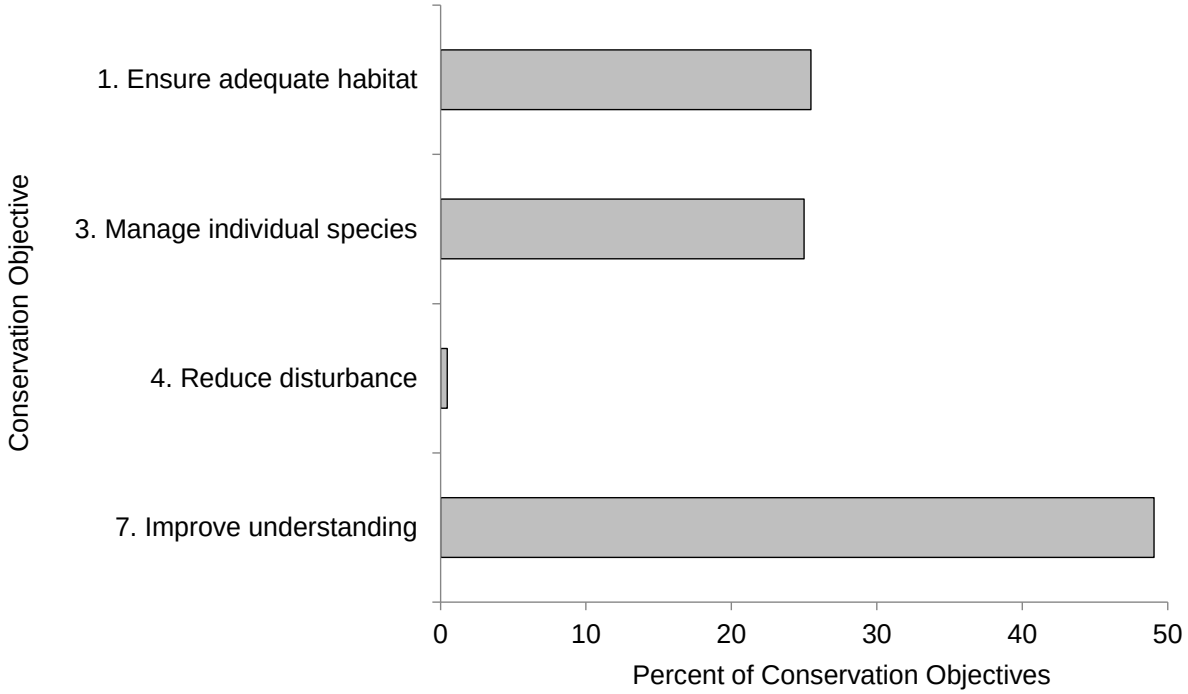

Figure 7. Percent of all conservation objectives assigned to each conservation objective category in BCR 8 ON.

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. 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 2014d). 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.

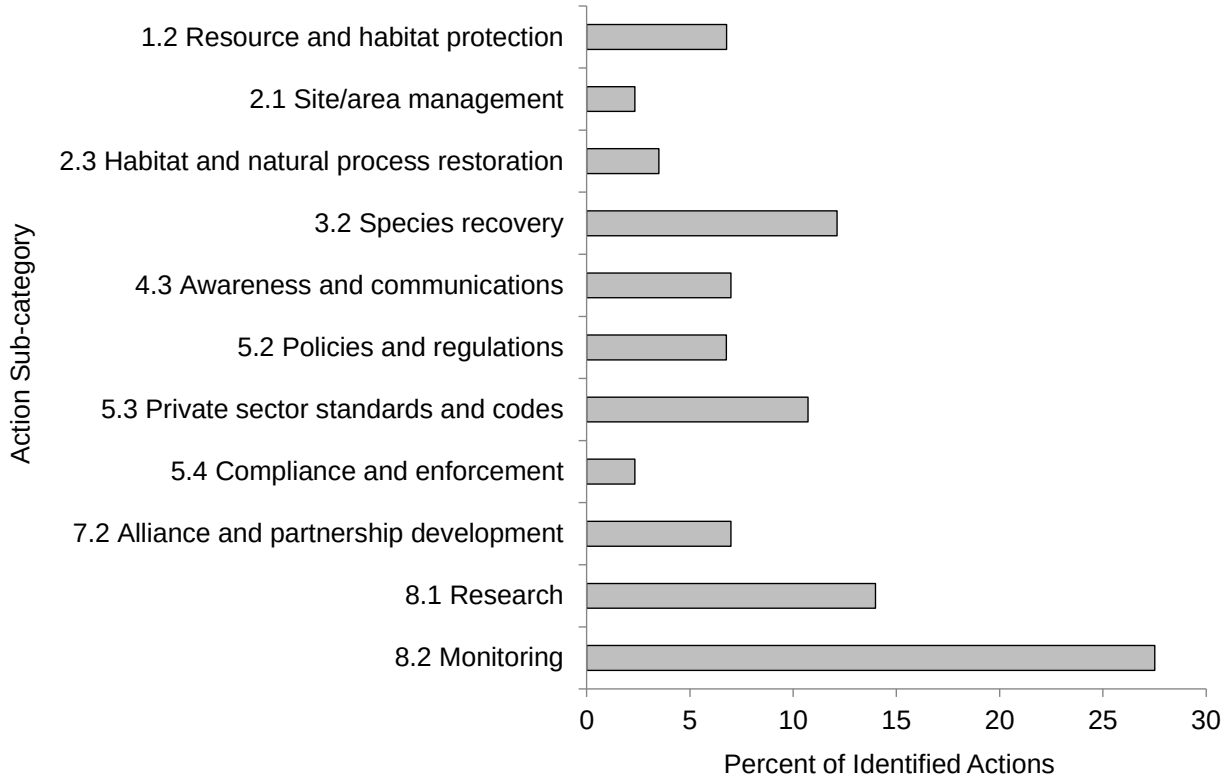

Figure 8. Percent of recommended actions assigned to each sub-category in BCR 8 ON.
Note: "Research and monitoring" refers to specific species where additional information is required. For a discussion of broad-scale research and monitoring requirements, see the section on Research and Population Monitoring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

References

Baldwin, D.J.B., J.R. Desloges and L.E. Band. 2000. Physical geography of Ontario. *In* A.H. Perera, D.L. Euler and I.D. Thompson, eds. *Ecology of a Managed Terrestrial Landscape: Patterns and Processes of Forest Landscapes in Ontario*. UBC Press, Vancouver, BC. pp. 12–29.

Cadman, M.D., D.A. Sutherland, G.G. Beck, D. Lepage and A.R. Couturier, eds. 2007. *Atlas of the Breeding Birds of Ontario, 2001-2005*. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature, Toronto, Ontario. xxii + 706 pp.

Canadian Boreal Forest Agreement. 2010. *The Canadian Boreal Forest Agreement: An historic agreement signifying a new era of joint leadership in the boreal forest*. http://canadianborealforestagreement.com/media-kit/Boreal-Agreement-Full.pdf

Cornell Lab of Ornithology. 2013. Birds of North America Online. http://bna.birds.cornell.edu/bna/

Donaldson, G., C. Hyslop, G. Morrison, L. Dickson, and I. Davidson. 2000. *Canadian Shorebird Conservation Plan*. Canadian Wildlife Service, Environment Canada.

Far North Science Advisory Panel. 2010. *Science for a changing Far North: the report of the Far North Science Advisory Panel*. A report submitted to the Ontario Ministry of Natural Resources.

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

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

Milko, R., L. Dickson, R. Elliot and G. Donaldson. 2003. *Wings Over Water: Canada's Waterbird Conservation Plan*. Canadian Wildlife Service, Environment Canada, Ottawa, Ontario. 28 pp.

NAWMP Plan Committee. 2004. *North American Waterfowl Management Plan 2004. Implementation framework: strengthening the biological foundation*. Canadian Wildlife Service, U.S. Fish and Wildlife Service, pp. 106.

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

Ontario Ministry of Natural Resources. 2014a. Crown Land Use Policy Atlas. www.giscoeapp.lrc.gov.on.ca/web/MNR/NHLUPS/CLUPA/Viewer/Viewer.html

Ontario Ministry of Natural Resources. 2014b. Forest Management Guide for Boreal Landscapes. Toronto: Queen's Printer for Ontario. 104 pp.

Ontario Ministry of Natural Resources. 2014c. *Species at Risk in Ontario (SARO) List*. www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_CSSR_SARO_LST_EN.html

Ontario Ministry of Natural Resources. 2014d. *Recovery Strategies*. www.mnr.gov.on.ca/en/Business/Species/2ColumnSubPage/MNR_SAR_SPEC_RCVRY_STRAT_EN.html

Ontario Ministry of Natural Resources. 2006. *State of the forest report, 2006*. Forest Information Series. Queen's Printer for Ontario, Toronto. 160 pp.

Ontario Partners in Flight. 2008. *Ontario Landbird Conservation Plan: Boreal Softwood Shield, North American Bird Conservation Region 8*. Ontario Ministry of Natural Resources, Bird Studies Canada, Environment Canada.

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

Parks Canada. 2014. National Parks of Canada. www.pc.gc.ca

Pearce, J.L. 2011. *Development of habitat objectives for BCR 12*. Unpublished Report prepared by Pearce and Associates Ecological Research for Environment Canada. 110 pp.

Perera, A.H., and D.J.B. Baldwin. 2000. Spatial patterns in the managed forest landscape of Ontario. In A.H. Perera, D.L. Euler and I.D. Thompson, eds. *Ecology of a Managed Terrestrial Landscape: Patterns and Processes of Forest Landscapes in Ontario*. UBC Press, Vancouver, BC. pp. 74–99.

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

Species at Risk Public Registry. 2014. *Recovery Strategies*. www.sararegistry.gc.ca/sar/recovery/recovery_e.cfm

Statutes of Ontario. 1994. *Crown Forest Sustainability Act, 1994*. Queens Printer for Ontario. Toronto, ON.

Thompson, I.D. 2000. Forest vegetation of Ontario: factors influencing landscape change. In A.H. Perera, D.L. Euler and I.D. Thompson, eds. *Ecology of a Managed Terrestrial Landscape: Patterns and Processes of Forest Landscapes in Ontario*. UBC Press, Vancouver, BC. pp. 30–53.

Voigt, D.R., J.A. Baker, R.S. Rempel and I.D. Thompson. 2000. Forest vertebrate responses to landscape-level changes in Ontario. *In* A.H. Perera, D.L. Euler and I.D. Thompson, eds. *Ecology of a Managed Terrestrial Landscape: Patterns and Processes of Forest Landscapes in Ontario*. UBC Press, Vancouver, BC. pp. 198–233.