

Ontario Landbird Conservation Plan:
Lower Great Lakes/St. Lawrence Plain
(North American Bird Conservation Region 13)

Priorities, Objectives and Recommended Actions

Draft
April 2005

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Acknowledgements

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Executive Summary

Southern Ontario is home to a great diversity of bird life, with species richness rivaling anywhere else in Canada or the United States during the breeding season. It also houses much of Canada's human population, with a landscape heavily influenced by agriculture, urban development, and industry. The purpose of this plan is to guide landbird conservation efforts in order to sustain the distribution, diversity and abundance of birds in southern Ontario's dynamic landscape.

The Planning Area

The plan covers Ontario's share of the Lower Great Lakes/St. Lawrence Plain, Bird Conservation Region 13 (BCR 13), which corresponds to Ontario south of the Precambrian shield. This is the first of four landbird plans being developed by Ontario Partners in Flight (PIF). Each focuses on Ontario's share of a single Bird Conservation Region (BCR), planning regions developed by the North American Bird Conservation Initiative (NABCI). Together these four plans will contribute to continent-wide efforts by PIF and NABCI to sustain the distribution, diversity and abundance of all North American landbirds. Read Chapter 1 to learn more about the scope and objectives of this Plan, and how it fits into continental conservation initiatives for birds. Chapter 2 provides a detailed look at the region, current and past land cover, avifauna and main conservation issues facing landbirds.

Most of the plan is devoted to three topics:

- Identifying priority species and habitats;
- Setting measurable objectives for the conservation of priority species; and
- Recommending conservation actions to achieve objectives.

Landbird Conservation Priorities

Forty-two (23%) of the 180 species of landbirds that regularly breed or winter in southern Ontario are identified as priority species (see Chapter 4 for a complete list), on the basis of a detailed species assessment (Chapter 3 outlines the approach, appendices provide details). Reasons for listing are diverse. Some species are of concern continent-wide and have important populations in southern Ontario (e.g., Willow Flycatcher, Short-eared Owl). A few have small global range and populations, so are considered vulnerable to future change (e.g., Golden-winged and Cerulean Warblers), while many are relatively abundant and widespread but are declining rapidly with continued declines a strong possibility (e.g., Vesper Sparrow, Eastern Meadowlark). Other species are listed because southern Ontario has a high global responsibility for the species' population in combination with other concerns (e.g., Bobolink, Baltimore Oriole). Southern Ontario is also home to many of Canada's, and Ontario's, listed Endangered and Threatened species (e.g., Prothonotary Warbler, Northern Bobwhite), which are also included on the list.

Most of these priority species depend on one of three general habitat types, each of which has been listed as a priority for attention in southern Ontario:

- **Forest Landbirds** – 13 priority species (see Chapter 5 for details)

- **Grassland / Agricultural Landbirds** – 13 priority species (Chapter 6)
- **Shrub / Successional Landbirds** – 10 priority species (Chapter 7)

Species with other habitat affinities are covered separately in Chapter 8.

A fourth group of landbirds is identified as a priority for attention in this plan – **aerial-foraging insectivores** – birds that feed "on the wing" on flying insects (see Chapter 9). This group includes swallows, swifts and nighthawks. Though only three species are individually on the priority list, all ten aerial insectivores that breed regularly in southern Ontario are showing signs of decline.

Landbird Conservation Objectives

Overall objectives are set for each priority species to give general guidance to conservation efforts. These objectives depend on whether the species is already the subject of a SAR recovery strategy (objective is **recovery**), is poorly monitored (**assess status**), has declined to a less desirable level (**reverse decline**), has declined but is still at an acceptable level (**halt decline**), or appears to be stable or increasing (**maintain current**). The objectives respond to current realities and conservation circumstances. For example, while reversing the long-term declines in priority grassland birds resulting from a decrease in agricultural grasslands in southern Ontario is not a conservation objective, halting these declines and maintaining current population and distribution levels is important because this region is an important refuge for North America's declining grassland birds.

Specific measurable objectives are also set for the abundance of each species, where the species is monitored by the North American Breeding Bird Survey, as well as for the distribution of each species across 4 sub-regions of southern Ontario, using changes between successive Breeding Bird Atlases as a benchmark. Similar measurable objectives are set for each priority group of birds, i.e., all forest birds, all aerial-foraging insectivores, etc. These specific objectives provide a means of evaluating progress against the overall objectives above. See Chapter 3 for the approach to objectives, and Chapters 4 through 9 for objectives specific to each guild of birds.

Conservation Actions

The plan proposes a wide range of actions for the conservation of landbirds in southern Ontario including actions related to monitoring, research and evaluation, planning and policy, outreach and education and applied conservation. General actions that apply to many groups of landbirds are found in Chapter 4, actions specific to habitat and foraging guilds are listed in Chapters 5 to 9, and actions specific to each priority species are contained in **Species Accounts** in Appendix F, which also contains details of species status, reasons for concern, ecology and objectives.

Implementation of the proposed actions will be done by a range of conservation partners, in coordination with other bird conservation initiatives under the NABCI umbrella. Conservation actions outside of southern Ontario may also be necessary to contribute to these objectives, as all but one priority species (Northern Bobwhite) is migratory.

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1 Introduction

1.1 Purpose

The purpose of this Plan is to guide landbird conservation efforts in those parts of Ontario that lie within the Great Lakes/ St. Lawrence Plain region, also known as Bird Conservation Region 13 (Figure 1). This is the first of four such plans being developed, to cover the four Bird Conservation Regions (BCRs) within Ontario (Figure 2).

The conservation goals of this plan are twofold:

- To sustain the distribution, diversity and abundance of native landbirds and their habitats in Ontario portions of BCR 13; and
- To contribute to continent-wide efforts to sustain the distribution, diversity and abundance of all North American landbirds.

This is a biological plan, aimed chiefly at:

- Identifying priority landbird species and habitats;
- Setting measurable and attainable objectives for the conservation of these priority species; and
- Recommending conservation actions to help achieve those objectives.

The plan is complementary to, and does not duplicate or replace, current recovery strategies and actions for those landbird species that have been officially designated as Endangered or Threatened, according to federal or provincial species at risk legislation.

To be successful, this Plan should be used to guide the actions of a diversity of partners including:

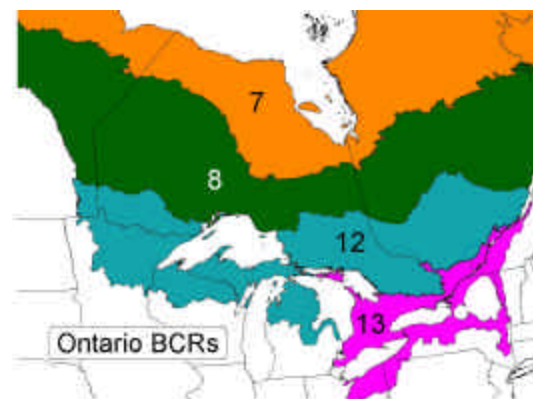
- Conservation planners at federal, provincial and municipal levels,
- Public and private land owners and managers,
- Project proponents, consultants and environmental assessment practitioners,
- Scientists and volunteers involved in wildlife research and monitoring, and
- Individuals and organizations interested in making a difference for landbirds in their communities.

These partners are the primary audience for this plan, as their actions will influence the fate of Ontario's landbirds. Many of these partners have been directly or indirectly involved in the development of this Plan.

Figure 1: Location Map showing the extent of the Lower Great Lakes/ St. Lawrence Plain Bird Conservation Region (BCR 13).



Figure 2: Map of Ontario Bird Conservation Regions (BCRs), including the Ontario BCR 13 Planning Region.



Landbirds include a broad variety of species that rely primarily on terrestrial habitats throughout the year including: vultures, eagles, hawks, falcons, grouse, quail, doves, cuckoos, owls, nightjars, swifts, hummingbirds, kingfishers, woodpeckers and passerines (songbirds).

1.2 Plan Objectives

The specific objectives of this Plan are to use existing data, information and expert knowledge to:

- Identify priority landbird species by following a comprehensive, objective, science-based assessment process;
- Provide concise summaries of relevant information on the status, ecology, management, and conservation needs of priority landbird species;
- Describe priority habitats used by several of these priority species, and summarize key issues affecting these habitats;
- As much as possible, establish realistic measurable population and distribution objectives for the conservation of priority landbirds in this region;
- Recommend conservation actions that will assist in achieving these objectives including:
 - Monitoring,
 - Research and evaluation,
 - Planning and policy,
 - Outreach initiatives to educate and inform target audiences; and
 - Applied conservation actions.
- Describe an implementation strategy to foster integration of this plan with other existing regional and international conservation initiatives.

The information in this plan is designed to guide the conservation of landbirds in the Ontario portion of BCR 13 and will be used to integrate and coordinate implementation of recommended actions with similar conservation efforts directed at waterfowl, waterbird and shorebird populations in BCR 13 (Hayes et al. 2002), and with the continental-scale Partners and Flight (PIF, Box 1) and North American Bird Conservation Initiative (NABCI, Box 2) programs.

1.3 The Importance of Landbird Conservation

Birds are the most familiar and widely enjoyed aspect of nature in North America, with more people watching and feeding birds than ever before. Birds bring beauty, song and joy into the lives of many people. Birds fill critical roles in ecological systems: seed dispersal, pollination, control of pest species, prey for other wildlife. And they serve as a valuable early warning

Box 1: Partners in Flight

In 1990, Partners In Flight (PIF) was launched in the U.S. in response to growing concerns about declines in the populations of neotropical migrant landbirds (www.partnersinflight.org). Later, PIF expanded to include all landbirds, and PIF initiatives began in Canada and Latin America.

At its broadest level, Partners In Flight is a coalition of countries, government agencies, conservation groups, academic institutions, industry and concerned citizens who share a common vision: *to maintain the health of landbird populations and their habitats.*

In Canada, PIF activities are coordinated by a National Working Group, comprised of representatives from several national organizations and regional PIF groups. Activities and products of this group include the Framework for Landbird Conservation in Canada (PIF Canada 1996) and Canadian Landbird Monitoring Strategy (Downes et al. 2000). (See www.cws-scf.ec.gc.ca/birds/lb_ot_e.cfm).

PIF activities are one of the four pillars in the NABCI framework. As part of NABCI, Partners in Flight supports the conservation of migratory and resident landbirds throughout their yearly ranges.

PIF Mission

To sustain the distribution, diversity and abundance of landbirds in their natural numbers and natural habitats, throughout their natural geographic ranges.

- 1) **Keeping common birds common.** Native birds, both resident and migratory, must be retained in healthy numbers throughout their natural ranges.
- 2) **Helping species at risk.** Species must be conserved before they become imperiled: allowing species to become threatened or endangered results in long-term and costly recovery efforts whose success is far from guaranteed.
- 3) **Working in partnerships for birds, habitats and people.** Conservation of landbirds and their habitats cannot be undertaken alone.

system for health of the environment, as demonstrated by declines in Peregrine Falcon, Osprey and other birds in the DDT era.

The residents of southern Ontario enjoy one of the richest assemblages of breeding birds in eastern North America, including more than 150 species of landbirds (Figure 3). Tremendous numbers of migrants also pass through southern Ontario, en route to breeding areas to the north and west and wintering areas that for some species may extend all the way to the extreme southern tip of South America.

Over the past several decades, populations of many common landbirds have undergone long-term declines, in this region and elsewhere. The reasons for these declines are complex, but habitat-related factors (loss, fragmentation and degradation) are considered the primary cause of the observed declines in many landbirds.

As a first step in addressing concerns regarding declining landbird populations and the loss of landbird habitats, PIF promoted the development of regional landbird conservation plans. PIF also produced a major North American landbird conservation plan, establishing continental-scale priorities (Rich et al. 2004).

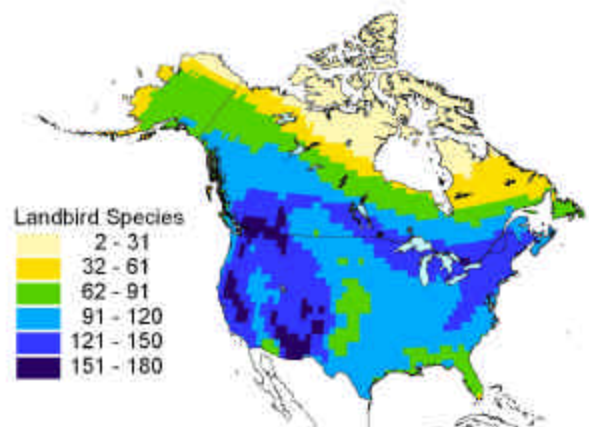
Box 2: The North American Bird Conservation Initiative (www.nabci.net)

The North American Bird Conservation Initiative (NABCI) is a tri-national initiative involving Canada, the United States, and Mexico. It was launched in 1999 by the Commission for Environmental Cooperation (an international organization created by Canada, Mexico and the United States under the North American Agreement on Environmental Cooperation) to address the need for coordinated bird conservation efforts that benefit “all birds in all habitats.”

NABCI advocates an approach to bird conservation that is regionally based, biologically driven, and landscape oriented. It draws together the major bird conservation plans already in existence for waterbirds, shorebirds, waterfowl, and landbirds (i.e., Partners in Flight plans such as this one), fills in knowledge gaps, and builds a coalition of groups and agencies to execute the plans.

In Ontario, NABCI activities are coordinated through the Eastern Habitat Joint Venture. It is anticipated that conservation plans for landbirds and other birds will be implemented through the Joint Venture and other partnerships initiatives.

Figure 3: Map of Species Richness of Breeding Landbirds in Canada and United States.



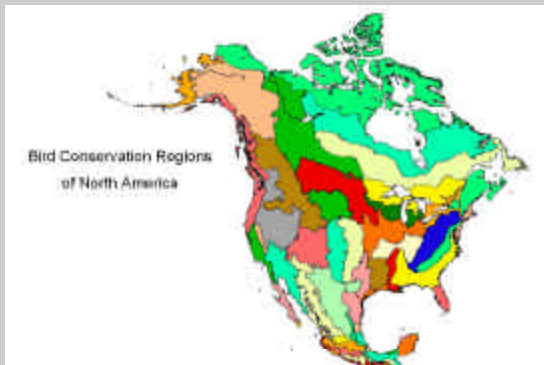
Box 3: North American Bird Conservation Regions (BCRs)

A shared concept of geography and landscapes is critical to effective planning. To that end, the North American Commission for Environmental Cooperation developed a map of North America (Figure 4) that delineates a set of 66 geographic areas called Bird Conservation Regions (BCRs) (U.S. NABCI Committee 2000). Each BCR encompasses landscapes having similar bird communities, habitats, and resource issues. The BCR framework is now widely used for PIF planning and by other initiatives under the NABCI umbrella.

All or part of twelve BCRs are located in Canada. The province of Ontario encompasses parts of four BCRs (Figure 2).

Like birds, BCRs cross over political borders: the success of current North American all-birds conservation efforts will ultimately depend on cooperation among jurisdictions. Regional plans, such as this one, are intended to facilitate multi-jurisdictional and multi-species conservation efforts, such as BCR 13 all-birds planning (Hayes et al. 2004).

Figure 4: North American Bird Conservation Regions (BCRs)



1.4 The PIF North American Landbird Conservation Plan

The first iteration of the PIF North American Landbird Conservation Plan was completed in March 2004. This landmark document (Rich et al. 2004), established a vision and planning framework for the conservation of all North American landbirds. Some 195 Species of Continental Importance were identified in the continental plan including:

- PIF Watch List species - characterized by a high level of vulnerability and concern; and
- PIF Stewardship species - those species for which a region has high responsibility because a high percentage of its global population occurs in a single biome.

Key links between the North American Plan and this Ontario BCR 13 plan include:

- Priority species list – Ontario's BCR 13 list includes species of regional concern as well as species of continental importance identified in the PIF North American Plan (those with relatively high density in southern Ontario;
- Population objectives – For the most part, this Ontario plan adopts the continental approach of aiming to reverse declines observed in priority species. As a result, achieving objectives in Ontario will contribute directly to achieving North America-wide objectives for these same species.

1.5 PIF in Ontario

In 1995, a partnership of government and non-governmental agencies produced a bird conservation plan for Ontario that was published in 1997 as the Ontario "Flight Plan" (Cheskey et al. 1995, Lounds et al. 1997). Priority species lists for southern Ontario were subsequently produced (Couturier 1999). The current plan builds on these earlier efforts and puts them within the NABCI BCR planning framework. The updated priority species list, objectives, and recommended actions in this plan will be used to facilitate and evaluate the implementation of landbird conservation efforts in ON BCR 13.

The current Ontario Partners in Flight planning initiative is being led by Environment Canada Ontario Region and Ontario Ministry of Natural Resources, in partnership with Bird Studies Canada. This regional partnership is in keeping with PIF's grassroots approach, where regions develop their own goals and strategies towards achieving the overall goal of *keeping common birds common*.

Box 4: Additional Information on PIF Activities in Ontario

The PIF Ontario web site has current information on PIF activities in this region and elsewhere. Newsletters, technical workshop notes, and other background information are available at: <http://www.bsc-eoc.org/PIF/PIFOntario.html>

2 Overview of the Lower Great Lakes/St. Lawrence Plain (BCR 13) in Ontario

2.1 Description

The Lower Great Lakes/St. Lawrence Plain Bird Conservation Region, BCR 13, encompasses 201,300 square kilometres of generally flat, low-lying land to the south of the Canadian Shield in Ontario and Quebec, and north of various highland systems in the four eastern U.S. states (Figure 5). The Ontario portion is the largest, comprising 42% of the total BCR. Smaller portions lie within New York (27%), Quebec (14%), Ohio (11%), Pennsylvania (4%) and Vermont (2%).

In Ontario, BCR 13 encompasses 84,700 square kilometres, including all of southwestern Ontario, Manitoulin Island, a 50 to 100-km wide strip along the north shore of Lake Ontario and the upper St. Lawrence River, and the lower Ottawa Valley (Figure 2).

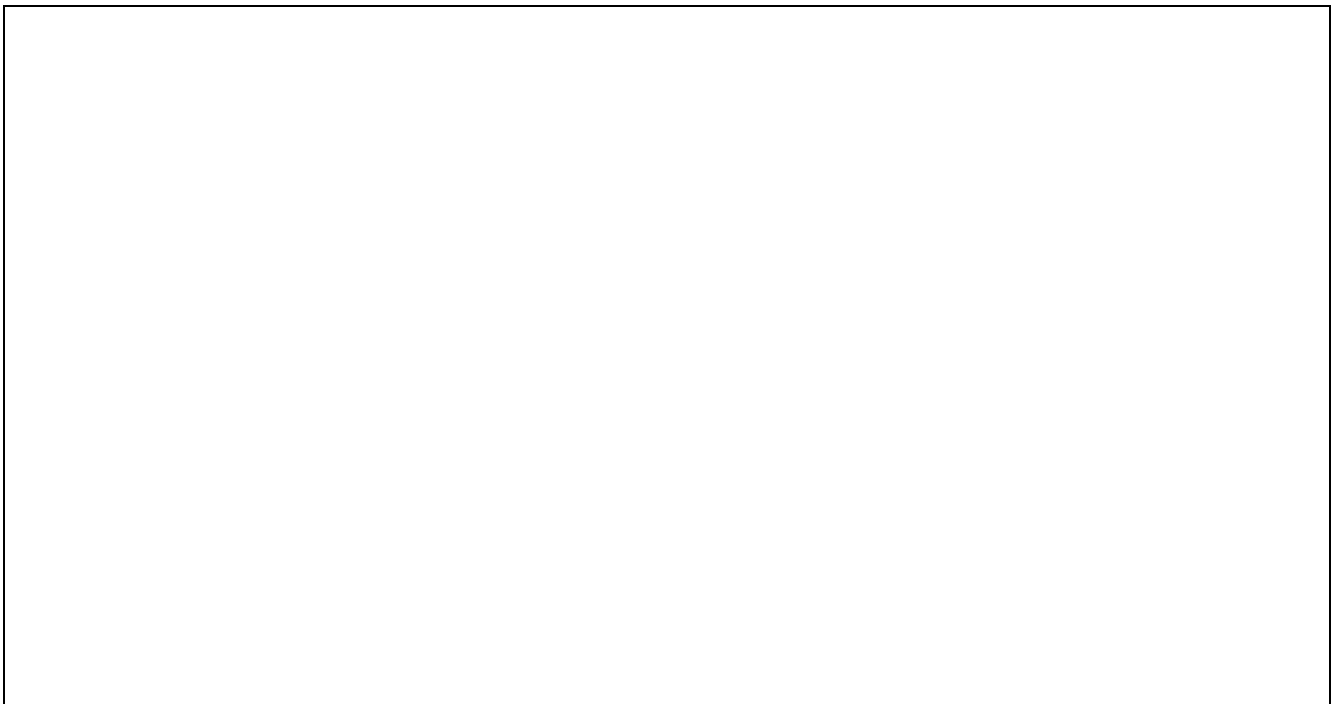
The Canadian boundaries of this BCR coincide closely with those of Environment Canada's Mixedwood Plain Ecozone (Wiken 1986, Marshall and Schut 1999). The portion within

Ontario encompasses two of the Ontario Ministry of Natural Resource's Site Ecoregions (Hill 1959, Jalava et al. 1997): Ecoregion 6E (Lake Simcoe – Rideau), and Ecoregion 7E (Lakes Erie-Ontario, also known as Carolinian Canada).

Where there were small discrepancies between the BCR and ecoregion boundaries, the BCR boundaries were used (e.g. in GIS analyses) with one notable exception: Cockburn Island (located west of Manitoulin Island) has been included within this ON BCR 13 plan (as in the MNR ecological regions), rather than in BCR 12.

This same ecologically-defined planning unit is widely used for other conservation planning purposes in Ontario, and is often referred to as "Ontario south and east of the Canadian Shield", or just "southern Ontario". In this plan the terms "Ontario portion of BCR 13", "southern Ontario" and "ON BCR 13" are used interchangeably.

Figure 5: Detailed Map of ON BCR 13 (show Cities, County boundaries, eco-region boundaries?)



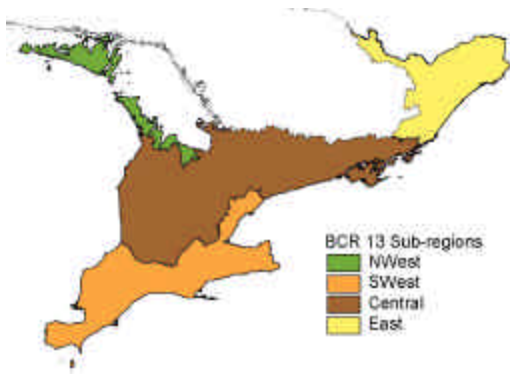
2.2 Sub-regions of Ontario BCR 13

The conservation needs and recommended actions for priority landbirds are not uniform across southern Ontario because people, land uses, habitats, and landbirds are unevenly distributed across the region. In recognition of these differences, four sub-regions of ON BCR 13 have been defined for purposes of this plan (Figure 6): Southwest (SW); Central (CE), Eastern (EA) and Northwest (NW).

The boundaries of these four sub-regions are ecological-defined, based on OMNR eco-region and site district boundaries (Jalava et al. 1997). Adjacent site districts with similar land cover patterns are grouped together to form the four sub-regions.

Differences amongst these sub-region units are mentioned in various parts of this overview section (e.g. current land cover). These geographic units are also used to describe regional differences in landbird distribution and to define distribution objectives.

Figure 6: Sub-regions of Ontario BCR 13 used in this plan



2.3 Physical Features

The following summary of the physical features of the region that affect the current distribution and abundance of landbirds and their habitats is based on information presented in Chapman and Putnam (1984), Wiken (1986), and Phillips (1990).

The overall topography of the Ontario portion of BCR 13 is quite subdued with elevations ranging from just under 50 m above sea level at the

confluence of the Ottawa and St. Lawrence Rivers, to a high of 541 m in the Blue Mountains south of Collingwood. The local topography generally consists of flat to gently-sloping plains, with the notable exception of the Niagara Escarpment, a 30 to 50 m high bedrock scarp that snakes its way for some 500 km across the landscape of southwestern Ontario.

The bedrock of the Lower Great Lakes/St. Lawrence Plain region consists of gently-sloping sedimentary rocks deposited in two basins separated by a southeast-trending ridge of PreCambrian metamorphic rocks known as the Frontenac Axis. Granitic bedrock knobs and outcroppings are frequent along the Frontenac Axis and there are a number of areas where the sedimentary bedrock is at or near the surface.

Over most of the region the bedrock is beneath thick deposits laid down during the last continental glaciation event. These unconsolidated materials include glacial till deposited directly by the ice; sand and gravels deposited in meltwater rivers; and sand, silt and clay sediments deposited in lakes formed as the glacier receded. Marine clay beds deposited in the Champlain Sea are present in the Ottawa Valley and eastern Ontario.

The soils across much of this region are deep and fertile. However, many areas of less-easily worked soils are also present, including poorly-drained clay soils, drought-prone sandy soils, stony soils, and areas of with very thin soils.

The temperate climate of this region is influenced by the Great Lakes. Summers are relatively warm and winters cool. Annual precipitation of 720 to 1000 mm is spread throughout the year. Snowfall is particularly heavy in “snowbelt” areas located downwind of the Great Lakes.

2.4 Physiographic Features

Key physiographic features that affect the distribution of bird habitats in this region are described below. Their locations are shown on Figure 7.

Figure 7: Location of Physiographic Features of Importance to Landbirds in ON BCR 13

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Canadian Shield Interface

Most of the northern boundary of this BCR lies along the transition between the PreCambrian rocks of Canadian Shield and the overlying sedimentary rocks. This physical interface is very distinct, but irregular in outline. This interface also marks the ecological transition between the Deciduous and Great-Lakes St. Lawrence Forest Regions.

This area has the highest average forest cover of any part of ON BCR 13. Breeding bird species richness is also high along this ecologically diverse interface (Cadman et al. 1987).

Frontenac Axis

The Frontenac Axis is a low, southeast-trending ridge of Pre-Cambrian rock that connects the Algonquin Highlands in eastern Ontario with the Adirondack Mountains in New York State. The surface expression of the Axis is the numerous granitic “knobs” which form the Thousand Islands in the St. Lawrence River and bare rock knolls separated by clay flats in the Leeds-Grenville area.

Relative to other parts of this southern Ontario, the Frontenac Axis has a high proportion of forest, shrubland and low-intensity agricultural habitats. The number of breeding bird species found in this area is exceptionally high (Cadman et al. 1987).

Limestone Plains

The main areas of limestone plain in ON BCR 13 are shown on Figure 7. A high proportion of these areas are in a relatively natural state or subject to low-intensity agriculture uses because of shallow, stony, drought-prone soils. Many of these areas support alvar habitats, a globally-rare ecosystem (Brownell and Riley 2000). Alvar ecosystems include a variety of open habitat types including rock pavement, grassland, shrubland and savannah.

These open areas are thought to represent the traditional (pre-settlement) habitat for eastern grassland birds such as the Loggerhead Shrike, Grasshopper Sparrow and Upland Sandpiper. They continue to be important refuges for these and other declining grassland and shrubland species.

Niagara Escarpment

Due to its rugged topography and the protection afforded by the Niagara Escarpment Plan (197x), lands along the Niagara Escarpment are relatively undeveloped. This feature forms a fairly continuous ribbon of green, with some larger nodes of natural areas such as the Dundas Valley and Hilton Falls.

Landbird habitats associated with the escarpment include forest, shrubland and low-intensity agricultural lands. Forested ravines along the escarpment provide breeding habitat for the Louisiana Waterthrush. In spring, migrating hawks make use of the updrafts created along the

cliff face, particularly along the Niagara Peninsula and Bruce Peninsula sections of the escarpment.

Glacial Till Landforms

Large parts of this region are underlain by glacial till. In general, fertile soils have developed on the till and these are mostly intensively farmed. However, the hummocky moraine ridges and hilly drumlin fields include many areas with stony soils, rolling topography, and/or poor drainage that have mostly been taken out of production or are subject to low-intensity agricultural uses only.

Forest, shrub/successional, grassland and wetland habitats are commonly associated with moraine and drumlin features (e.g. Oak Ridges moraine, Peterborough drumlin field, and Waterloo hills).

Clay Plains

Despite poor-drainage, the easily-worked soils of the various clay plains in this region are intensively used for agriculture (hay, corn, soybeans, and seeded pasture). Upwards of 90% of the land in some of these areas (e.g. St. Clair plain) has been cleared. The few remnant natural areas typically consist of low-lying wetlands, some of which are quite large, e.g., Wainfleet Bog in Niagara Region, shoreline marshes by Rondeau and Lake St. Clair, and the Alfred and Mer Bleue bogs in Ottawa Valley clay flats.

Sand Plains

Most sand plain areas in southern Ontario were cleared in the 19th century, but many parts were subsequently abandoned because the sandy soils were found to be droughty, easily eroded, and not very productive. Between 1910 and 1950, extensive areas of sandy soils were planted with pine seedlings to hold the soils. Many of these conifer plantations have subsequently been logged, and have been replaced by mixed and deciduous forests.

Several of the largest Carolinian forest complexes in southwestern Ontario (e.g. Lambton County Forest, Newbury Swamp/Skunk's Misery forest complex in Middlesex /Lambton, Backus-St. Williams and South Walsingham forests in Norfolk County) are associated with sand plains. Extensive plantation forests are also present on sand plains in eastern Ontario (e.g. Prescott and Russell Counties).

Great Lakes Shoreline, Connecting Rivers and Islands

This area includes the Canadian shorelines of Lakes Ontario, Erie, St. Clair, and Huron, as well as the south shore of Georgian Bay. The Canadian shores of the St. Clair River, Detroit and Niagara Rivers, and the upper St. Lawrence River are included in this region. Other major river systems include the Ottawa, Grand, Thames, Maitland and Saugeen. Manitoulin Island, Pelee Island, the Thousand Island archipelago, and numerous smaller coastal islands are included in this region.

These shoreline and riparian features provide important habitat for several riparian landbirds, such as Bald Eagles, as well as stopover sites for the concentrations of migrating landbirds that funnel past the Great Lakes in spring and fall. Particularly large concentrations of migrants have been recorded at the three sand spits (Peele, Rondeau and Long Point) along the north shore of Lake Erie.

2.5 Natural Vegetation Cover

2.5.1 Pre-European Settlement

Historically, the landscape of this region was dominated by a patchwork of forest environments (OMNR 1999). Prior to European contact, the First Nations people of this region developed agricultural settlements in areas with easily worked soils suitable for growing crops. It has been estimated that at most 5.2% of the land south of the Canadian Shield was at some time cultivated by the Iroquois (Campbell and Campbell 1994). The First Nations also used fire to manage vegetation and maintain extensive areas of open habitats for hunting game.

During the 200-year period following first European contact around 1600, and before the start of extensive European settlement, the aboriginal population was decimated due to the combined effects of disease, warfare and displacement. Following the collapse of the agrarian aboriginal societies, forest cover in southern Ontario increased.

At the time of first lands surveys in the late 1700s and early 1800s, over 90% of southern Ontario was covered by deciduous and mixed woodlands (forest and shrub/successional habitats); more than 70% of this was upland

forest (Larsen et al. 1999). The pre-settlement forests of southern Ontario experienced relatively low levels of natural disturbances and old-growth conditions predominated (OMNR 1997, Larsen et al. 1999). Common forms of natural disturbance included insect and disease outbreaks, high wind events, ice storms, wildfires, seasonal flooding and flooding caused by beaver dams. The impact of most of these disturbances was localized.

Interspersed within the forest matrix were patches of shrub/successional and open habitat types including marsh, alvar and tallgrass prairie, and savanna. Due to the low level of natural disturbance, only about 5% of the pre-settlement landscapes of southern Ontario consisted of shrub and early successional habitats (Larsen et al. 1999).

Wetland communities (mostly swamp forest, swamp thicket/carr, and marsh) comprised about 25% of the land area in Ontario south of the Canadian Shield (Snell 1987).

Open alvar, prairie and savannah habitats occupied at least 1.3% of the upland areas in southern Ontario, including at least 800 km² of tallgrass prairie (Rodger 1998). Small patches of rock barrens, cliff, shoreline dune, fen and bog habitats were present locally, where suitable physical conditions existed.

2.5.2 Habitat Change following European Settlement

Intensive European settlement of this region began towards the end of the 18th century. As land was settled, it was systematically cleared of natural vegetation and converted to agricultural production. In most areas, all trees were clear-cut, with some logs salvaged for lumber and fuel, and the remaining slash burnt.

Between the mid-1700s and the early 1900s, about 90% of the landscape was converted from a natural state to agricultural production (Larsen et al. 1999). Total forest cover in southern Ontario reached an all-time low of approximately 10.6% by 1920 (Larsen et al. 1999). Most of that forest cover consisted of working woodlots that were periodically logged, and less than 1% of the land base was in original older-growth forest.

Several studies have estimated the proportion of pre-settlement natural habitats in southern

Ontario that have been lost since 1800, for example:

- 68% loss of wetlands in Ontario south of the PreCambrian Shield by 1982 (Snell 1987);
- 97% loss of prairie and savannah habitats (Rodger 1998); and
- 93.7% loss of the original upland woodland by about 1920 (Larsen et al. 1999).

Despite this grim picture of habitat loss, some landbird habitats are more extensive now than in 1800. For example, shrub/successional habitats have likely increased overall, due to natural succession of abandoned farmlands and frequent logging in working forests (Larsen et al. 1999). Open alvar grasslands and shrublands have increased in areas (e.g. Manitoulin Island, Bruce Peninsula) affected by a series of large, intense forest fires in the early 1900s, that were fuelled by waste wood left by previous logging activities (Brownell and Riley 2000).

In addition, a variety of native and introduced landbird species have adapted to using the extensive agricultural croplands and grasslands created by the European settlers, or to the associated farmsteads and urban settlement areas. These human-tolerant or human-adapted landbirds are among the most abundant birds in the region today.

Habitat conditions continue to change relatively rapidly in southern Ontario, and habitat-related factors are among the most common limiting factors for priority landbirds in this region. More information on habitats of importance to priority landbirds is presented in Chapters 5 to 7.

2.6 Current Land Cover

In general, the Ontario Land Cover (OLC) spatial database (OMNR 1998) provides the best available information on the current extent and distribution of landbird habitats in this region. More detailed information on habitat conditions and vegetation communities is available for some areas and some habitat types (see specific habitat chapters). For example, wetland inventory mapping is available for most parts of this region.

The OLC database is a land cover classification derived from LANDSAT-TM satellite images acquired during the early 1990s. The provincial-scale database uses 28 consistent land cover classes, including vegetated (dense deciduous

forest, cropland) and non-vegetated (bedrock outcrops and quarries, developed land) cover types. Fourteen of the land cover classes have been combined into seven general land cover categories for purposes of this plan (Table 1). Other land cover classes are rare (open fen, treed bog, recent burns) or absent (tundra heath) in this region.

The current distribution of the general land cover categories in this planning region and the four sub-regions is shown in Table 2 and Figure 8.

Over half of the land base of ON BCR 13 currently consists of agricultural croplands (Table 2). Much of the land included in the “Fields” category (Table 2) consists of agricultural grasslands (e.g. pasture) but this land cover category also includes natural grasslands (alvar) and some shrubland (old fields) habitats. Of the four sub-regions, the Southwest has the highest percentage of crops (75%) and the lowest proportion of fields (4%), the Northwest has the lowest proportion of crops (11%), and the Eastern has the highest percentage fields (22%) (Table 2, Figure 8).

Overall, 30% of the land cover is classified as forested, mostly consisting of dense upland forests but also including lands classified as sparse and swamp forests (Table 2). Major differences in forest cover exist amongst the four sub-regions, ranging from 14% in Southwest versus 67% in Northwest (Figure 8). The forest land cover category includes a range of treed habitats, that support both forest and shrub/successional landbirds (see Chapters 5 and 7).

Table 1: Relationship of the Ontario Land Cover Classes with the General Land Cover Categories used in this plan

Ontario Land Cover Classes (OMNR 1998)	General Land Cover Categories
<ul style="list-style-type: none"> Dense Deciduous Forest Dense Coniferous Forest Mixed Forest, mainly Deciduous Mixed Forest, mainly Coniferous Coniferous Plantation 	Dense Forest
<ul style="list-style-type: none"> Sparse Deciduous Forest (30-40% canopy closure) Sparse Coniferous Forest (30-40% canopy closure) 	Sparse Forest
<ul style="list-style-type: none"> Deciduous Swamp Coniferous Swamp 	Swamp
<ul style="list-style-type: none"> Pasture and Abandoned Fields Alvar 	Fields
<ul style="list-style-type: none"> Cropland (row crops, open soil) 	Crops
<ul style="list-style-type: none"> Freshwater Coastal Marsh/ Inland Marsh 	Marsh
<ul style="list-style-type: none"> Settlement and Developed Land (includes major transportation routes) 	Urban

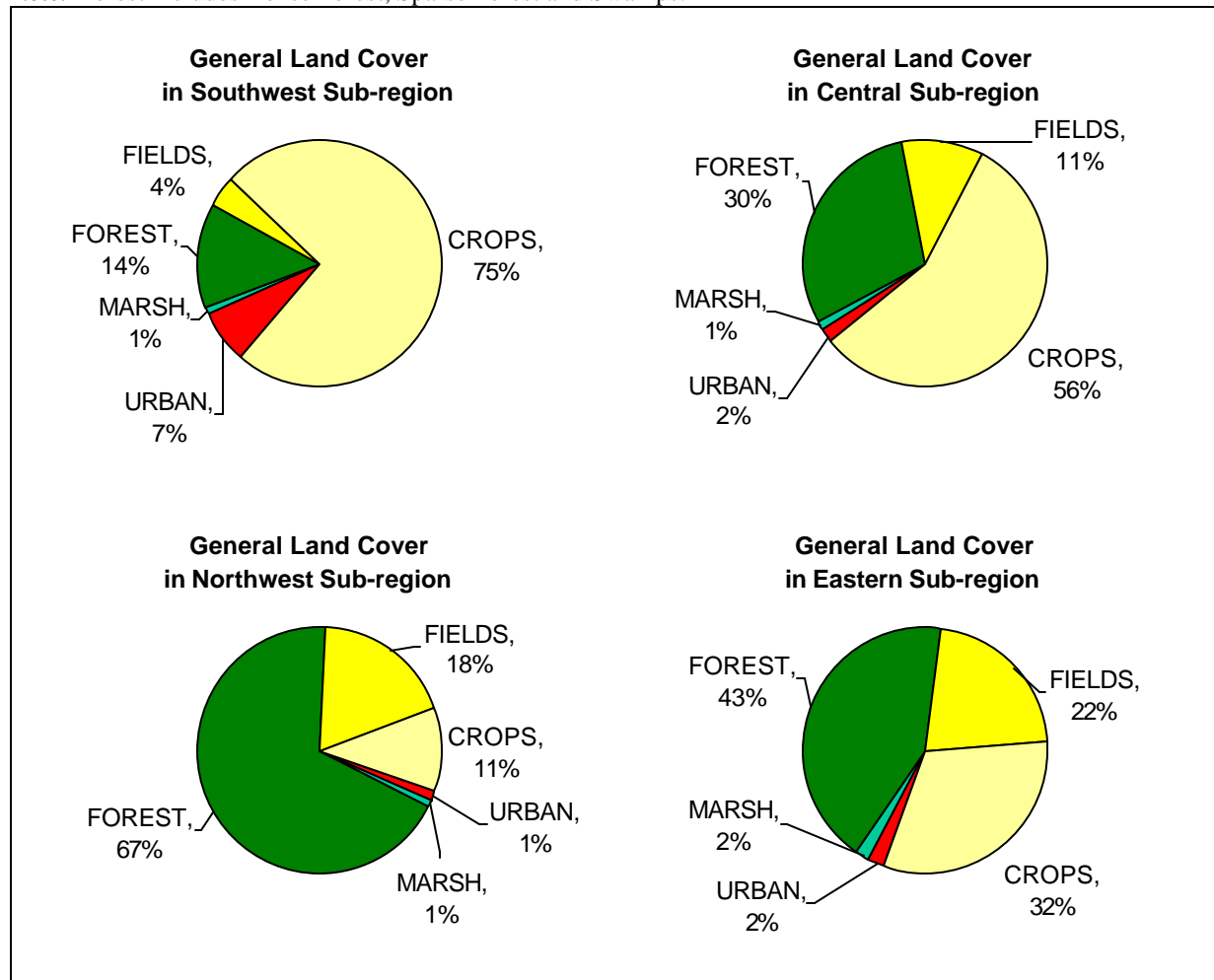
Table 2: Current General Land Cover (ca. early 1990s) in Ontario BCR 13 and Sub-regions

General Land Cover Category	ON BCR 13	ON BCR 13 Sub-regions			
		Southwest (SW)	Central (CE)	Eastern (EA)	Northwest (NW)
Dense Forest	24%	12%	23%	34%	48%
Sparse Forest	3%	1%	3%	3%	17%
Swamp	3%	<1%	4%	6%	2%
Marsh	1%	1%	1%	2%	1%
Fields	12%	4%	11%	22%	18%
Crops	54%	75%	56%	32%	11%
Urban	3%	7%	2%	2%	<1%

Source: Ontario Provincial Land Cover database, MNR 1998.

Figure 8: Distribution of General Land Cover in ON BCR 13 by Sub-region

Note: Forest includes Dense Forest, Sparse Forest and Swamps.



Source: Ontario Land Cover database, OMNR 1998.

Marshes and other wetland habitats account for only a small proportion of the total land cover in Southern Ontario. The classification methods used to produce the land cover figures in Table 2 under-estimate some types of wetlands (e.g. coastal marshes, swamp thickets) (Riley and Snell 1997). Analyses based on land use mapping found that wetlands comprised 8.3% of the land area in Ontario south of the Canadian Shield in 1982, of which 82% was forested wetland (mostly swamps) (Snell 1987).

Most of the urban land cover in southern Ontario is concentrated in the Southwest sub-region (7% compared to 3% overall).

2.7 Land Ownership and Management

Unlike elsewhere in Ontario, the overwhelming majority of land in southern Ontario is privately-owned and privately-managed. Only a small portion of these private lands, which comprise more than 90% of the land base, are officially managed as conservation lands (e.g. properties with conservation easements, lands subject to a conservation agreement under the province’s Conservation Land Tax Incentive Program or other voluntary programs). Many private landowners choose to manage their lands for wildlife and conservation values and there are several programs that support such land stewardship efforts (OMNR 2003).

Publicly-owned lands of importance to landbirds include national and provincial parks, national wildlife areas, conservation reserves, military bases, locally-managed working forests (e.g. Conservation Authority and County forests), recreational areas, and road right-of-ways.

Municipal official plans are the primary instrument for influencing land use decisions, and implementing the 2005 Provincial Policy Statement with respect to the protection of natural heritage in Ontario (OMMAH 2005). The Province has also developed land use plans for certain key areas of southern Ontario, including the Niagara Escarpment and the Oak Ridges Moraine.

2.8 Current Land Use Patterns

Conservation lands, including protected public lands managed for strictly conservation purposes (e.g. Provincial Conservation Reserves and National Wildlife Areas) and private lands subject to conservation easements or agreements comprise less than xx% of the landbase of Southern Ontario (find reference). Almost all lands in Southern Ontario are “working” lands, subject to some level of active land use.

Agriculture is the predominant land use in ON BCR 13, with almost two-thirds of all lands being used as either cropland or fields (Table 2). Non-agricultural land uses are predominant only in the Northwest sub-region. Most mature forests throughout the region are “working forests”, used to produce lumber and firewood.

With respect to landbird conservation, some land uses are more compatible than others with the overall goal of supporting diverse, healthy, native landbird populations. In general, lands subject to “intensive” land uses, such as annual crop production and urban development, are of lower value in terms of their ability to support landbirds than lands subject to less intensive land uses, such as grazing, logging or recreation. However, there are exceptions to this rule. For example, grassland birds such as Bobolink commonly breed in seeded hayfields or small grain crops. Elevated numbers of predators (native and introduced) in urban parklands and suburban woodlots can make these habitats biological “sinks”, that depend on immigration from other areas to maintain breeding bird populations.

Land management practices also greatly affect the ability of land to support healthy and diverse bird populations. For example, no-till management of croplands is more “bird-friendly” than conventional tillage practices; whereas, early harvesting can result in high mortality and low productivity for birds breeding in hayfields.

2.9 Human Population

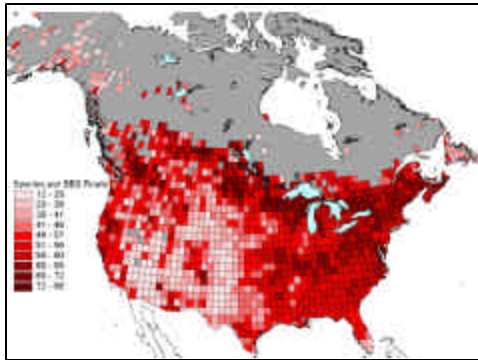
Although ON BCR 13 comprises less than 1% of the Canadian landmass, it is home to more than 10 million people; about 1/3rd of the total Canadian human population. Nine out ten Ontarians currently live within ON BCR 13. Population centres are mostly concentrated along the main transportation routes including the Golden Horseshoe (QEW), the Windsor – Cornwall axis (Highway 401), the Ottawa Valley (417), and the Toronto – Barrie (400) corridors.

Population growth rates in this region are expected to be higher than the rest of the province, e.g. a 36% increase is projected over a 30-year interval (1999-2028) in counties within ON BCR 13, compared to a 33% increase for all of Ontario (Ontario Ministry of Finance, 2000 report, give URL/or reference). Population growth within this region is expected to occur near existing urban areas. The population of the Greater Toronto Area (GTA) is expected to grow by approximately 48% by 2028. The highest growth projections are for areas adjacent to the GTA, including Simcoe (77%), Dufferin (63%) and Victoria (48%) Counties. Municipal and provincial land use policies and strategies, such as the province’s Smart Growth Strategy (url), will influence the future distribution of the human population in this region.

2.10 Avifauna

From a continental perspective, the avifauna of this region exhibits relatively high species richness during the breeding season (Figure 9). High diversity results from the conjunction of three extensive biomes here: eastern deciduous forest, northern mixed forest and western grasslands, each with distinctive avifaunas. In addition, several non-native species now breed here, particularly in urban settings. Wintering diversity is much lower, though still high by Canadian standards.

Figure 9: Breeding Bird Species Richness in North America



Because most of the species that occur here are widespread, few are highly reliant on BCR 13. Only a handful of birds have more than 5% of their global population here. Bobolink and Ring-billed Gull are the two species with the highest reliance in terms of proportion of global population breeding in BCR 13, at about 20% and 17% respectively (**Source:** PIF Continental Database).

The breeding birds in this region are largely migratory. While the emphasis in this plan is on breeding season conservation actions, the vital link to wintering grounds in other countries is also recognized.

Stopover habitat within ON BCR 13 is also very important to migratory birds that breed further north. This BCR hosts some of the largest concentrations of migrant passerines, hawks, shorebirds and waterbirds in eastern North America. As birds funnel through this region in spring and fall, many stop to rest and feed - particularly in areas along the shores of the Lower Great Lakes.

Southern Ontario is home to a high proportion of Canada's listed Species at Risk (SAR), including 19 bird species (COSEWIC 2004). Two other bird species formerly occurred here: the Passenger Pigeon was very common in southern Ontario but is now extinct (Kirk 1985); and the Greater Prairie-Chicken was native to the extreme southwestern corner of this region but is now considered permanently extirpated due to lack of habitat (Hjertaas et al. 1993). The high number of SAR birds in southern Ontario is partly because the jurisdictional boundary includes the northern range limit for several

species (particularly those restricted to the Carolinian life zone), but also because of the extensive habitat alteration and environmental degradation caused by to the large number of people living within this relatively small region.

The avifauna of this region has undergone many major adjustments in the past, in response to radical changes in the biological environment. Glaciers covered this entire area about 15,000 years ago. Plants and birds rapidly colonized the land as it emerged from under the ice and melt-waters, as did humans. By 13,000 years ago, spruce forests were well established in southwestern Ontario (Karrow and Warner 1990). As the climate warmed, spruce forests were replaced by a sequence of pine forests, mixed forests and deciduous forests (*ibid.*). The temporal succession of forest types in this region corresponds to the current latitudinal gradient in forest types in Ontario. It is likely that the historic avifauna shows a similar relationship, with the breeding distribution of most species shifting north over time, in close association with their preferred habitats.

Humans have influenced habitats in this region on a large scale for more than 1000 years but the fundamental change from a forest-dominated to an agricultural-dominated landscape occurred in the 19th century. The avifauna of this region has continued to adapt to changes in land use and habitat availability since 1800. Many of these changes have been well documented in the literature (see McNicholl and Cranmer-Byng 1994) but, few quantitative datasets were available until relatively recently (avian datasets are described in Appendix B).

Changes in the relative abundance of most common birds since 1968 can now be measured using the North American Breeding Bird Survey (BBS) dataset (<http://www.mbr-pwrc.usgs.gov/bbs/trend/guild03.html> and http://www.cws-scf.ec.gc.ca/birds/Trends/default_e.cfm). Changes in species distribution in Ontario over the past two decades can be measured by comparing the results of the first and second Ontario Breeding Bird Atlas (BBA) projects (<http://www.birdsontario.org/atlas/atlasmain.html>). Even over these relatively short time spans, there have been dramatic changes--both increases and losses--in the abundance and distribution of the avifauna of this BCR.

Since 1968, slightly more bird species in this region show long-term population increases than decreases. In particular, most (but not all) forest birds are increasing, whereas, most grassland birds are declining. This pattern mirrors changes in the availability of forest and grassland habitat in southern Ontario.

2.11 *Bird Conservation Issues*

Table 3 presents an overview of the threats and major conservation issues affecting landbird populations and habitats in Ontario portion of BCR 13. Additional details are presented in Chapters 5, 6, 7, 9, and the priority species accounts (Appendix F).

Table 3: Conservation Threats facing Landbirds in ON BCR 13

General Threat	Examples of Specific Issues Affecting Landbirds in this Region
Habitat loss	<ul style="list-style-type: none"> • Conversion of natural and agricultural lands to urban and industrial land uses • Conversion of agricultural grasslands to row crops • Removal of hedgerows due to agricultural intensification • Natural succession of old field and shrub habitats (mature into forest unless periodic disturbance) • Loss of natural grassland and shrubland habitats due to fire suppression and flood control (lack of natural disturbance).
Habitat fragmentation and isolation	<ul style="list-style-type: none"> • Fragmentation and isolation of forest habitats due to linear developments such as transportation and utility corridors • Fragmentation and isolation of grasslands due to conversion of adjacent grasslands to row crops, urban development, or successional habitats.
Habitat quality modification or degradation	<ul style="list-style-type: none"> • Agricultural intensification • Logging and silviculture practices • Drainage of wetlands and wet fields • Impact of high deer populations on vegetation • High populations of human-tolerant native predators that feed on birds and nests (Blue Jay, American Crow, Common Grackle, raccoon, skunk, opossum, squirrels). • High populations of human-tolerant native herbivores that impact ground vegetation and shrubs (deer, rabbits, rodents). • Water quality and quality changes affecting riparian habitats and birds
Competition	<ul style="list-style-type: none"> • Inter-specific competition with generalist species (e.g. House Wrens competing with other cavity nesting species).
Spread of exotic and invasive species	<ul style="list-style-type: none"> • Impact of invasive species (e.g. insects, plants, fungi) on natural habitats and food supply. • Impact of introduced (feral and domestic cats) predators on productivity and survivorship. • Impact of competition from introduced birds (e.g. House Sparrow, European Starling) on nest availability and productivity. • Impact of nest parasitism by Brown-headed Cowbirds on productivity • Emerging avian diseases (West Nile Virus, avian malaria, House Finch disease)
Direct Mortality due to Exploitation and Anthropogenic Factors	<ul style="list-style-type: none"> • Collisions with structures (towers, buildings, windows, wind turbines, transmission lines) • Collisions with moving vehicles • Incidental destruction or disturbance to nests and nesting birds during farming, forestry and recreational activities • Legal and illegal harvesting (e.g. capture of wintering neotropical landbirds for pet trade) • Legal and illegal control of nuisance birds (e.g. blackbirds, Belted Kingfisher) • Direct toxicological impact of pesticides and other toxic substances on non-target species.
Environmental contaminants	<ul style="list-style-type: none"> • Bioaccumulation of toxins (e.g. mercury, organochlorine compounds) leading to reduced productivity and longevity. • Indirect impact of toxins and environmental contaminants on food supply (pesticides reduce availability of insect and weed seeds)
Climate change	<ul style="list-style-type: none"> • Changes in the pattern of temperature (hotter summers), precipitation (decrease), number of extreme weather events (increase), frequency and severity of droughts (increase) impact on habitat and food supply • Increased stress to vegetation could lead to increase in insect outbreaks and disease • Potential long-term (hundreds of years) shift in vegetation communities could affect the distribution of associated bird communities.

3 The PIF Ontario Planning Approach

3.1 Plan Development

This regional PIF plan focuses on the conservation of those landbird species and habitats in Ontario BCR 13 that are most in need of conservation attention. Priority species include Species of Continental Importance (Rich et al. 2004) for which this BCR has a high responsibility, and Species of Regional Importance (Box 4).

This document is the result of a two-year plan development process (Figure 10), designed to be objective, build consensus, and develop support for landbird conservation in Ontario. In keeping with the overall PIF approach, this plan was developed using the best available science, data and regional expertise.

This planning initiative was led by Environment Canada Ontario Region (EC) and the Ontario Ministry of Natural Resources (MNR), in partnership with Bird Studies Canada (BSC). Members of the Ontario BCR 13 Technical Advisory Committee (Appendix A) shared their knowledge and expertise at two technical workshops and reviewed the draft plan.

3.2 Sources of Information

3.2.1 Avian Datasets

Information on the distribution, abundance and trends of landbirds in the Ontario portion of BCR 13 is generally good. Breeding season datasets are particularly robust. Few monitoring programs collect standardized data on the distribution and abundance of wintering landbirds in this region. Standardized migration monitoring datasets are available for some locations within ONBCR 13, but comparable data are not available elsewhere.

The avian datasets used in preparing this plan include the:

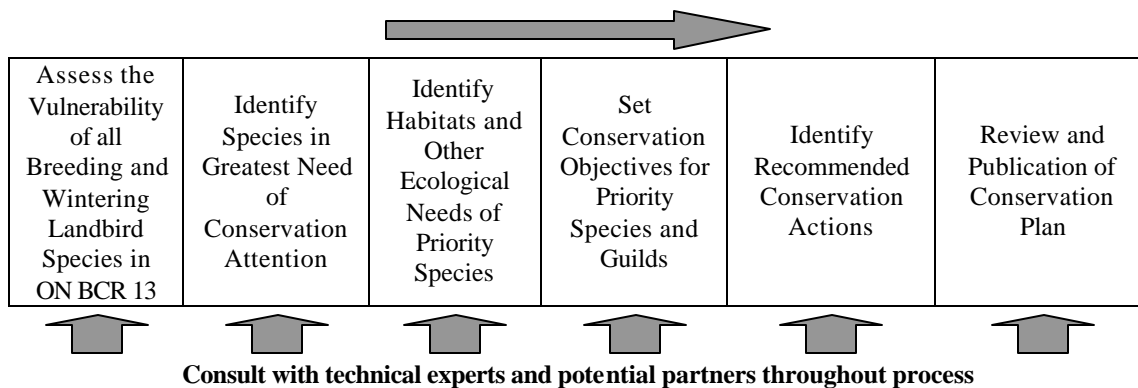
- North American Breeding Bird Survey (BBS)
- First and second Ontario Breeding Bird Atlases (BBAs); and
- Christmas Bird Count (CBC).

These datasets, and the analyses done in support of this plan, are outlined in Appendix B. An evaluation of current monitoring coverage in southern Ontario is presented in Appendix J

3.2.2 Habitat Datasets

Existing habitat data sets for southern Ontario are of limited value in determining the quantity,

Figure 10: Ontario BCR 13 Plan Development Process



quality and trends in landbird habitat because the

data are generally not comprehensive, consistent, and/or do not provide a sufficient level of detail or accuracy.

The Ontario Land Cover (OLC) spatial database (OMNR 1998, see Section 2.6) was the only habitat dataset used in developing this plan. The OLC mapping is the most comprehensive source of information on the current extent and distribution of habitat, particularly for landbirds associated with woodlands and grassland habitats. These data are currently available for only one time interval (satellite data were acquired during the mid-1990s).

3.3 Assessing Species Vulnerability

PIF species assessment methods (Rich et al. 2004) were used to identify those landbird species most in need of conservation attention. The PIF methods use a standardized approach that combines the best available data and expert

knowledge for six biological factors to objectively assess the status and vulnerability of each species. Assessment methods used in this regional plan are consistent with the current continental PIF methods, as of January 2005. See Appendix C for details of the assessment methods.

All of the 180 species of landbirds that regularly breed and/or winter in BCR 13 (see Appendix C) were assessed initially. Species assessment scores for breeding and wintering species are presented in Appendix E. The status of species passing through this region on migration was not assessed (but see Appendix H).

3.4 Identifying Priority Species

Species were initially identified as priority species in this BCR if they met the PIF criteria for Species of Continental or Regional Importance, because of high conservation

Box 5: Categories used for including Species in PIF Regional Priority Species Lists.

(See Appendix B for further details of the species assessment and prioritization methods).

Species of Continental Importance:

- **Continental Concern Species:** Species on the PIF Continental Watch List (Rich et al. 2004) for which the BCR has some conservation responsibility.
- **Continental Stewardship Species:** Species identified in Rich et al. 2004) as PIF Stewardship Species for which the BCR has high stewardship responsibility.

Species of Regional Importance:

- **Regional Concern:** Species of regional concern in this BCR due to combination of regional population decline and high threat score.
- **Regional Stewardship Responsibility:** Species of regional stewardship responsibility in this BCR because of high regional density score and/or BCR contains a high proportion of the global population.

Species at Risk:

- **National Species at Risk:** Species at Risk as identify by COSEWIC and/or listed under the Canadian Species at Risk Act (SARA).
- **Provincial Species at Risk:** Species at Risk as identify by COSSARO and/or listed under Ontario's Endangered Species Act (ESA) and also protected by other provincial legislation.

Additional Species of Regional Management Interest:

- Species (or subspecies/ populations) not included above that are of regional management interest or importance for any of a variety of reasons. Species were included in this category if there was evidence of substantial local (Ontario BCR 13) declines in abundance or distribution, combined with elevated threats to future conditions.

concern / vulnerability, and/or high stewardship responsibility scores (Box 4, see Appendix C for details of assessment methodology). The results of this initial BCR-wide assessment were then reviewed in a southern Ontario context. Some species (e.g. Rusty Blackbird) were screened out as priority species because they do not breed regularly in meaningful numbers in southern Ontario. Others were added as priority species because they are listed under federal or provincial species at risk legislation (e.g. Acadian Flycatcher), or because of regional declines and other specific concerns (e.g. Chimney Swift).

PIF priority species include species of high conservation responsibility, as well as species of high concern. Not all priority species require immediate conservation attention. For some, ongoing monitoring and periodic assessments to ensure that populations remain stable are sufficient. Other priority species require more direct conservation action to identify and remedy factors causing population declines or limiting population growth.

3.5 Identifying Priority Habitats and Ecological Guilds

Landbirds in southern Ontario face many threats (see Table 3). Habitat loss and fragmentation is generally considered the most serious threat to biodiversity in southern Ontario. However, other ecological factors or processes may be driving population declines in some priority landbird species.

Information on the general habitat requirements and other ecological needs (food supply, nest site requirements) of each priority species was compiled from the literature (see Appendix F).

In the plan that follows, various **suites** of priority species that share habitats or other ecological needs are identified. These ecological suites serve to focus attention on priority habitats used by multiple priority landbirds, and draw attention to conservation issues or ecological factors that may be adversely affecting many priority species. In addition, the suites make it easier to identify conservation actions that will benefit multiple species, thereby increasing efficiency.

The same ecological factors used to group the priority landbirds into suites, are used to categorize all landbirds species in this region,

including non-priority species, into ecological **guilds** (Appendix D). The guilds provide an objective means of identifying conservation issues and opportunities for landbird species not yet listed as priority species in the region.

As in other BCR plans, habitat is used as the primary basis for structuring the contents of this plan. Habitat provides a useful and efficient means of integrating the conservation needs of landbirds with those of the other bird groups and other wildlife. For example, the NABCI all-birds planning initiative for BCR 13 (Hayes et al. 2002) uses habitat as the primary basis for coordinating the conservation needs of the priority species identified in the various landbird, waterfowl, waterbird and shorebird plans that encompass BCR 13.

3.6 Setting Objectives

This plan establishes descriptive conservation objective and quantitative conservation objectives for each priority species, and priority guild in Ontario BCR 13. These objectives will be used to focus conservation action and evaluate progress towards the goal of sustaining the distribution, diversity and abundance of native landbirds and their habitats in southern Ontario.

3.6.1 General Approach

In this plan, “current” levels of landbird abundance, distribution, and habitat availability are used as the point of reference for setting objectives. This benchmark differs from that used in the PIF North American landbird plan and other regional BCR plans, which take the late 1960s (beginning of the BBS survey) as the benchmark.

In southern Ontario, current conditions are considered a better point of reference than the late 1960s for two reasons:

- Many of the changes observed in landbird populations and habitats in this region over the past 35 years reflect a long-term shift towards more natural conditions (e.g. increase in forest since 1920 as described in Section 2.5); and
- Given the current landscape and future land use projections for this region, attempting to “roll-the-clock-back” for all species and habitats to a particular time period (35 years, 100 years, pre-settlement conditions) is neither achievable nor reasonable.

3.6.2 Overall Objectives

While the overall objective is to **maintain current** levels of abundance, distribution, and habitat availability for landbirds in southern Ontario, there are various circumstances where a different overall objective was considered more appropriate for some priority species.

- For priority species that are designated as Endangered or Threatened under federal or provincial Species at Risk legislation, the overall objective is **recovery to a more secure status**, as specified in current or future Species at Risk Recovery Strategies.
- For priority species that have experienced population declines and/or distribution losses in this planning region, the overall objective is to **reverse recent declines**, provided that objective is achievable and reasonable objective. Unless otherwise specified, the timeframe for reversing a decline is equivalent to the duration of the decline, e.g. 30 years to reverse long-term BBS population declines, 20 years to reverse BBA distribution declines. In some instances, a longer time frame is necessary, e.g. it will require in the order of 100 years to reverse a decline caused by loss of mature forest habitat
- Options for reversing declines caused by habitat loss in southern Ontario are constrained by the many competing land uses in the intensively developed landscape. Not only must wildlife needs be balanced with the needs of the growing human population, it is often necessary to strike a balance between the conflicting needs of different wildlife species and groups. Modifying habitat to benefit one set of species is usually at the expense of a different set of species (e.g. creating forest habitat can reduce habitat availability for grassland and shrubland species). For priority species where reversing habitat losses is not considered an appropriate or realistic objective, the objective is set as **halt decline**, to avoid further losses.
- For some rare and uncommon species whose current status in this region is unknown or uncertain, the overall objective is set as **assess status**.

3.6.3 Conservation Objectives

Quantitative conservation objectives are set for all priority species and guilds identified in this plan, except for species that are the subject of SAR recovery strategies and species with insufficient information (Box 6). Quantitative

habitat objectives were not set due to insufficient information.

The explicit conservation objectives set in this plan should help coordinate actions for landbirds with other conservation efforts in southern Ontario. For example, it will be easier to identify which wetland habitat restoration projects also advance landbird conservation priorities, and the objectives will help land managers decide on appropriate conservation actions if the expected outcome is a mix of winners and losers (e.g., restoring forests on idle farmland).

3.6.4 Monitoring Objectives

Our ability to set and evaluate quantitative conservation objectives is constrained by the present and future availability of avian and habitat monitoring datasets. Therefore, this plan also proposed seven monitoring objectives (Box 7).

3.7 Identifying Conservation Actions

Various methods were used to identify conservation actions including:

- A literature and Internet search was carried out (particularly species accounts, management summaries and best management practice documents),
- Various actions were proposed by the Technical Advisory Committee at the second technical workshop (Appendix A);
- Input on actions and priorities were solicited from technical reviewers during their review of the draft plan.

Box 6: Conservation Objectives for Priority Species and Guilds in Ontario BCR 13

Measurable conservation objectives are set for each priority species and priority guild identified in this plan, where information is currently available. Progress in achieving these objectives can be measured, provided that comparable monitoring information is available in the future.

Population Abundance Objectives

Data from the Breeding Bird Survey (BBS) are used to establish quantitative objectives for breeding distribution of priority species and guilds. Species abundance indices have been converted to population estimates to show the magnitude of population change needed to reach objectives, using methods described in Appendix B of the PIF continental plan (Rich et al. 2004).

Priority Species

- **Current population levels:** average BBS species abundance indices in 2001 to 2003.
- **Past population levels:** average BBS species abundance indices over the first 10-years of the BBS, 1968-77.
- **Future population levels:** annual BBS indices will provide an indication of short-term progress. In the longer term, the next BBA could provide a finer scale measure of changes in abundance, by comparing point counts with those collected in the current atlas.

Priority Guilds

- **Current population levels:** average BBS guild abundance indices in 2001 to 2003.
- **Past population levels:** average BBS guild abundance indices over the first 10-years of the BBS, 1968-77.
- **Future population levels:** annual BBS guild indices will provide an indication of short-term progress. In the longer term, a third Ontario BBA could provide a finer scale measure of changes in abundance.

Breeding Distribution Objectives

Data from the Breeding Bird Atlas (BBA) projects are used to establish quantitative objectives for breeding distribution. Only those atlas squares receiving at least 20 hours of atlas effort were used. Preliminary objectives have been provided based on the first four years (2001-04) of the current Atlas. Distribution objectives will be finalized once the Atlas is completed.

Priority Species

- **Current distribution levels:** the proportion of Atlas squares (10 x 10 km) reporting breeding evidence during the second BBA in each of four sub-regions of Ontario BCR 13.
- **Past distribution levels:** the proportion of atlas squares in each sub-regions reporting breeding evidence during the first BBA in 1981-85.
- **Future distribution levels:** A third BBA, proposed for 2021-25, will measure changes in bird distribution over the next 20 years. In the interim, BBS trends within the four subregions of southern Ontario will indicate if progress is being made on distribution goals.

Priority Guilds

- **Current guild species richness levels:** average number of species in a guild per Atlas square in each sub-region during the second BBA.
- **Past distribution levels:** average number of species in a guild per Atlas square (with adequate coverage) in each sub-region during the first BBA (1981-85).
- **Future distribution levels:** A third BBA, proposed for 2021-25, will measure changes in species richness over the next 20 years. BBS guild abundance trends within the four subregions of southern Ontario will indicate if progress is being made on distribution goals.

Box 7: Landbird Monitoring Objectives for Ontario BCR 13

See Appendix J for additional details.

Trend Monitoring Objectives

Monitoring Objective 1: Maintain adequate monitoring coverage (able to detect severe population decline) for at least 80% of landbirds breeding regularly in BCR 13 Ontario (Relative Density >1).

Monitoring Objective 2: Maintain current precision of BBS population abundance indices for all Priority Species and Priority Guilds that use BBS indices as the basis for Population Abundance objectives.

Monitoring Objective 3: Periodic status assessments (at least every 5 years) for all other Priority Species not currently tracked by BBS [includes several listed Species at Risk, and a few other uncommon species]

Monitoring Objective 4: Contribute to range-wide monitoring for species poorly monitored at Continental Level, by conducting non-breeding season monitoring to detect trends in migrants and wintering species, especially PIF Species of Continental Importance (Rich et al. 2004).

Distribution Objective:

Monitoring Objective 5: Maintain ability to detect moderate changes in breeding distribution for at least 80% of landbirds breeding in BCR 13 Ontario (Relative Density >1); and an ability to detect a severe decrease in size of breeding range for all priority species, including those with Relative Density =1 (relatively rare in southern Ontario)

Demographic Objective:

Monitoring Objective 6: Productivity, Survival and Fidelity tracked for species or study areas of high management concern / interest – e.g., selected species at risk, or birds within selected protected areas (species not identified in this Plan).

Habitat Monitoring Objective:

Monitoring Objective 7: Measure and report changes in general land cover and land use, for the entire planning area, at regular intervals (approx. 5 years), ensuring data are directly comparable among time periods.

4 Landbird Conservation Priorities in ON BCR 13

4.1 Priority Species in ON BCR 13

Forty-two (23%) of the 180 species of landbirds that regularly breed or winter in southern Ontario (Appendix D) are identified as priority species in Ontario BCR 13, using the PIF species assessment criteria outlined in Appendix C. A summary of the reasons for the priority status of these species, along with the overall conservation objective set in this plan, and their habitat and ecological guilds are presented in Table 4, and discussed below. Additional details are provided in the individual species accounts (Appendix F) and in subsequent chapters of this plan.

4.1.1 Residency Status

All of the priority species occur in southern Ontario during the breeding season. One priority species, Northern Bobwhite, is a permanent resident in this region. The other 41 species are migratory—highlighting the need for coordinated, international conservation efforts.

Two migratory species (Short-eared Owl and Bald Eagle) are priority species in this region during both the breeding and winter seasons (likely higher numbers during the winter). No species was identified as a priority species only in winter.

4.1.2 Reasons for Priority Status

Most of the species on the priority list are included because they are of conservation concern at the regional (21 species) or continental (11) level (Figure 11). Only five of the priority species are of high regional stewardship responsibility. None of the continental stewardship species has more than 5% of its North American population within BCR 13.

Fifteen (36%) of the priority species are designated as Species at Risk (SAR) in Canada and Ontario. One additional species (Bald Eagle) is listed as at risk provincially but not nationally.

Three species (Chimney Swift, Grasshopper Sparrow and Vesper Sparrow) are included on the list as of regional management interest because of a combination of regional declines and ongoing threats to their populations.

4.1.3 Conservation Objectives for Priority Species

The overall conservation objectives for the priority species are varied (Figure 12). The objective for the ten priority landbirds that are currently designated as Endangered or Threatened is **recovery**, as specified in SAR recovery strategies. Their inclusion as priority species in this plan is intended to ensure that

Figure 11: Distribution of Priority Species by Reasons for Priority Status

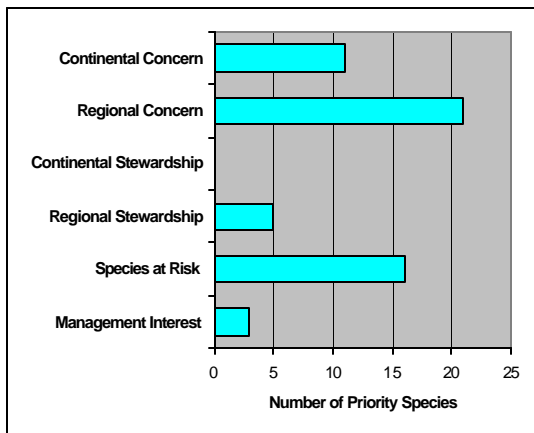


Figure 12: Distribution of Priority Species by Conservation Objective

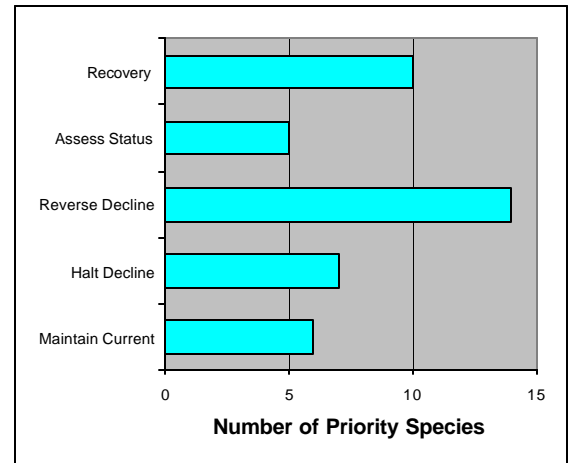


Table 4: Priority Landbird Species in ON BCR 13 showing Reasons for Priority Status, Overall Objective, and Priority Suites Designation

Species	Priority Reasons								Overall Objective	Guild(s) (Boldface indicates habitat obligates)
	Continental Concern	Regional Concern	Continental Stewardship	Regional Stewardship	At Risk – Canada	At Risk – Ontario	Management Interest			
Acadian Flycatcher					EN	EN			Recovery	Forest
American Kestrel	Y								Halt Decline	Grass/Agriculture
Bald Eagle						EN			Recovery	Other Habitats
Baltimore Oriole	Y			Y					Reverse Decline	Other Habitats
Bank Swallow				Y					Reverse Decline	Other & Aerial
Barn Owl					EN	TH			Recovery	Grass/Agriculture
Belted Kingfisher		Y							Reverse Decline	Other Habitats
Black-billed Cuckoo		Y		Y					Reverse Decline	Shrub/Successional
Blue-winged Warbler	Y								Maintain Current	Shrub/Successional
Bobolink		Y		Y					Halt Decline	Grass/Agriculture
Brown Thrasher		Y							Reverse Decline	Shrub/Successional
Canada Warbler	Y	Y							Reverse Decline	Forest
Cerulean Warbler	Y	Y			SC	SC			Assess Status	Forest
Chimney Swift							Y		Reverse Decline	Other & Aerial
Eastern Kingbird		Y							Halt Decline	Grass/Agriculture
Eastern Meadowlark		Y							Halt Decline	Grass/Agriculture
Eastern Towhee		Y							Reverse Decline	Shrub/Successional
Eastern Wood-Pewee		Y							Reverse Decline	Forest
Field Sparrow		Y							Reverse Decline	Shrub/Successional
Golden-winged Warbler	Y	Y							Maintain Current	Shrub/Successional
Grasshopper Sparrow							Y		Halt Decline	Grass/Agriculture
Henslow's Sparrow	Y	Y			EN	EN			Recovery	Grass/Agriculture
Hooded Warbler					TH	TH			Recovery	Forest
Kirtland's Warbler	Y				EN	EN			Recovery	Shrub/Successional
Loggerhead Shrike					EN	EN			Recovery	Grass/Agriculture
Louisiana Waterthrush					SC	SC			Assess Status	Forest
Northern Bobwhite					EN	EN			Recovery	Grass/Agriculture
Northern Flicker		Y							Reverse Decline	Forest
Northern Harrier		Y							Maintain Current	Grass/Agriculture
Peregrine Falcon					TH	EN			Recovery	Other Habitats
Prairie Warbler	Y								Assess Status	Shrub/Successional
Prothonotary Warbler					EN	EN			Recovery	Forest
Red-headed Woodpecker	Y	Y			SC	SC			Reverse Decline	Forest
Red-shouldered Hawk					SC	SC			Assess Status	Forest
Rose-breasted Grosbeak				Y					Maintain Current	Forest
Savannah Sparrow		Y							Halt Decline	Grass/Agriculture
Short-eared Owl	Y				SC	SC			Assess Status	Grass/Agriculture
Vesper Sparrow							Y		Halt Decline	Grass/Agriculture
Whip-poor-will		Y							Reverse Decline	Forest & Aerial
Willow Flycatcher	Y								Maintain Current	Shrub/Successional
Wood Thrush	Y	Y							Maintain Current	Forest
Yellow-breasted Chat					SC	SC			Reverse Decline	Shrub/Successional

Notes: Priority Reasons: See Box 5 and Appendix C for an explanation of the priority reasons categories.

Overall Objective: Overall conservation objective for the species as established by this plan, see Chapters 5 to 9 for additional information. **Guild(s):** Breeding habitat guild and priority foraging guild, see sections 0 to 4.5 and Chapters 5 to 9 for additional information. Boldface guild indicates species is a habitat obligate, and is dependent on that breeding habitat category.

actions taken on behalf of all priority landbirds are coordinated with ongoing recovery actions for listed Species at Risk in southern Ontario.

The objective for five priority species is to **assess status**, as population trend data for this region are not available and there is no clear evidence of a change in breeding distribution. All but one of these species is currently designated as of Special Concern.

Reverse decline is the overall objective for 14 priority species that have undergone significant declines in population and/or distribution. Seven additional priority species in the grassland guild show long-term declines, but the objective for these grassland species is to **halt declines**.

Six priority species appear to have stable or expanding populations in southern Ontario. The objective for these species is to **maintain current levels**. The small number of species in this category is largely a reflection of the low number of priority species included on the list

for stewardship reasons.

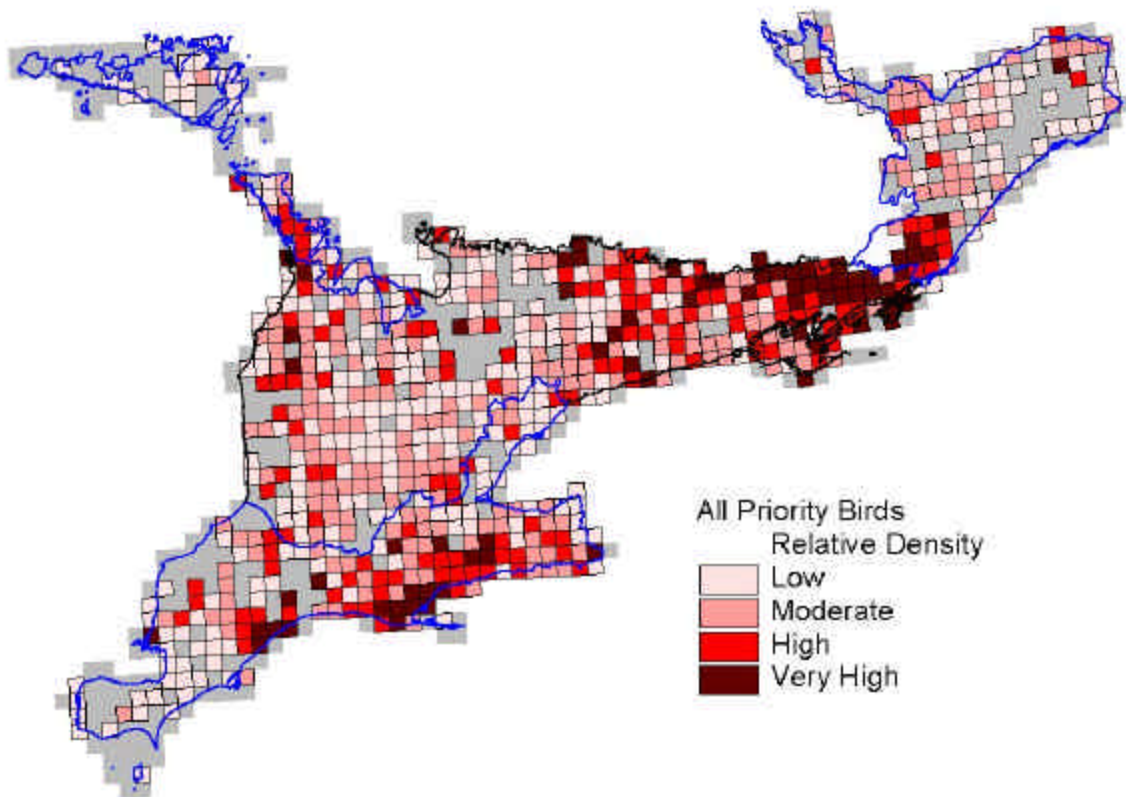
4.1.4 Specific Conservation Objectives for Priority Species

This plan sets measurable objectives for the 32 priority species that are not the focus of SAR recovery strategies (Appendix F). Abundance objectives are set for 26 priority species, for which BBS-based population abundance indices are available. Preliminary distribution objectives are set for 32 priority species but will need to be finalized once the second BBA is completed. Demographic and habitat objectives for priority species have not been determined in this plan.

4.1.5 Current Distribution of Priority Species

The preliminary BBA data show high concentrations of priority species in some areas of Ontario BCR 13 (Figure 13). Most of these “hot spot” areas have a diversity of habitat types and good coverage (only squares with a minimum of 20 hours coverage are shown).

Figure 13: Map showing Relative Density of Priority Species in Southern Ontario



4.2 Priority Habitats

Thirty-six of the 42 priority landbird species (Table 4, Figure 14) are assigned to one of three broad habitat guilds:

- Forest habitats,
- Grassland and agricultural habitats, and
- Shrub and early successional habitats.

These three habitat categories are identified as **priority habitats** for landbird conservation in Ontario BCR 13.

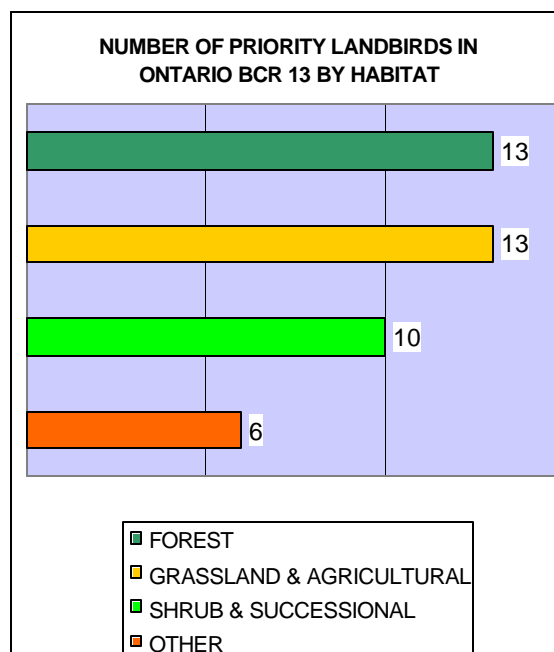
The 13 priority species that breed in forest habitats are referred to in this plan as the **priority forest suite**. Similarly, the priority species breeding in grassland and agricultural habitats, or in shrub and early successional habitats are referred to as the **grassland/ agriculture**, and the **shrub/ successional priority suites**, respectively. The entire group of landbirds, including priority and non-priority species, breeding in each habitat type is referred to as the **guild**, e.g. the forest guild includes all the 80 landbirds breeding primarily in forest habitats in (Table 5, Appendix D).

The conservation of the landbirds associated with each of these priority habitats, including the suite of priority species and the overall guild, is the subject of a chapter in this plan (Chapters 5, 6, and 7).

4.3 Priority Species in Other Habitats

Six priority species are found in habitats other than the three priority habitats identified in section 4.2. Four of these additional species are associated with riparian or shoreline habitats because of their feeding or nest site requirements. The other two priority species, Chimney Swift and Peregrine Falcon, have very

Figure 14: Distribution of Priority Species by Habitat Association



specific nesting requirements that, in southern Ontario, are more commonly found in urban situations than in natural settings.

Chapter 8 covers the conservation of the six priority species found in these other habitats.

4.4 Wetland-associated Landbirds

Although landbirds are by definition found mostly in terrestrial ecosystem, many landbird species do use a variety of wetland habitats in southern Ontario including marshes, wet meadows, swamp thickets, and swamp forests. The three priority habitats (see section 4.2) include both wetland and upland components. For example, priority species that breed in swamp forests are included in the forest bird suite, those that use wet thickets are included in

Table 5: Priority Species Suites and Landbird Guilds Categories used in Ontario BCR 13 Plan

Ecological Basis for the Grouping	Categories used in this Plan	Number of Landbird Species in the Guild	Number (%) of Priority Species in the Suite
Habitat Association	Forest	80	13 (16%)
	Grassland/ Agriculture	22	13 (59%)
	Shrubland/ Successional	31	10 (32%)
	Other Habitats	33	6 (18%)
Foraging Strategy	Aerial Insectivores	9	3 (33%)

Notes: See Appendix D for list of guilds assignments for all landbirds in southern Ontario.

the shrub/ successional suite, and birds that use marsh and wet meadows are included in the grassland/ agricultural suite.

A comprehensive list of the priority landbird species that make most use of wetland habitats in this region is included as Appendix G in this plan. The species listed there could benefit from wetland conservation projects designed to create, restore or enhance wetland habitat.

4.5 Aerial Insectivore Guild

One additional group of landbirds is highlighted in this plan: aerial-foraging insectivorous landbirds. This grouping is based on a foraging guild rather than a habitat guild. Aerial insectivores share a common feeding strategy of capturing and eating flying insects while in continuous flight. This particular guild of landbirds has recently been recognized as of high conservation concern in Ontario because of widespread declines (Heagy and McCracken 2004a, 2004b). Three priority species (Bank Swallow, Chimney Swift, and Whip-poor-will) are included in this priority foraging suite. The six other non-priority landbirds in this guild are also showing alarming recent declines. The conservation of aerial-foraging insectivorous landbirds is the focus of Chapter 9.

4.6 Migratory Landbird Stopover Habitat

Immense numbers of northern-breeding landbirds rely on migratory stopover habitat in southern Ontario to rest, feed and wait out unfavourable flying conditions (OMNR 2000). The quantity, quality and distribution of stopover habitat in Ontario BCR 13 is of particular importance to the conservation of the 20 PIF Species of Continental Importance (Rich et al. 2004) that breed to the north of BCR 13 (mostly in the boreal forest) and migrate through southern Ontario in substantial numbers (see Appendix H).

4.7 Evaluation

Ongoing monitoring and evaluation are essential elements of any conservation plan. Local monitoring is needed to determine the outcomes of individual conservation actions. Broad-scale monitoring is needed to track the status of the conservation objectives for priority species and priority guilds that are presented in the individual Species Accounts (Appendix F) and the guild chapters (Chapters 5, 6, 7 and 9).

Monitoring results must be regularly evaluated to determine whether conservation objectives are being achieved and whether conservation actions need to be modified.

An evaluation of current landbird monitoring coverage in southern Ontario was undertaken to determine where we are at in terms of the monitoring objectives proposed in Section 3.6.4 (Box 7). The results of this evaluation are presented in Appendix J, along with a comprehensive list of proposed monitoring-related actions. An evaluation of the accuracy and precision of the population abundance objectives and estimated population size for priority species is presented in Appendix I.

4.8 Conservation Actions

Conservation actions that apply to *all* priority landbirds in ON BCR 13 are summarized here. Additional conservation actions specific to the priority guilds are presented in subsequent chapters. Species-specific conservation actions are included in the individual Species Accounts (Appendix F).

4.8.1 Monitoring

Proposed general monitoring actions include:

- Maintain current BBS coverage in southern Ontario.
- Ensure that the status of all priority species that are not currently tracked by the BBS is assessed regularly (at least every 5 years).
- Continue to repeat BBAs at 20-year intervals, ensuring coverage is comparable to the current Atlas.
- Assess the ability of other bird surveys (breeding season, CBCs) to monitor regional population trends in species not adequately monitored by the BBS.
- Assess the ability of migration hawkwatch counts and migration monitoring stations to monitor population trends in species not adequately monitored by the BBS, including PIF Species of Continental Importance breeding to the north of BCR 13.
- Assess the value and feasibility of setting demographic objectives for priority species, other landbird species (focal species, bio-sentinel species, representative species), and/or study areas of high management concern/ interest.
- Identify or develop habitat, land cover or land use datasets that could be used in combination with information on species

habitat requirements to set and measure habitat objectives for priority species and guilds.

- Investigate the feasibility of using information on land use change and/or disturbance rates as surrogate measures for monitoring shrub/successional habitat.

Additional details are presented in Appendix J.

4.8.2 Research and Evaluation

Although information on landbird distribution and population trends in southern Ontario is generally very good, information on population demographics and regionally-specific habitat requirements is available only from various site-specific projects that often look at a limited number of species, habitats and/or time period.

Proposed research and evaluation actions include:

- Demographic research to identify factors causing declines and/or limiting population growth in the aerial foraging guild and the 19 priority species that are not presently designated as endangered or threatened by show long-term population declines.
- Demographic research is also needed to assess whether areas of high relatively density for priority species are source populations, and to assess the effects of land use and habitat attributes on population demographics.
- Evaluate various approaches to demographic monitoring (nest monitoring, MAPS, focal species, focal sites) in different habitats.
- Develop and maintain a central database of landbird research in southern Ontario that is accessible to researchers and conservationists.
- Identify critical knowledge gaps and promote applied research to fill these specific gaps
- Promote research to increase understanding of the effects of land uses and habitat management activities on landbird population in southern Ontario.
- Evaluate the response of priority species to recommended habitat management actions at demonstration sites.
- Encourage long-term species- and site-specific studies that can be used to understand and assess species response to fluctuating or long-term changes in environmental conditions (climate, food supply, etc.).

4.8.3 Policy and Planning

- Encourage all levels of government to include all birds values in future land use and natural heritage conservation plans and policies.
- Evaluate existing provincial and municipal policies tools to identify tools that can contribute to PIF objectives (e.g. land use planning policies, tax incentives, tree-cutting bylaws) and policies that may interfere with natural processes important to landbird conservation (fire suppression, flood control, snag management).
- Improve coordination of existing stewardship incentive programs for private landowners and encourage governments to develop/expand incentive programs for specific needs (e.g. for bird-friendly stewardship of agricultural grasslands).
- Work with the provincial and municipal and governments to develop and/or implement regional growth and development strategies and landscape-level management plans that ensure adequate protection of a full range of interconnected natural habitats across the landscape, including native grassland and shrubland habitats.
- Coordinate implementation of regional landbird conservation plan with national and international PIF and NABCI planning processes, and with national and provincial SAR planning processes.
- Help provincial and municipal governments identify and protect areas and processes of importance to landbird conservation including breeding, wintering and stopover habitat for regionally and continentally important priority species.

4.8.4 Outreach and Education

- Use existing communication tools and strategies to deliver key landbird conservation messages (keeping common birds common, links between breeding and wintering areas, bird-friendly land use and land management practices).
- Work with partners to develop and deliver information for landowners, land managers, government agencies and funding organizations to help them identify and protect species, habitats, areas and processes of importance to landbird conservation.

- Work with partners to ensure that the needs of landbirds, including priority species and their habitats, are incorporated in relevant best management practices documents (agricultural BMPs, silvicultural BMPs, pits and quarries BMPs, right-of-way BMPs etc.)
- Facilitate communications between researchers, conservation organizations and agencies, and land owners and managers to promote the transfer of new scientific knowledge and foster an adaptive management approach.
- Promote and support the development of new volunteers to maintain a trained corps of volunteer participants in bird monitoring programs.

4.8.5 Applied Conservation

- Promote the protection and restoration of native grassland, forest, shrub and riparian habitats in situations where they formerly occurred, particularly in the Southwest sub-region where habitat loss is greatest.
- Assess the distribution and abundance of PIF priority species in current protected areas (parks, wildlife areas), Important Bird Areas and other areas of conservation interest to identify management opportunities and gaps.
- Use results of gap analysis, demographic and habitat research, and habitat database to identify information to identify additional sites that could be designated and managed to achieve PIF conservation objectives..

Promote the following practices throughout the landscape of southern Ontario:

- Encourage the use and retention of native vegetation and natural habitats.
- Encourage the retention of snags, downed woody debris, and leaf litter.
- Maintain, restore or emulate natural processes and disturbance regimes that are important to priority landbirds and their habitats.
- Prevent and control the spread of invasive and exotic species.
- Exclude livestock from stream banks and forests and adjust the timing and duration of livestock grazing in grassland, shrubland and riparian habitats to benefit landbirds and/or minimize adverse impacts on landbirds.
- Minimize use of chemical pesticides.
- Reduce fragmentation and increase connectivity of priority landbird habitats.

5 Conservation of Forest Landbirds

5.1 Forest Landbirds

Although forests comprise less than a third of the land cover in southern Ontario today, almost half of all landbirds breeding in southern Ontario (Appendix D) are forest-associated species. The high diversity of forest species is a reflection of the forest-dominated natural landscape of this region, which is located at the transition of the southern Deciduous Forest Region with the northern Great Lakes St. Lawrence Forest Region.

5.2 Forest Priority Species

Almost a third (13 species) of the priority landbirds are included in the forest habitat suite (Table 5). Species that breed in shrub-dominated forest canopy gaps (e.g. Hooded Warbler) are included in this suite; whereas, species that breed in early successional forests (e.g. Kirtland's Warbler) or in forest-edges situations (e.g. Blue-winged Warbler) are included in the shrub/successional suite. Black-billed Cuckoo often uses forest habitats, but is included shrub/successional habitats suite as it shows a slight preference for shrub habitats.

Most of the species in the forest suite are priorities because of high regional and/or continental concern (8 species), and/or because they are SAR (7 species). One forest species, Rose-breasted Grosbeak, is a regional stewardship species.

Many of the priority forest species have specialized habitat needs (Table 6). Eight are forest-obligate species that depend on forest habitats and tend to avoid wooded hedgerows or open areas with sparse trees. Eight are considered area sensitive. Some forest priority landbirds breed in a broad range of treed habitats including forests, open woodlands, and treed habitat strips (e.g. riparian corridors, fencerows).

Despite these differences, all of the priority forest landbirds in this region face similar conservation issues, particularly regional forest cover, and the affect of forest management practices on habitat quality.

Table 5: Forest Priority Breeding Landbirds in ON BCR 13 showing Reasons for Priority Status

Species	Reason(s) for Priority Status						Add Species of Mgmt Interest
	Concern		Stewardship		At Risk		
	Cont	Reg	Cont	Reg	CA	ON	
Acadian Flycatcher					EN	EN	
Canada Warbler	Y	Y					
Cerulean Warbler	Y	Y			SC	SC	
Eastern Wood-Pewee		Y					
Hooded Warbler					TH	TH	
Louisiana Waterthrush					SC	SC	
Northern Flicker		Y					
Prothonotary Warbler					EN	EN	
Red-headed Woodpecker	Y	Y			SC	SC	
Red-shouldered Hawk					SC	SC	
Rose-breasted Grosbeak				Y			
Whip-poor-will		Y					
Wood Thrush	Y	Y					

Notes: Cont = Continental level, Reg = Regional (ON BCR 13) level, CA = Canada, ON = Ontario, Add Species of Mgmt Interest = Additional Species of Regional Management Interest. See Appendix C for details. EN = Endangered, TH = Threatened, SC = Special Concern.

Table 6: Summary of Habitat Needs of Priority Forest Landbirds in southern Ontario

Species	Breeding Habitat	Forest Obligate	Area Sensitive	Dense Ground Cover	Dense Shrub Layer	Closed Canopy	Snags	Stand Composition	Stand Age
Acadian Flycatcher	Large tracts of mature deciduous swamp forest or forested ravine	Y	Y	X		Y		Deciduous	Mature
Canada Warbler	Mature swamp forest in large (>400 ha) forest patches	Y	Y		Y	Y			Mature
Cerulean Warbler	Large tracts of mature deciduous forests.	Y	Y					Deciduous	Mature
Eastern Wood-Pewee	Intermediate-aged forests with little understorey				X	X			Intermediate
Hooded Warbler	Mature deciduous or mixed forest with patches of dense shrub	Y			Y			Deciduous or Mixed	Mature
Louisiana Waterthrush	Forested riparian systems and large swamp forests	Y	Y			Y		Deciduous or Mixed	Mature
Northern Flicker	Large snags for nesting cavities.					X	Y >30 cm		
Prothonotary Warbler	Mature deciduous swamp forest or riparian forest with water and nest cavities.	Y	Y		X		Y >10 cm	Deciduous	Mature
Red-headed Woodpecker	Large snags for nesting cavities.				X	X	Y >40 cm	Deciduous	
Red-shouldered Hawk	Large tracts of mature forest with wetland or riparian features	Y	Y					Deciduous or Mixed	Mature
Rose-breasted Grosbeak	Young and early successional forests.				Y			Deciduous	Immature or Mature
Whip-poor-will	Dry deciduous or mixed forests with open canopy.		Y	X	X	X		Deciduous or Mixed	
Wood Thrush	Deciduous or mixed forests within large (100+ ha) forest patches.	Y	Y		Y			Deciduous or Mixed	Mature

Notes: Y Requires or prefers this habitat feature. X - Avoids this habitat feature

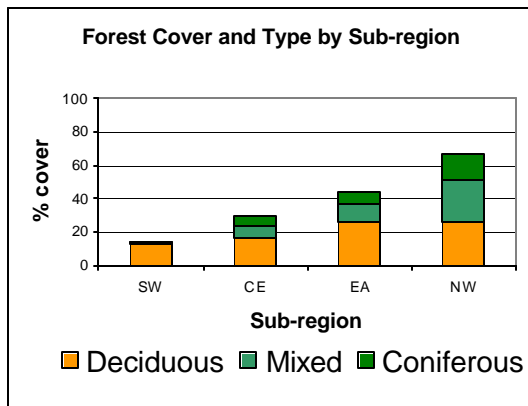
5.3 Forest Habitats in ON BCR 13

5.3.1 Description

Terrestrial upland forests and wetland swamp forests with greater than 60% tree cover are the most widespread forest habitats in southern Ontario. Other less frequent or more localized treed community series in this region include plantations, tallgrass savanna woodlands (on dry sand plains), treed cliffs (along Niagara Escarpment), treed alvar (on limestone plains), and treed bog (in kettle depressions on moraines) (Lee et al. 1998).

Deciduous forests are predominant in the southwestern sub-region, whereas other parts of the region contain a mosaic of deciduous, mixed and coniferous forests (Figure 15).

Figure 15: Forest cover (%) by forest type in southern Ontario by sub-region.



Source: Ontario Land Cover data, OMNR 1998.

Dominant tree species in the southern portion of ON BCR 13 (SW sub-region, Ecoregion 7E) are Sugar Maple, White Elm, American Beech, Black Cherry, White Ash, Red Oak, White Oak, Red Ash, and Butternut (Lee et al. 1998). Tree species that are distinctive of the Carolinian Zone (e.g. Tulip-tree, Sassafras, Black Walnut, Sycamore, Black Oak) are also present in the SW sub-region (*ibid.*).

The natural vegetation in the northern portion of this region, corresponding to MNR Ecoregion 6E, is characterized by mixed forests of White Pine and Red Pine, Eastern Hemlock, Sugar Maple, Red Maple, Yellow Birch, Red Oak, Basswood, and White Elm. Other wide-ranging

species include Eastern White Cedar, Largetooth Aspen, American Beech, White Oak, Butternut and White Ash (Lee et al. 1998).

5.3.2 Historical Perspective

Forest habitats in southern Ontario have undergone many drastic changes in the past two centuries. As a direct result of European settlement, total forest cover in this region plummeted from more than 90% of the land base in 1801 to an all-time low of 10.6% by 1920 (Larsen et al. 1999). Since 1920, overall forest cover has increased as a result of reforestation of former agricultural lands, particularly in the eastern and northwestern sub-regions. However, the amount of “original” forest, on lands that have never been cleared and ploughed, has continued to decrease.

Historically, the forests in this region were relatively undisturbed and mostly in a mature state with many large trees in excess of 200 years old (Larsen et al. 1999). By 1986, original woodlands were present on about 6% of the land base of southern Ontario, but most of these were working forests and less than 1% of the land base supported original old-growth or mature forests (Larsen et al. 1999).

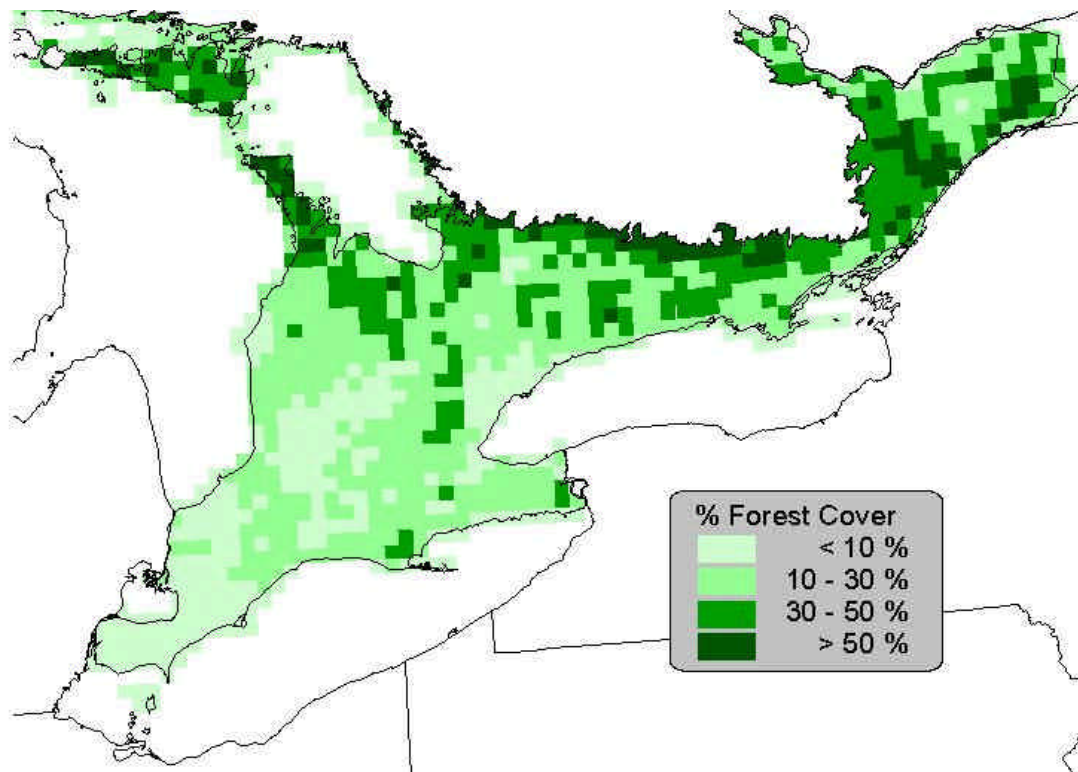
5.3.3 Current Status

Forest and woodland habitats currently comprise about 30% of the land cover in southern Ontario (based on Ontario Land Cover data from 1990s). A portion of the area classified as forest in the land cover mapping includes patchy shrub and early successional habitats created as a result of anthropogenic or natural disturbances, especially intensive logging practices.

Forest habitats are unevenly distributed within the region (Figure 16). In general, the amount of forest cover increases from south to north and from west to east across this region. Total forest cover ranges from less than 14% in the Southwest sub-region to 67% in the Northwest sub-region (Figure 15). Less than 3% forest cover remains in Essex County, at the extreme southwest corner of this region (Riley and Mohr 1994).

Most present-day forests in southern Ontario are “replacement forests”, created through a combination of natural succession and reforestation on lands that had at some point been cleared for agriculture. Due to the high

Figure 16: Distribution of Forest Cover in ON BCR 13



level of past disturbance, an estimated 25% of existing woodlands in southern Ontario are in an early successional stage, and less than 5% are in an old-growth or older growth state (Larson et al. 1999).

Almost all forests outside of parks and other protected areas, including most publicly-owned forests, are working forests that are logged on a regular basis. Forest management practices are the main determinant of the age, composition, and structure of forest habitats in this region. Forests are also influenced by natural disturbances, such as ice storms, high wind events, disease or pest outbreaks, fire, and flooding but most of these natural disturbances are localized or infrequent.

5.3.4 Recent Trends

Forest bird populations in this region have benefited greatly as a result of the three-fold increase in forest cover between 1920 and the 1990s. Forest cover has continued to increase in recent years (Riley and Mohr 1994). The forest bird guild population trend over the past 35-year period shows an increasing trend (Figure 17), presumably in response to the ongoing increase

in forest cover. A similar increasing trend is observed when the analysis is restricted to forest obligates species.

5.3.5 Threats

Because of the disparity in forest cover in different parts of this region, the threats affecting forest birds and forest habitats vary across the region.

Despite the overall pattern of increasing forest cover, habitat loss continues to be an issue for forest landbirds in some areas, particularly near urban centres and in the most productive agricultural areas (e.g. Essex County).

Fragmentation of forest habitats is a particular concern in the extensive areas of southern Ontario with less than 30% forest cover (Figure 16, includes almost the entire Southwest sub-region). Many forest birds are sensitive to habitat fragmentation and either avoid small woodlots and forest edges, or suffer low productivity in these habitats due to elevated rates of nest predation, nest parasitism by Brown-headed Cowbird, reduced food supply or other factors (Hagen and Johnson 1992, Robinson et al. 1995,

Austen et al. 2001, Burke and Nol 2000). Land use surrounding forests can also affect the composition of birds in the forest. For example neo-tropical migrant landbirds were negatively affected by urban development within 2 km of woodlots (Dunford and Freemark 2005).

The size and configuration of forested patches are considered less critical to forest birds in areas with more than 30% forest cover, where small patches are typically in close proximity to larger forest tracts (EC 2004). Conversely, forest bird abundance and species richness is generally lower in areas with less than 30% regional forest cover. Area-sensitive forest birds are particularly vulnerable to forest fragmentation (Appendix D).

In terms of habitat quality, forest landbirds respond to changes in forest structure (vertical layering, canopy closure, and age). Forest management practices therefore greatly influence habitat quality and suitability for various forest landbirds (Holmes et al. 2004). For example, Whip-poor-wills and Acadian Flycatchers prefer closed forests with little understorey, Wood Thrush and Rose-breasted Grosbeaks prefer younger forests with more understorey vegetation, and Northern Flickers and Red-headed Woodpecker require large snags for nesting cavities (Appendix G in OMNR 2000).

The OMNR silvicultural guidelines for southern Ontario recommend selection cuts as the preferred harvesting method in southern Ontario (OMNR 2000), as it emulates natural disturbance processes that typically create only small gaps in the canopy. Diameter-cut harvests that reduce canopy cover and remove most mature trees are also common in this region. The intensity and frequency of forest harvest affects bird communities, particularly species that require mature, closed-canopy forests.

Habitat loss, fragmentation and alteration are of particular concern for Carolinian forest species whose Canadian range is restricted to the 14% existing forest cover in the SW sub-region. The Canadian populations of four of the priority forest landbirds (Acadian Flycatcher, Hooded Warbler, Louisiana Waterthrush, Prothonotary Warbler) are concentrated within these Carolinian forests.

Disease and insect outbreaks are an ongoing concern. In the past century, some diseases had

drastic effects on specific common trees species (chestnut blight, Dutch elm disease) resulting in a long-term change in forest composition and a short-term increase in the availability of dead trees. Many other pest outbreaks (e.g. spread of gypsy moth into this region in the 1980s) result in local or short-term impacts on forests and bird communities. Forest pests and diseases of current concern in this region include emerald ash borer (ash specialist), Asian long-horned beetle (hardwood trees), pine shoot beetle (pines), hemlock woolly adelgid (hemlock specialist), butternut canker (butternut), beech bark disease (American beech) and blister rust (white pine) (OMNR 2002).

Severe pest outbreaks can have a variety of short and long-term impacts on forest birds, with some bird species benefiting (e.g. woodpeckers benefiting from increased food availability and increased snag availability) and others negatively impacted (e.g. defoliation making cup nests more vulnerable to predation, loss of preferred tree species).

Direct mortality and lost productivity due to logging activities are not major concerns as most logging activities are scheduled to occur outside of the breeding season.

5.4 Conservation Objectives for Priority Forest Landbirds

Species-level objectives for forest landbirds are presented in the Species Accounts (Appendix F) and summarized in Table 7.

5.4.1 Recovery

The three endangered/ threatened forest birds (Acadian Flycatcher, Hooded Warbler, Prothonotary Warbler) are Carolinian species that reach the northern limit of their breeding range in Southern Ontario, where they occur mostly in the Southwest sub-region. The recovery of these rare species is dependent on protecting and enhancing large tracts of mature forest that meets their specialized habitat requirements. Abundance and distribution objectives for these species are based on current Recovery Strategies.

5.4.2 Assess Status

Three priority forest species (Cerulean Warbler, Louisiana Waterthrush, Red-shouldered Hawk) are not detected in sufficient numbers on BBS surveys for trend analyses. All of these species

are currently designated as Species at of Species Concern. The status of these species should be periodically assessed (at least every five years). Preliminary Atlas results indicate a slight reduction in the distribution of Cerulean Warbler in the SW and NW sub-regions, a trend that should be reversed if substantiated.

5.4.3 Reverse Declines

Four priority forest landbirds (Eastern Wood-Pewee, Northern Flicker, Red-headed Woodpecker, Whip-poor-will) have experienced significant population declines over the past 35-year period. One additional forest species, Canada Warbler, shows a significant decrease in distribution (but not in population). The immediate objective for these five declining species is to reverse these declines. Abundance and distribution objectives have been set for all of these species based on past levels as indicated by the BBS or BBA, respectively. One common species, Northern Flicker, remains ubiquitous (present in all squares with 20 hours coverage) despite a significant long-term population decline.

5.4.4 Maintain Current Levels

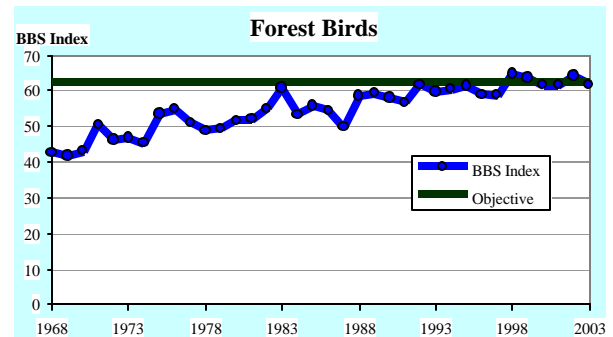
The overall objective for the two priority forest landbirds that do not appear to have experienced significant declines in Ontario BCR 13 (Rose-breasted Grosbeak, Wood Thrush) is to maintain current abundance levels.

5.5 Conservation Objectives for the Forest Landbird Guild

5.5.1 Guild Abundance Objective

Forest bird abundance in southern Ontario has increased by 39% between 1968-77 and 2001-03 (Figure 17). Forest-obligate species show a similar 40% increase. The abundance objective for the forest guild is therefore to maintain the current abundance level (BBS Guild Index of 55.7).

Figure 17: Long-term BBS Trend, 1968-2003, and Guild Abundance Objective for Priority Forest Birds in southern Ontario

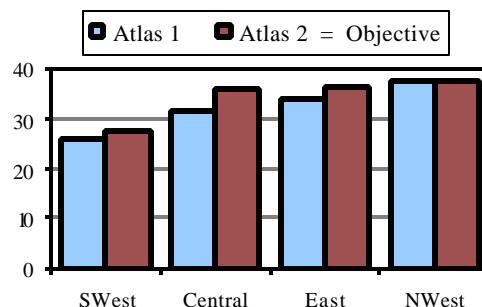


5.5.2 Guild Distribution Objective

Interim results from the second BBA (through 2004) show a significant increase in forest species richness between Atlases in all sub-regions except the Northwest, which has experienced no change (Figure 18). The greatest increase (13%) was in the Central sub-region.

The average number of forest-obligate species also shows a significant increase of 12% overall in southern Ontario, due to increases in the Central (20%) and Eastern (9%) sub-regions. There was no significant change in forest obligate species richness in the Southwest or Northwest sub-regions.

Figure 18: Changes in Forest Landbird Species Richness and Preliminary Guild Distribution Objectives (=Atlas 2) in ON BCR 13 sub-regions.



Source: BBA1 (1981-85) and BBA2 (2001-04 preliminary) data.

Table 7: Summary of Conservation Objectives and Conservation Focus for Priority Forest Landbirds in Southern Ontario.

See Species Accounts in Appendix F for additional details.

Species	General Objective	Abundance Objective	Distribution Objective	Conservation Focus
Acadian Flycatcher#	Recovery	Increase to 250+ pairs (current estimate of 35 to 50 pairs).	15+ breeding sites in SW sub-region (currently ~ 15% of BBA squares in SW and ~2% in CE).	<i>Recovery:</i> Complete and Implement Recovery Strategy for this Endangered species.
Hooded Warbler#	Recovery	Increase to 500+ pairs (current estimate of 150 to 210 pairs)	15+ breeding sites in SW sub-region (currently ~24% of BBA squares in SW and ~3% in CE).	<i>Recovery:</i> Complete and Implement Recovery Strategy for this Threatened species.
Prothonotary Warbler#	Recovery	Increase to 40+ pairs (current estimate of 5 to 25 pairs)	6+ breeding sites in SW sub-region (currently ~ 5% of BBA squares in SW and ~1% in CE).	<i>Recovery:</i> Finalize and Implement Recovery Strategy for this Endangered species.
Cerulean Warbler	Assess Status	Assess abundance and trend of breeding population in southern Ontario	Restore to 8% of Atlas squares from ~6% (reverse losses in SW and NW sub-regions)	<i>Habitat Protection:</i> Identify and protect large tracts of mature deciduous forests supporting source populations.
Louisiana Waterthrush	Assess Status	Maintain current population (estimate of less than 1,000 birds) and periodically assess status (currently considered stable).	Maintain current distribution of ~4% of Atlas squares (mostly in SW but also in CE and NW).	<i>Habitat Protection:</i> Identify and protect forested ravine systems and large swamp forests, especially in SW.
Red-shouldered Hawk	Assess Status	Maintain current population (ca. 13,000 birds in Ontario) and periodically assess status (currently considered stable).	Maintain current distribution of ~23% of Atlas squares.	<i>Habitat Protection:</i> Protect extensive tracts (>100 ha) of mature forest with wetland or riparian features
Canada Warbler	Reverse Decline	Maintain current population, BBS Index of 0.10, ~3,000 birds.	Restore to 32% of Atlas squares from ~29% (reverse losses in SW, CE and EA sub-regions)	<i>Habitat Protection:</i> Protect mature mixed swamp forest with dense understorey, within extensive forest tracts (>400 ha).
Eastern Wood-Pewee	Reverse Decline	Restore to BBS Index of 4.0, ~100,000 birds (current Index 2.7, ~80,000)	Restore to 98% of Atlas squares (reverse losses in NW sub-region)	<i>Research:</i> Identify factors causing population decline and/or limiting population growth (e.g. changes in forest structure or food supply?).
Northern Flicker	Reverse Decline	Restore to BBS Index of 6.5, ~200,000 (current Index 2.5, ~90,000)	Maintain current distribution of 100% of Atlas squares.	<i>Habitat Enhancement/Evaluation:</i> Evaluate the effects of increasing the supply of nest sites (snags >30 cm DBH and/or nest boxes) at selected study sites.

Red-headed Woodpecker	Reverse Decline	Restore to BBS Index of 0.65, ~25,000 (current Index 0.07, ~2,500)	Restore to 70% of Atlas squares from ~30% (reverse losses in all sub-regions)	<i>Habitat Enhancement/Evaluation:</i> Evaluate the effects of increasing the supply of nest sites (deciduous snags >40 cm dbh and/or nest boxes) in open woodlands and savannas with mast-producing trees.
Whip-poor-will	Reverse Decline	Restore to BBS Index of 0.18, ~20,000 (current Index 0.02, ~2,500)	Restore to 42% of Atlas squares from ~24% (reverse losses in all sub-regions)	<i>Research:</i> Identify factors causing population decline and/or limiting population growth (food supply, land use matrix, demographics).
Rose-breasted Grosbeak	Maintain Current	Maintain current population, BBS Index of 3.4, ~100,000 birds.	Maintain current distribution of ~96% of Atlas squares (reverse possible loss in NW sub-region)	<i>Monitoring:</i> Evaluate change in distribution in Northwest sub-region.
Wood Thrush	Maintain Current	Maintain current population, BBS Index of 2.7, ~150,000 birds.	Maintain current distribution of ~92% of Atlas squares (reverse loss in EA sub-region).	<i>Habitat Management:</i> Manage forests to maintain supply of upland deciduous or mixed forest with dense understorey, preferably in patches of 100 ha or greater.

Objectives for Endangered and Threatened Species are from Recovery Strategy, Recovery Plan and Status Report documents as available. See Species Accounts, Appendix F.

The gradient in forest species richness seen in Figure 18 is similar to the gradient in forest cover (Figure 15), with increasing species richness in areas with high forest cover and a depauperate forest bird fauna in the Southwest sub-region (despite several Carolinian forest bird species being mostly restricted to the SW sub-region).

5.5.3 Forest Habitat Objective

The general habitat objective for maintaining forest bird diversity, abundance and productivity throughout southern Ontario is to have at least 30% regional forest cover in all four sub-regions. This is a long-term objective that will require at least 100 years to achieve. This objective is consistent with other forest habitat guidelines for this region (OMNR 2000, EC 2004).

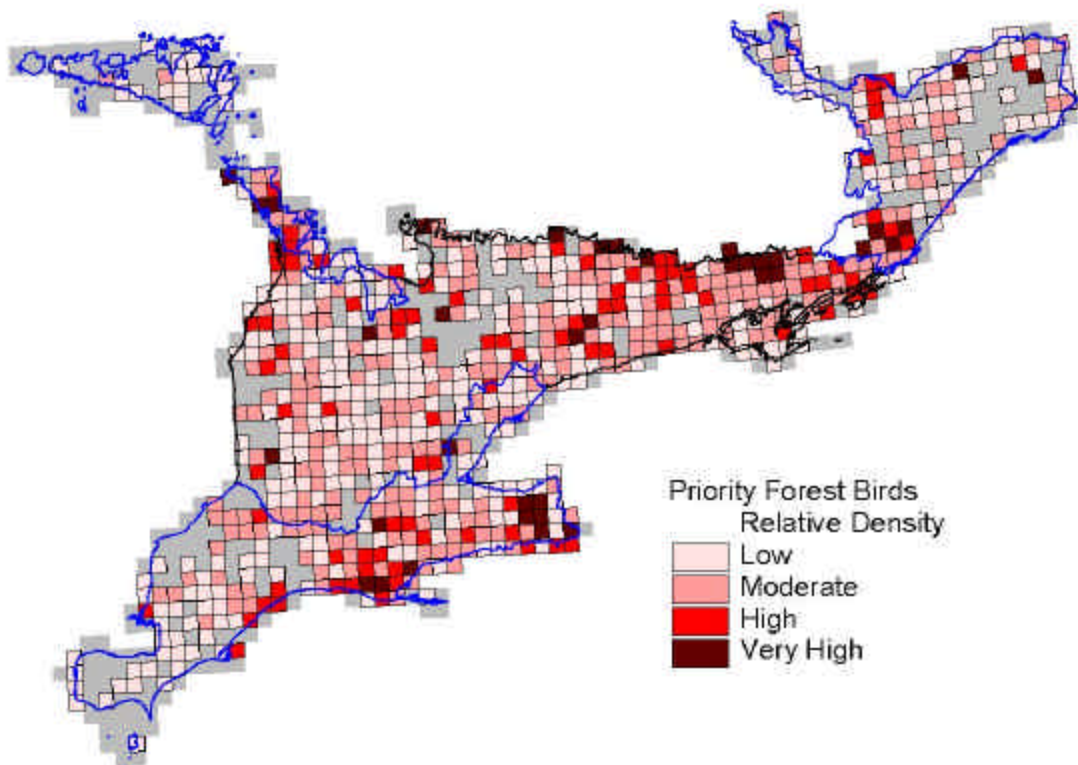
Forest cover in the SW sub-region (ca. 14%) is substantially below the 30% threshold; therefore, protection of all existing forests and reforestation of areas that were historically forested are high priorities in the SW sub-region. Forest cover in the CE sub-region is currently about 30% and

protection of all existing forests is a high priority in that sub-region. In the NW and EA sub-regions, the current priority is to identify and protect the most significant woodlands, including large (>100 ha) and high quality (intact, mature, uncommon) forest habitats. Additional guidelines on forest size, shape and connectivity for forest birds, particularly for area-sensitive species, are provided in existing habitat guidelines for southern Ontario (OMNR 2000, EC 2004, ON 2004). MNR Silvicultural guidelines provide additional information on maintaining various aspects of forest habitat quality (stand structure, snags, downed woody debris) that are important to landbirds (OMNR 2000).

5.5.4 Conservation Focus

The overall increase in forest birds in response to increased forest cover indicates that most forest landbirds in this region do not require old-growth original forests and will readily use replacement forests. However, habitat quantity and/or quality may be a limiting factor for some of the priority forest landbirds, particularly those

Figure 19: Map showing Relative Density of Priority Forest Birds in Southern Ontario



that are area-sensitive or have specialized habitat requirements (Table 6). The distribution of priority forest birds (Figure 19) shows only a general similarity to the distribution of forest cover (Figure 16). Observed population declines in some forest species may be due to reduced food supply, reduced snag availability, and/or conditions on the wintering grounds.

Priority conservation actions for this suite include research to better understand limiting factors, evaluating the response of priority species to habitat enhancement efforts at demonstration sites, and protecting identify and protecting existing source populations and habitat.

5.6 Recommended Conservation Actions

5.6.1 Monitoring

- Maintain monitoring efforts for endangered and threatened forest landbirds including Acadian Flycatcher, Hooded Warbler, and Prothonotary Warbler
- Develop more standardized surveys to assess population abundance, distribution and trends for Cerulean Warbler and Louisiana Waterthrush.
- Evaluate suitability of other existing breeding season surveys (Red-shouldered Hawk and Spring Woodpecker survey, Forest Bird Monitoring Program, Nocturnal Owl Survey) for monitoring forest species that are not well monitored by BBS (especially forest interior species).
- Update and maintain the Forest Resource Inventory (FRI) mapping for southern Ontario including an assessment of the current stand composition, age, structure and condition.

5.6.2 Research and Evaluation

- Promote demographic and habitat research to identify cause(s) of the observed or apparent declines in Canada Warbler, Cerulean Warbler, Eastern Wood-Pewee, Northern Flicker Red-headed Woodpecker, and Whip-poor-will.
- Promote research to increase understanding of the effects of forest condition (size, structure, composition, health), forest management practices, and landscape variables (proximity for forests, regional

forest cover) on the abundance, distribution and demographics of priority forest birds.

- Identify species whose populations are likely to be limited during the non-breeding season.

5.6.3 Planning and Policy

- Encourage municipalities to identify and protect Significant Woodlands in Official Plan documents in keeping with existing guidelines OMNR 1999, OMNR 2000, ON 2004).
- Encourage municipalities to develop and enforce appropriate tree-cutting bylaws that retain large trees and snags across the landscape.
- Restrict residential development in and adjacent to forests.
- Review provincial policies related to the protection of trees with unoccupied stick nests.
- Update provincial planning guides to consider the needs of PIF priority landbirds.

5.6.4 Outreach and Education

- Promote the development and use of updated forest management guidelines (site, stand and landscape scales) and/or silvicultural guides (OMNR 2000) appropriate for the protection of priority forest birds by public and private forest managers in southern Ontario (i.e. update existing OMNR habitat guidelines such as James 1984, incorporate other BMP documents such as Rosenberg et al. 1999 and 2003, incorporate results of research projects such as Holmes et al. 2003).
- Promote the development of relevant educational materials for woodlot owners.
- Work to change public perceptions about the value of leaving standing dead trees and limbs (where not a safety hazard).
- Work with partners in the United States and Latin America to protect priority forest landbirds during migration and on wintering grounds, making use of NABCI and PIF initiatives.

5.6.5 Applied Conservation

- Implement conservation actions outlined in the Recovery Strategies for Acadian Flycatcher, Hooded Warbler, and Prothonotary Warbler.
- Implement proposed habitat enhancement or management actions for declining priority forest birds at select demonstration sites

(e.g., increase snags for Northern Flickers and Red-headed Woodpeckers) and evaluate effects on the abundance, distribution and productivity

- Identify and protect significant, high quality woodlands that support source populations of priority species including large intact forest tracts, and mature and old growth forests.
- Promote the restoration of large, mature, native forests and natural ecological processes at sites that were historically forested in areas with less than 30% regional forest cover.
- Promote the restoration and protection of key forest complexes including the following areas that support priority forest species and habitats in the southwest sub-region:
 - Clear Creek Forest
 - Rondeau
 - Little Otter Creek Complex
 - Holiday Beach/Big Creek CA
 - Norfolk Forest Complex
 - Point Abino
 - Port Franks/Pinery Forested Dunes
 - Skunk's Misery Complex
 - Southwest Elgin Forest Complex
 - Springwater Conservation Area
 - Dundas Valley Forest
 - Twelve Mile Creek Headwaters

6 Conservation of Grassland/ Agricultural Landbirds

6.1 Grassland/ Agricultural Landbirds

Grassland/agricultural birds represent a relatively small portion of the avifauna of southern Ontario, with some 22 landbirds included in this guild (Appendix D). About 60% of all grassland-associated landbirds in this region are considered priority species, a higher proportion than for any of the other priority guilds.

Grassland birds in southern Ontario are more frequently associated with habitats of cultural origin than in natural settings. Landbirds that use agricultural grasslands in southern Ontario are considered conservation priorities because grassland birds have undergone significant and serious declines across Canada (Downes and

Collins 2003) and North America (Blancher 2003), and because the regional populations represent a substantial portion of the global population of some grassland landbirds (e.g. Bobolink) (see Appendix E).

6.1.1 Priority Landbirds in Grassland/Agricultural Habitats

Thirteen priority breeding landbirds are included in this guild (Table 8). Two of these species (Table 9) are also priority wintering species (Northern Bobwhite is a permanent resident, wintering Short-eared Owls include migrants from northern breeding populations).

Eight of the priority species in this group (Table 10) are grassland-obligate species, depending almost entirely on grassland habitats. American Kestrel and Eastern Kingbird require a mix of

Table 8: Grassland Priority Breeding Landbirds in ON BCR 13 showing Reasons for Priority Status

Species	Reason(s) for Priority Status						Add Species of Mgmt Interest
	Concern		Stewardship		At Risk		
	Cont	Reg	Cont	Reg	CA	ON	
American Kestrel		Y					
Barn Owl					EN	TH	
Bobolink		Y		Y			
Eastern Kingbird		Y					
Eastern Meadowlark		Y					
Grasshopper Sparrow							Y
Henslow's Sparrow	Y	Y			EN	EN	
Loggerhead Shrike					EN	EN	
Northern Bobwhite					EN	EN	
Northern Harrier		Y					
Savannah Sparrow		Y					
Short-eared Owl	Y				SC	SC	
Vesper Sparrow							Y

Notes: **Cont** = Continental level, **Reg** = Regional (ON BCR 13) level, **CA** = Canada, **ON** = Ontario, **Add Species of Mgmt Interest** = Additional Species of Regional Management Interest. See Appendix 1 for details. **EN** = Endangered, **TH** = Threatened, **SC** = Special Concern.

Table 9: Grassland Priority Wintering Landbirds in ON BCR 13 showing Reasons for Priority Status

Species	Reason(s) for Priority Status						Add Species of Mgmt Interest
	Concern		Stewardship		At Risk		
	Cont	Reg	Cont	Reg	CA	ON	
Northern Bobwhite					EN	EN	
Short-eared Owl	Y				SC	SC	

Notes: **Cont** = Continental level, **Reg** = Regional (ON BCR 13) level, **CA** = Canada, **ON** = Ontario, **Add Species of Mgmt Interest** = Additional Species of Regional Management Interest. See Appendix 1 for details. **EN** = Endangered, **TH** = Threatened, **SC** = Special Concern.

Table 10: Summary of Habitat Needs of Priority Grassland/Agricultural Landbirds in southern Ontario

Species	Breeding Habitat	Grassland Obligate	Area Sensitive	Ground Cover			Woody Vegetation	Nest Site
				Short/sparse	Medium height/Moderate density	Tall/Dense		
American Kestrel	Open agricultural and rural areas with hunting perches and nest cavities.			Y	Y		Y	Cavity
Barn Owl	Open agricultural grassland and marsh habitats with nest sites	Y					X	Cavity
Bobolink	Large blocks of moderately tall, dense, grassland with high grass to forb ratio	Y	Y		Y	Y	X	Ground
Eastern Kingbird	Open agricultural, rural and wetland areas with hunting perches and nest trees.						Y	Shrub
Eastern Meadowlark	Large blocks of grassland and savanna habitats with good grass and litter cover.	Y	Y		Y	Y	X	Ground
Grasshopper Sparrow	Dry sparse grasslands and alvars with little shrub cover.	Y	Y	Y			X	Ground
Henslow's Sparrow	Large blocks of wet grassland with dense litter layer and singing perches	Y	Y		Y	Y	X	Ground
Loggerhead Shrike	Moderately grazed pastures or sparse grasslands with trees and shrubs for nest and hunting perches, especially on limestone plains.		Y	Y	Y		Y	Shrub
Northern Bobwhite	Interspersed grasslands, agricultural fields and early successional habitats, and open pine-hardwood forest.						Y	Ground
Northern Harrier	Grasslands, hayfields, wet meadows, and marsh habitats with adequate rodent supply		Y		Y	Y	X	Ground
Savannah Sparrow	Grasslands habitats on at least 27% of the land base.	Y	Y	Y	Y		X	Ground
Short-eared Owl	Large blocks of wet grassland or marsh with high rodent populations	Y	Y				X	Ground
Vesper Sparrow	Dry grasslands, with some shrubs, trees, or forest edge.	Y		Y			Y	Ground

Notes: Woody Vegetation: Y - requires woody vegetation for nest site and/or hunting perches. **X** - Avoids areas with woody vegetation (but can generally tolerate some woody vegetation).

Box 8: Why Are Landbirds Breeding in Agricultural Grasslands a Conservation Priority in southern Ontario?

- Grasslands were an important, albeit minor, component of the predominately forested landscape of southern Ontario prior to European settlement (Bakowsky and Riley 1994, Rodger 1998).
- Only small remnants of natural grassland habitats in southern Ontario, including globally rare tallgrass prairie and alvar communities, have persisted - and most of these are in a disturbed condition due to combination of land conversion, fire suppression, grazing, and the encroachment of woody plants.
- Native grassland birds were an important part of the biodiversity of eastern North America, including this region, prior to European settlement (Askins 2002).
- Despite the loss of natural grassland habitats following European settlement in this region, grassland birds (and other grassland fauna) were able to adapt to the surrogate agricultural grasslands created by the settlers.
- BCR 13 currently supports significant numbers (>1% of the global population) of many native grassland landbirds, including some 20% of all Bobolinks (PIF database), and therefore has a high responsibility for conserving these species.
- Over the past 35 years, BBS data show that North American grassland birds have experienced steeper, more consistent and more widespread population declines than other avian guilds in North America (Vickery et al. xxxx, Root et al. 2004, Blancher 2004).
- Grassland birds have also undergone a similar serious long-term decline in BCR 13 (Figure 24).
- Loss, fragmentation and degradation of agricultural grasslands (i.e. conversion of pasture to cropland, early-season cutting of hayfields, and natural succession of unmanaged grasslands) have been identified as the primary causes of the observed declines in eastern North America (Vickery et al. xxxx, Root et al. 2004).
- Conservation of grassland birds is a priority in this region because of the level of continental concern and the relatively high numbers of grassland birds that breed in agricultural habitats in southern Ontario.
- Active management of agricultural grasslands is the most effective means of conserving grassland bird populations in eastern North America, and preventing further declines of priority landbird species identified in this plan.

open and forest-edge habitats that, in southern Ontario, are most commonly found in agricultural landscapes. Northern Bobwhite requires various habitats through the year, including grasslands, croplands, early successional habitat, and open forest. Northern Harrier, Short-eared Owl, and Eastern Kingbird also frequently use wet meadow and marsh habitats.

Many species in this suite have fine-scale habitat preferences that are not necessarily compatible with other grassland priority species (Table 10). All of the priority species in this suite are strongly influenced by agricultural land use practices that affect the availability and quality of their breeding and/or wintering habitats in this region.

6.2 Grassland and Agricultural Habitats

6.2.1 Description

Grassland/agricultural landbirds are typically found in open areas dominated by non-woody vegetation consisting of some combination of graminoids (grasses and sedges) and broad-leaved forbs. Most present-day grassland habitats in southern Ontario are “tame” grasslands of agricultural origin, i.e. pastures and hayfields that are dominated by non-native vegetation and maintained by a combination of mowing and grazing. This region does, however, encompass significant native grassland habitats that are biologically diverse and of high conservation value. As noted above, a few of the priority landbirds in this suite occur in a broad range of open agricultural habitat types.

For conservation planning purposes, it is important to distinguish among three habitat sub-categories within this general habitat grouping: natural grasslands, agricultural grasslands, and other agricultural habitats. Many of the priority landbirds occur in more than one of these settings.

6.2.1.1 Natural Grasslands

Natural grassland vegetation communities occur on two types of drought-prone soils in southern Ontario. Alvar communities (Brownell and Riley 2000) are found locally in areas of shallow limestone plains; whereas, tallgrass prairie and savannah communities are found mostly in the

extreme southwestern part of this region and in sand plain areas and along railway tracks (Rodger 1998). Grazing and periodic fires are necessary to maintain these natural grasslands and control the growth of woody vegetation.

Some priority grassland landbirds show a clear preference for natural grasslands over cultural grasslands. For example, all of the current breeding areas for the endangered Loggerhead Shrike in this region are associated with limestone plains that support alvar grasslands communities. Within these core areas, active nesting territories are typically in disturbed alvars that are being used as summer pasture for cattle.

Historically, tall-grass prairies in Ontario likely supported small populations of Northern Bobwhite, Henslow's Sparrow, Loggerhead Shrike and Greater Prairie-Chicken (Rodger 1998). The only remaining viable wild population of Northern Bobwhite in Canada is on Walpole Island, an area with extensive high quality tall-grass prairie and savanna habitats as well as extensive low-intensity agricultural areas (James and Canning 2003, Rodger 1998).

6.2.1.2 *Agricultural Grasslands*

Agricultural grasslands (also referred to as tame, cultural or surrogate grasslands) include pastures and hayfields that have been seeded with non-native forage plants that are maintained as a permanent land cover (versus croplands that are cultivated annually). Fallow fields and retired farmland are also included in this category. The distinction between agricultural and natural grasslands is sometimes blurred because many alvars are being used for pasture.

Few grassland birds prefer agricultural grasslands over native grasslands, but the latter are by far the most common and widespread form of grassland habitat in the region and therefore supports the bulk of the population for most grassland landbirds.

Additional information on the importance of agricultural habitats to landbirds is included in Box 9.

6.2.1.3 *Other Agricultural Habitats*

Most agricultural lands in southern Ontario are cultivated croplands used for the annual production of grain crops including corn, beans, barley, winter wheat and mixed grains (Statistics

Box 9: Key Facts about Birds and Agriculture in Southern Ontario

- Agriculture is the dominant land use in this region, accounting for 2/3rds of all land cover in ON BCR 13 (54% cropland and 12% fields). In some counties (e.g. Essex) more than 90% of the land base is agricultural.
- Many bird species are found in agricultural areas but avian biodiversity on farmlands is strongly influenced by land management practices (e.g. crop types, tillage, pesticide use, chemical fertilizers, field size) and landscape composition (e.g. availability and distribution of pasture, hayfields, woodland, fencerows, riparian corridors) (Best et al. 2001).
- Relatively few landbird species (e.g. Song Sparrow, Horned Lark, Red-winged Blackbird, Common Grackle, European Starling) occur regularly in the breeding season in intensively-farmed cropland (e.g. corn, soybeans) in this region (Boutin et al. 1999).
- Some additional landbird species (Snow Bunting, Horned Lark, Lapland Longspur) feed on crop residue, weed seeds and insect material during migration and winter (McGauley 2004).
- Several "nuisance" landbird species are also associated with agricultural habitats (e.g. European Starling, Brown-headed Cowbird, Common Grackle, Red-winged Blackbird).
- No-till and other soil conservation management techniques that leave crop residues on the ground result in habitats that are intermediate between tilled cropland and permanent cover in terms of supporting breeding landbirds (and are also used by many migrants and some wintering landbirds) (Boutin et al. 1999, Best et al. 2001).

Canada, Census of Agriculture 2001). Some agricultural areas are used almost exclusively for row crops, particularly in the SW sub-region (light-coloured area on Figure 21). Other agricultural areas are much more diversified, with a mix of crops, fields, and other open habitat types such as ponds, wetlands, fencerows, stream corridors, and transportation and utility corridors. Many farms in this region

also include a farm woodlot used to produce lumber, firewood, maple syrup or other forest products.

6.2.2 Historical Perspective

Grassland habitats were a minor but important component of the historic landscape of southern Ontario. At the time of the first land surveys around 1800, natural tallgrass communities comprised at least 1.3% of upland areas, including at least 800 km² of tallgrass prairie (Bakowsky and Riley 1994, Roger 1998). Extensive areas of alvar grasslands were present on areas of limestone plains (see map in Brownell and Riley 2000). Grasslands and alvars may have been much more extensive before European contact because First Nation cultures actively used fire to create and maintain open grassland and savannah habitats (Lumsden 1966).

Most natural grasslands were converted to agriculture in the 19th century, the amount of surrogate grassland habitat increased dramatically as extensive forested areas were cleared of trees and converted to numerous small farms, each with diverse crops, including areas of pasture and hay for livestock. Over the past century, farming has become more specialized and changes in crops and farmland management techniques that have affected grassland and agricultural birds.

Grassland bird populations have undergone major changes over time, initially decreasing following European contact (1600 to 1800) due to the cessation of the deliberate use of fire to manage habitats by First Nations people, then increasing dramatically due to widespread clearing of forests habitats (1800 to 1910), then a gradual long-term decrease due to changing farming practices that were less favourable to grassland birds.

6.2.3 Current Status

Information on the status of grassland and agricultural habitats is available from three sources as described below.

Ontario Land Cover mapping

The Ontario Land Cover database includes information on the amount and distribution of three categories of grassland/ agricultural habitats, as interpreted from remote sensing data:

- Alvar, totalling about 1% of the land base (Figure 20);
- Fields, about 12% (Figure 21); and
- Croplands covering 54% of the total land base of southern Ontario.

There are some limitations to the land cover data and the cover categories are not necessarily consistent with those used in other datasets. Only clusters of open grasslands on limestone bedrock are classified as alvar in the land cover mapping (many other smaller alvar areas are missed). The “fields” category (pasture and abandoned field class) includes pasture, hayfield, old fields and orchards. The croplands category includes row crops and bare cultivated fields (but not include hayfields as included in agricultural census cropland data). Tallgrass prairie grasslands are not distinguished in the land cover data.

The three categories of grassland/ agricultural land cover are unevenly distributed across the region. Large alvars are found locally across the region, except in the Southwest sub-region (Figure 20). The Southwest sub-region also has the lowest amount of fields (Figure 21) but the highest proportion of cropland (see Figure 8 in Chapter 2).

Canadian Census of Agriculture

The national Census of Agriculture (<http://www.statcan.ca/english/agcensus2001/index.htm>), conducted every fifth year by Statistics Canada, contains accurate information on the extent and distribution of agricultural crops (including pasture and croplands) and land use management practices (pesticide use, tillage practices). Data on the extent and sub-regional distribution of cropland, pasture and other agricultural land uses as reported on the 2001 agricultural census are summarized in Figure 22.

Figure 20: Map showing Distribution of Alvar Land Cover in ON BCR 13

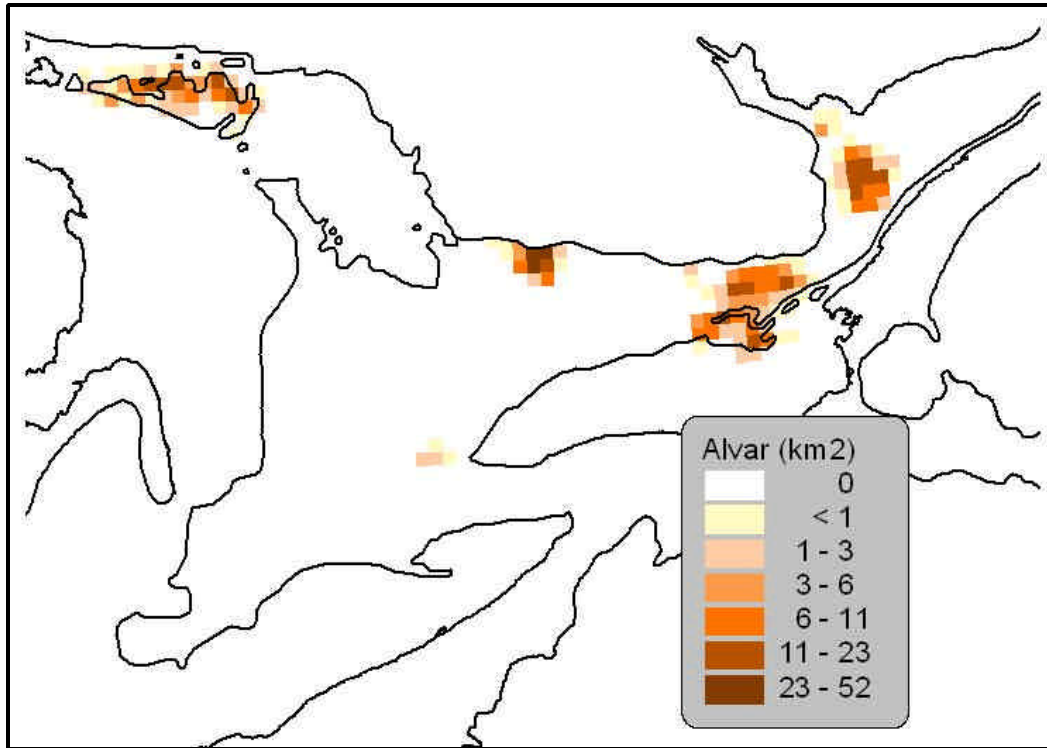
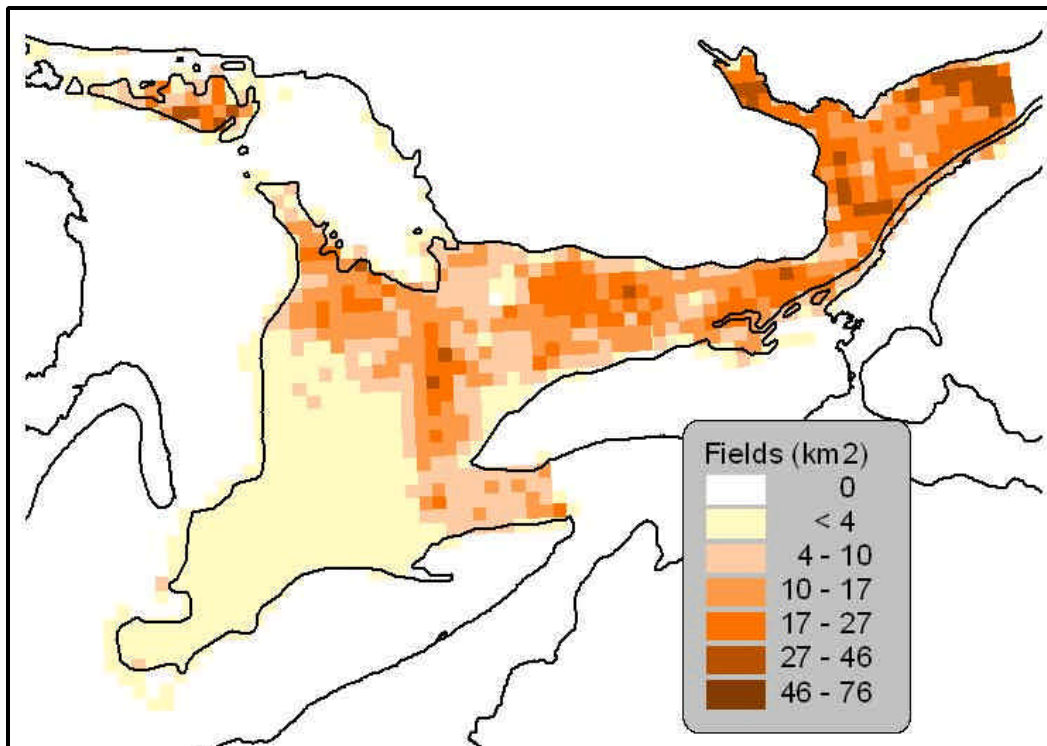
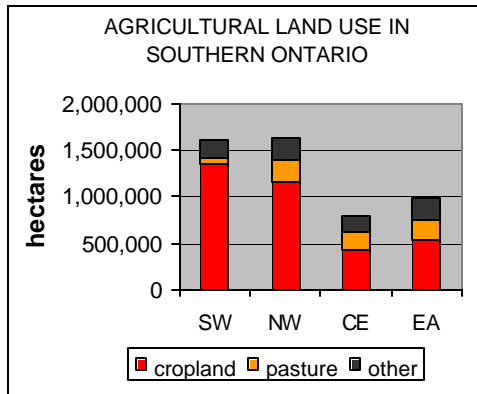


Figure 21: Map showing Distribution of Fields (pasture and old fields land cover) in ON BCR 13



Source: Ontario Land Cover data, OMNR 1998.

Figure 22: Agricultural Land Use in southern Ontario sub-regions



Source: 2001 Census of Agriculture, Statistics Canada.

Note: Data are for Census Agricultural Regions (CAR) that are only roughly equivalent to ON BCR 13 sub-regions as follows: SW = Southern Ontario CAR; NW = Western Ontario CAR; CE = Central Ontario CAR; and EA = Eastern Ontario CAR

Natural Heritage Information Centre data
The Natural Heritage Information Centre (NHIC) database tracks known occurrences of alvar and prairie communities, as they often contain rare plants and vegetation types. In many cases a ground survey is needed to identify these occurrences and assess whether they should be classified as high quality or disturbed natural grasslands, or as cultural grassland. Such detailed habitat mapping is available for only parts of southern Ontario (e.g. protected areas, significant natural areas). Consequently, information on the current extent of natural grassland habitats is incomplete. The general distribution of current and potential alvar and tall-grass prairie habitats in southern Ontario is known (see maps in Brownell and Riley 2000 and in Rodger 1998).

Current tallgrass prairie and savanna habitats in southern Ontario are reduced to just a few thousand hectares (only 3% of historic extent) (Rodger 1998). Only a few, relatively small areas (e.g. Walpole Island, Ojibwa Prairie, High Park prairie) are actively managed to maintain tallgrass prairie habitats. Larger amounts of alvar habitat have been protected and are being actively managed for grassland and alvar flora

and fauna (including Loggerhead Shrike). Grassland birds have been identified as management objectives in some other blocks of public lands (e.g. Prince Edward Point NWA and Ostrander Block property in Prince Edward County, Meaford Tank Range).

6.2.4 Recent Trends

Net changes in the amount of natural prairie and alvar grassland in recent years are not known. There have been some gains from active management, and some losses due to quarrying and ongoing encroachment of woody vegetation.

Changes in agricultural land use in Ontario between 1991 and 2001 that affect grassland and

Box 10: Recent Trends in Agricultural Land Use in Ontario, 1991 to 2001.

- Total farm area was stable.
- Average farm size increased 15%, from 78 to 90 hectares (196 acres to 226 acres)
- Amount of land used for pasture decreased by 18% (now 15% of all farmland)
- Amount of land used for summer fallow decreased by 78%
- Amount of land used for hay and fodder crops decreased by 3% (but remained the number one field crop by area at 19% of all farmland)
- Amount of land used for crops other than hay increased by 12%, mostly due to a 60% increase in soybean acreage (now number two field crop by area)
- Amount of land classified as “other farmlands” (includes farm woodlots, Christmas tree plantations and other non-productive lands) remained stable
- The amount of land being treated with herbicides increased by 23%, but no increase in area being treated with commercial fertilizer or being irrigated.
- There was a dramatic increase in the amount of cropland managed using no-till (up 609%) or conservation tillage (up 31%) practices that leave crop residues on the surface (benefits many bird species), whereas the area managed using conventional tillage fell by 29%.

Source: Statistics Canada Census of Agriculture data 1991, 1995, and 2001.

agricultural landbirds in ON BCR 13 are summarized in Box 10. (Data are for all of Ontario but over 95% of all farmland in the province is within this BCR, Statistics Canada Agriculture Census 2001).

6.2.5 Threats

Habitat loss, degradation and fragmentation are affecting grassland bird populations in natural and agricultural grasslands in southern Ontario.

Grassland habitat is being lost due to:

- Conversion of pasture to cropland;
- Natural succession of idle agricultural lands;
- Encroachment of woody vegetation in native grasslands in the absence of wildfires or grazing disturbances; and
- Expansion of rock quarries in alvar habitats.

The ability of remaining grasslands to support grassland birds is being degraded due to:

- Changing grassland management practices that are less bird-friendly (early season mowing, change in seeded forage species mixtures, pesticide use).
- More intensive use of agricultural pastures (trampling, over-grazing, seeding with non-native species);
- Agricultural intensification (larger fields, monocultures, removal of fencerows, increased use of herbicides and pesticides resulting in reduced number and diversity of insects and weed); and
- The spread of invasive plant species in native grasslands.

On the positive side, migrant and wintering birds are benefiting from the increase in crop residue on the surface due to increase in conservation tillage and no-till practices.

As grassland habitat is lost and degraded, the remaining grassland areas are increasing isolated and fragmented. Area sensitive species (Table 10) are particularly vulnerable to habitat fragmentation.

6.3 Conservation Objectives for Priority Grassland/Agricultural Landbirds

Abundance and distribution objectives for priority grassland/agricultural birds are presented

in the Species Accounts (Appendix F) and summarized in Table 11.

6.3.1 Recovery

The conservation objective for the four priority grassland landbirds that are designated as endangered (Table 8) is **recovery** to a more secure status, as outlined in current Recovery Strategy documents (or equivalent).

6.3.2 Assess Status

Trends in the abundance and distribution of breeding and wintering populations of Short-eared Owl in southern Ontario are not known, as this species is uncommon and difficult to monitor. The objective for this Special Concern species is, therefore, to assess the current population status in Ontario BCR 13 at least every five years.

6.3.3 Halt Decline

As is the pattern elsewhere in North America, populations of most priority grassland landbirds in this region are in decline. These changes have been linked to declines in the amount and quality of agricultural grasslands habitats. Increasing the amount of agricultural grassland in order to reverse the long-term declines in grassland birds is not considered practical or necessary. Most of these grassland birds (except those designated as endangered) are still common to abundant, with population estimates ranging from more than 10,000 individuals (American Kestrel, Grasshopper Sparrow) to about a million birds (Bobolink, Savannah Sparrow). Current populations are considered to be well above those present before European settlement.

Due to the widespread pattern of grassland bird decline and the high relative densities of these species present in southern Ontario, the conservation objective for seven priority grassland birds is to halt declines and maintain current abundance and distribution levels over the next 20 years.

6.3.4 Maintain Current

The only grassland bird that is not showing significant declines in this region is the Northern Harrier. The conservation objective for this ground-nesting hawk, which is uncommon and not very well monitored in southern Ontario due to low breeding densities, is to maintain current abundance and distribution levels.

Table 11: Summary of Conservation Objectives and Conservation Focus for Priority Grassland/Agricultural Landbirds in southern Ontario.

Priority Species	General Objective	Abundance Objective	Distribution Objective	Conservation Focus
Barn Owl#	Recovery	Establish a viable population	Establish a viable population	<i>Recovery:</i> Complete and Implement updated Recovery Strategy.
Henslow's Sparrow#	Recovery	Establish a stable or increasing population of 500 birds in Ontario (currently fewer than 10 pairs).	Establish viable populations (to be determined)	<i>Recovery:</i> Complete and Implement updated Recovery Strategy for this Endangered species
Loggerhead Shrike#	Recovery	Recover to a viable population (to be determined); currently 30 to 50 wild pairs.	Recover to a viable population (to be determined); currently two main sub-populations.	<i>Recovery:</i> Complete and Implement updated Recovery Strategy for this Endangered species.
Northern Bobwhite#	Recovery	Recover to a viable population (to be determined); currently less than 1000 birds.	Recovery (to be determined); currently one viable wild population.	<i>Recovery:</i> Complete and Implement Recovery Strategy for this Endangered species.
Short-eared Owl	Assess Status	Determine abundance of breeding and wintering populations	Maintain current distribution of ~5% of Atlas squares.	<i>Habitat management:</i> Maintain large areas of grassland and open wetland, supporting high densities of voles.
American Kestrel	Halt Decline	Maintain current population, BBS Index of 0.59, ~20,000 birds	Maintain current distribution of ~89% of Atlas squares.	<i>Habitat management:</i> Maintain open agricultural areas with areas of short grass, scattered perches and nesting cavities.
Bobolink	Halt Decline	Maintain current population, BBS Index of 26.0, ~ 1,000,000 birds	Maintain current distribution of ~96% of Atlas squares.	<i>Outreach:</i> Promote the adoption of BMPs for grassland birds.
Eastern Kingbird	Halt Decline	Maintain current population, BBS Index of 7.2, ~ 200,000 birds	Maintain current distribution of ~99% of Atlas squares.	<i>Research:</i> Identify factors causing population decline.
Eastern Meadowlark	Halt Decline	Maintain current population, BBS Index of 13.1, ~ 100,000 birds	Maintain current distribution of ~93% of Atlas squares.	<i>Outreach:</i> Promote the adoption of BMPs for grassland birds.
Grasshopper Sparrow	Halt Decline	Maintain current population, BBS Index of 0.89, ~ 30,000 birds	Maintain current distribution of ~41% of Atlas squares.	<i>Habitat protection:</i> Identify and conserve sites with important populations.
Savannah Sparrow	Halt Decline	Maintain current population, BBS Index of 30.1, ~1,000,000 birds	Maintain current distribution of ~96% of Atlas squares.	<i>Habitat management:</i> Maintain large areas (>50 ha) of agricultural or native grasslands of intermediate height and density with well-developed litter and no woody vegetation.
Vesper Sparrow	Halt Decline	Maintain current population, BBS Index of 2.2, ~90,000 birds	Maintain current distribution of ~77% of Atlas squares.	<i>Habitat management:</i> Maintain dry, sparse grassland vegetation with scattered woody vegetation.
Northern Harrier	Maintain Current	Maintain current population, BBS Index of 0.45, ~4,000 birds	Maintain current distribution of ~77% of Atlas squares.	<i>Habitat management:</i> Maintain large (>100 ha) blocks of grassland or marsh with thick vegetation and abundant prey (particularly voles).

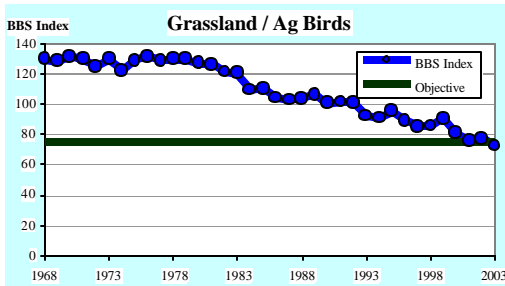
Objectives for Endangered/Threatened Species are based on available Recovery Strategies and related documents (See Species Accounts for sources).

6.4 Conservation Objectives for the Grassland/Agricultural Guild

6.4.1 Guild Abundance Objective

The BBS guild index for grassland birds in southern Ontario has decreased by 46% over the past three decades (Figure 24). The immediate objective set for this guild is to **halt the long-term decline** and maintain the overall grassland bird guild at its current abundance levels, as measured by the BBS guild index.

Figure 24: Long-term BBS Trend, 1968-2003, and Guild Abundance Objective for Grassland Landbirds in southern Ontario.

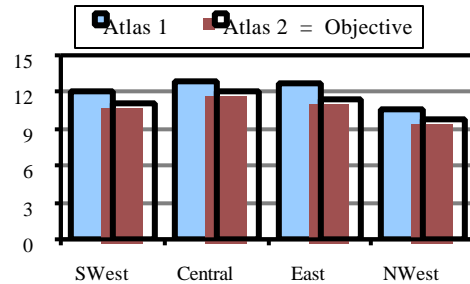


6.4.2 Guild Distribution Objective

Preliminary BBA results from the second Atlas show a significant 11% decrease in the average number of grassland species per Atlas square (Figure 23), from 12.5 to ~11.5 species/square on average. Grassland species richness has declined in all sub-regions, especially the Southwest (-14%) and Eastern (-14%).

The grassland guild distribution objective is to **halt the ongoing loss of grassland species**, and maintain species richness in each sub-region at current levels (BBA 2001-05).

Figure 23: Changes in Grassland Landbird Species Richness and Preliminary Guild Distribution Objectives (=Atlas 2) in ON BCR 13 sub-regions.



Source: BBA1 (1981-85) and BBA2 (2001-04 preliminary) data.

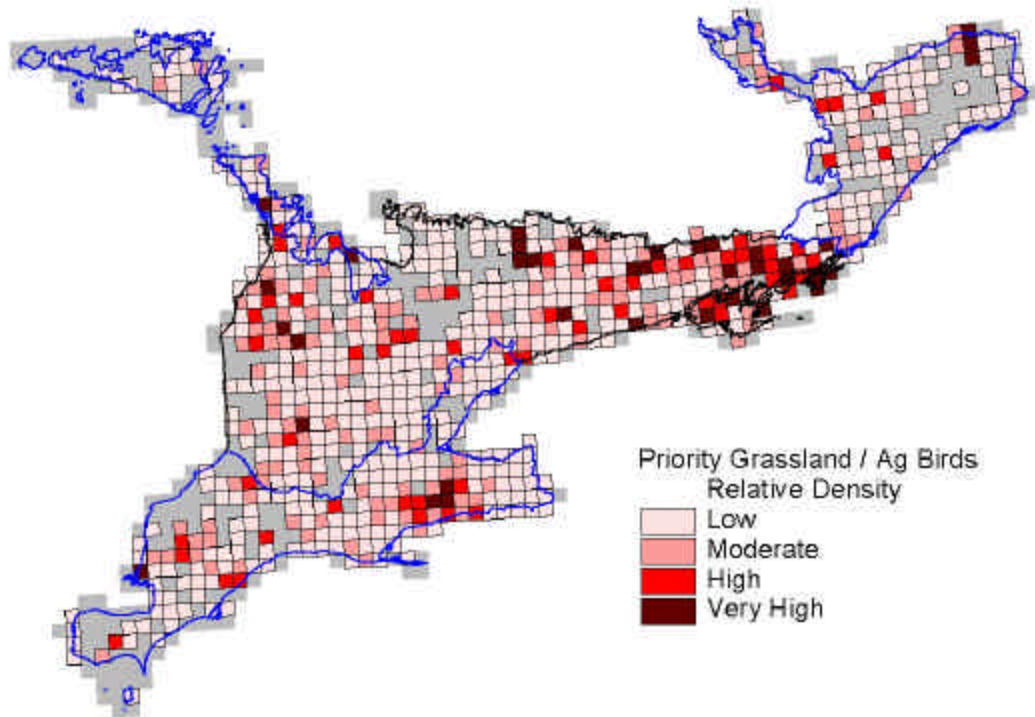
6.5 Conservation Focus

The conservation focus for most grassland birds is to maintain and manage enough suitable habitat to support current populations. Grassland birds are currently concentrated in areas with higher amounts of agricultural grasslands (Haldimand Clay Plain) and/or alvar habitat (Napaneer Plain, Carden Plain) (Figure 25). Grassland habitats are not well represented in protected areas.

Habitat quality, in particular habitat fragmentation and the impact of agricultural activities (early haying, pesticides) on the productivity of grassland birds is also a major concern. Nesting studies are needed to determine if additional factors are affecting some grassland species such as American Kestrel, Eastern Kingbird and Loggerhead Shrike (see Species Accounts in Appendix F).

Further research is needed to determine appropriate guidelines for the amount, type, size, configuration and distribution of grassland habitats needed to maintain grassland bird biodiversity in this region.

Figure 25: Relative Density of Grassland/ Agricultural Birds in Southern Ontario



Source: Preliminary BBA Point Count Data (2001-04).

6.6 Conservation Actions

6.6.1 Monitoring

- Maintain or increase surveillance, inventory and monitoring efforts for rare breeding grassland landbirds including Barn Owl, Henslow’s Sparrow, Loggerhead Shrike, Northern Bobwhite, and Short-eared Owl.
- Improve CBC coverage to establish distribution and population trend for wintering Northern Bobwhite and Short-eared Owls.
- Complete a comprehensive region-wide mapping of native grasslands (prairie and alvars), including assessment of current condition, landbird occurrence, and restoration potential.

6.6.2 Research and Evaluation

- Identify the importance of factors other than habitat loss to the decline grassland birds in Ontario BCR 13.

- Compile an inventory of past and current research on grassland and agricultural birds in this region and similar landscapes.
- Evaluate the results of existing grassland/agricultural bird research to develop a synthesis of the current understanding as to how grassland condition (size, structure, composition) and management practices affect the abundance, distribution and demographics of priority grassland birds.
- Evaluate the impact of agriculture on the abundances, distribution, and productivity of priority grassland/agriculture landbirds.

6.6.3 Planning and Policy

- Review provisions in the provincial Drainage Act and other agricultural legislation and policies that are detrimental to landbirds.
- Coordinate conservation actions with those for non-landbird grassland species such as Upland Sandpiper.

6.6.4 Outreach and Education

- Promote the development and use of best management practices for tame grasslands and croplands as appropriate for the protection of priority grassland birds by public and private landowners in southern Ontario.
- Promote the development of educational materials for rural landowners and land managers, such as the *Birds on the Farm* booklet (McGauley et al. 2004).
- Promote the value of prescribed burns as a safe, beneficial and cost-effective land management practice for restoring and maintaining natural grasslands.
- Encourage ranchers to adjust the timing and duration of livestock grazing activities and the timing of haying operations to minimize adverse effects on landbirds.

6.6.5 Applied Conservation

- Implement conservation actions in Recovery Strategies for Barn Owl, Henslow's Sparrow, Loggerhead Shrike, and Northern Bobwhite.
- Identify and protect core areas of high-quality grasslands (especially natural grassland habitats and large blocks of agricultural grasslands) that support important source populations of priority grassland birds.
- Promote the restoration and protection of natural grasslands habitats including following priority sites:
 - Cabot Head (alvar)
 - Carden Plain (alvar)
 - Napanee Limestone Plain (alvar)
 - Eastern Lake St. Clair (prairie/savannah).
- Encourage periodic grazing, mowing, controlled burns and other management activities to maintain agricultural and native grassland habitats that support important breeding populations of grassland birds including:
 - Carden Plain
 - Napanee Limestone Plain
 - Prince Edward County
 - Amherst Island
 - Wolfe Island
 - Luther Marsh
 - Haldimand County
 - Bruce County
 - Manitoulin Island

- Encourage habitat management activities to maintain agricultural grassland habitats supporting important wintering raptor populations including following priority sites:
 - Prince Edward Point
 - Amherst Island
 - Wolfe Island

7 Conservation of Shrub/ Successional Landbirds

7.1 Landbirds in Shrub and Early Successional Habitats

Almost a fifth of the landbird species breeding in southern Ontario (Appendix D) are associated with shrub and early successional habitats. About a third of these shrub species are considered priority species.

7.1.1 Priority Landbirds Breeding in Shrub/ Successional Habitats

Nine of the ten priority landbirds in this suite (Table 12) are habitat obligates, being dependent on early successional and shrubland habitats. The one exception, Black-billed Cuckoo, shows a slight preference for shrub/successional habitats but also uses forest habitats.

Shrub/successional habitats are also important to some grassland priority species (e.g., Loggerhead Shrike, Eastern Kingbird and Northern Bobwhite) and to post-breeding and migrating landbirds (Askins 2002). Shrub thicket habitats provide breeding habitat for American Woodcock, a shorebird species of conservation concern in this BCR (Ross et al. 2003).

The particular habitat requirements of the

priority landbirds in the shrub/successional suite are varied (Table 13). Some have specialized habitat requirements (e.g. Prairie Warbler is a fire-adapted species that in this region breeds in young dry pine-oak-juniper stands on sand or rock barrens); whereas, others (e.g. Brown Thrasher) use a broad range of shrub/successional habitats.

Most shrub/successional-associated landbirds are adapted to finding and colonizing small habitat patches and are not considered area-sensitive. Many of the priority species in this suite are edge-tolerant and will use shrub habitat along fencerows, or at the interface of forest and open agricultural habitats.

7.2 Shrub/ Successional Habitats

7.2.1 Description

Early successional and shrubland habitats used by priority landbirds encompass a range of terrestrial and wetland vegetation communities with at least 25% of the cover consisting of shrubs, saplings (1 to 3 m), and woody vines. Most shrub/successional habitats are created by natural or anthropogenic disturbances.

Table 12: Shrub/ Early Successional Priority Breeding Landbirds in ON BCR 13, with Reasons for Priority Status. Habitat obligate species are indicated in **boldface**.

Species	Reason(s) for Priority Status						Add Species of Mgmt Interest
	Concern		Stewardship		At Risk		
	Cont	Reg	Cont	Reg	CA	ON	
Black-billed Cuckoo		Y		Y			
Blue-winged Warbler	Y						
Brown Thrasher		Y					
Eastern Towhee		Y					
Field Sparrow		Y					
Golden-winged Warbler	Y	Y			UR	UR	
Kirtland's Warbler	Y				EN	EN	
Prairie Warbler	Y						
Willow Flycatcher	Y						
Yellow-breasted Chat					SC	SC	

Notes: **Cont** = Continental level, **Reg** = Regional (ON BCR 13) level, **CA** = Canada, **ON** = Ontario, **Add Species of Mgmt Interest** = Additional Species of Regional Management Interest. See Appendix C for details. **EN** = Endangered, **SC** = Special Concern, **UR** = under review.

Table 13: Summary of Habitat Needs of Priority Shrub/Successional Landbirds in southern Ontario

Species	Breeding Habitat	Shrub/ Successional Obligate	Area Sensitive	Dense Ground Cover	Dense Shrub Layer	Disturbance Regime
Black-billed Cuckoo	Range of successional forests, deciduous thickets, riparian and forest edge settings.					
Blue-winged Warbler	Range of early – to mid-successional shrub habitats.	Y				
Brown Thrasher	Wide range of shrub/ successional habitats.	Y				
Eastern Towhee	Shrub/successional habitats with dense cover and well-developed litter layer.	Y		Y	Y	
Field Sparrow	Dry shrubby grasslands or shrub- dominated areas near grasslands.	Y			X	Fire-adapted
Golden-winged Warbler	Patches of shrub habitat with dense patches of forbs/shrubs for nesting and a treed perimeter.	Y		Y	Y	
Kirtland's Warbler	Extensive stands of young even-aged jack pine stands.	Y	Y			Fire-dependent
Prairie Warbler	Open oak-pine-juniper communities on dunes or rock barrens and/or pine plantations with open shrubby areas.	Y			X	Fire-adapted
Willow Flycatcher	Deciduous shrublands, especially riparian thickets, swamp thickets and successional fields.	Y			Y	
Yellow-breasted Chat	Early successional habitat with dense shrub thickets.	Y			Y	Fire-adapted

Notes: Y Requires or prefers this habitat feature. X - Avoids this habitat feature.

Natural shrub-dominated communities in southern Ontario (Lee et al. 1998) include:

- Swamp thickets in wetland areas with seasonally high water-tables;
- Riparian thickets in flood-prone areas;
- Shrub dune and shrub shoreline communities in erosion-prone areas;
- Shrub alvar and shrub savannah on drought- and fire-prone limestone plains and sand plains, respectively;
- Shrub/successional communities in forest gaps caused by tree fall, wind downbursts, ice storms, etc.

Most present-day shrub/successional habitats in this region are the result of anthropogenic disturbances. These “cultural” shrublands include:

- “Old field” habitats developed on abandoned farmlands through natural regeneration.
- Post-logging successional communities created in canopy gaps following intensive diameter-limit harvests or group selection cuts.
- Linear shrub/successional habitats along fence-lines, power-line right-of-ways, and other utility and transportation corridors.
- Agricultural shrubland surrogates including Christmas tree plantations, orchards, and vineyards.
- Young plantations on former farmlands, quarries and gravel pits that have been seeded or planted with shrubs and trees to create wildlife habitat and/or to promote reforestation.

Some natural shrub habitats are able to persist due to periodic natural disturbances (e.g. seasonal flooding of swamp thickets) but most shrub/ successional habitats are ephemeral, maturing into forest. Some cultural shrublands are actively managed to control tree growth (e.g. tree-cutting or herbicide applications along power-line right-of-ways).

More so than for other habitat types, cultural shrub/successional habitats used by priority landbirds vary in size (0.1 ha canopy gaps to 10+ ha old fields), shape (regular block, linear strip, irregular patches), and matrix (forest, agricultural, wetland, urban, various). Management practices are also highly variable as to intensity (no management to intensive management), frequency (annual to multi-year cycles), and objectives (maximize tree growth, limit tree height, maximize crop production,

minimize erosion, maximize game or non-game wildlife values, etc.).

7.2.2 Historical Perspective

Information on the historical extent of shrub/successional habitat in this region is limited. The following description is based on past patterns of environmental and anthropogenic disturbance and natural succession processes.

In the extensive pre-settlement forests, shrub/successional habitats were created by windfall, fire, ice storm and flooding events. Such natural disturbances were local and infrequent, thus shrub and early successional habitats comprised only about 5% of the pre-settlement landscape of southern Ontario (Larson et al. 1999).

Fire-dependent native shrub and grassland ecosystems in this region benefited from active fire management by the First Nations cultures, a practice, which ended following European contact. Historical riparian and wetland shrub thickets would have been considerably more extensive than at present.

Extensive land clearing for agriculture and settlement during the 19th century resulted in the direct removal or alteration of most natural shrub/ successional habitats. These losses were offset by the creation of anthropogenic shrub/ successional habitats in cleared areas, such as fencerows and along field edges, and from logging in the remaining forested areas.

In many parts of southern Ontario, land clearing was followed by the abandonment of marginal farmlands. Over the past two centuries, extensive areas of abandoned farmland have undergone a natural succession in land cover, from agricultural fields and grasslands, to old-field shrub/successional, to young forest, to mature forest. The timing and extent of farmland retirement varied in the different sub-regions of southern Ontario. There is no question that farmland abandonment followed by natural succession processes has had a major impact on shrubland bird populations in southern Ontario given the increase in three-fold increase in forest cover, from 10% to 30%, since 1920 (Larson et al. 1999).

At the same time as marginal farmlands were being retired, there was a shift towards more intensive farming on productive agricultural

lands. Agricultural intensification has resulted in the loss of fencerows, shrubby pastures, and other shrubby agricultural habitats, favoured by many shrubland birds (e.g., Brown Thrasher, Eastern Towhee, Song Sparrow).

During the 20th century, most natural shrubland ecosystems continued to be adversely affected by anthropogenic forces including:

- Increasing fire suppression activities have reduced the extent and quality of fire-dependent shrubland ecosystems.
- Wetland drainage has reduced the extent of swamp thicket habitat.
- Flood and erosion control measures (e.g. construction of dams, river bank hardening) over the past 50 years have further reduced the extent of riparian shrubland habitats.
- Shoreline development has affected shrub dune and shrub shoreline communities.

7.2.3 Current Status

The current extent of shrub/successional habitats in southern Ontario is difficult to measure because these habitats:

- Are hard to distinguish using remote sensing data (e.g. “sparse” forest and field categories in the Ontario Land Cover mapping may include some shrub/successional habitats);
- Can develop within a few years following a disturbance (wind storm) or change in land use (retirement of farmland); and
- Are inherently unstable and can change drastically (due to natural succession or new disturbance) over just a decade.

Larson et al. (1999) estimated that present-day forests and woodlands in southern Ontario contain about 25% shrub/early successional habitats, indicating that about 7.5% of the current land base consists of shrub/successional habitats within a forest matrix. The current extent of other shrub habitats is not known.

7.2.4 Recent Trends

Trends in the amount and distribution of shrub/successional habitat are not available. Even the overall trend direction in recent years is not known, as quantitative information on the relative magnitude of habitat creation (e.g. farmland retirement, canopy-opening logging, quarry rehabilitation), versus habitat loss (e.g. forest maturation, fencerow removal, conversion to urban and other land uses) is not available.

A better understanding of past and future trends in the availability of shrub/successional habitat in southern Ontario is needed to determine the extent to which habitat is a limiting factor for priority species in this suite. Predicting the future supply of cultural shrub/successional habitat is particularly difficult, as the rate of habitat creation will vary depending on environmental and socio-economic factors.

In the northeast US, decreased availability of old-field habitats due to forest maturation has been linked to the observed decline of shrub/successional landbirds (Hunter et al. 2001). In southern Ontario, some shrub species (e.g. Willow Flycatcher, Northern Cardinal) are increasing; whereas, others (e.g. Brown Thrasher, Song Sparrow) are decreasing. Differences in specific habitat requirements and other factors must also be considered.

7.2.5 Threats

Although the birds in this suite use a diverse range of specific habitat types, all of these shrub/successional habitats are dependent on periodic disturbance to prevent natural succession, rejuvenate existing habitat, or create replacement habitat. Habitat loss is the primary threat to most shrub species.

Other threats affecting particular types of shrub/successional habitats (and priority species that are adversely affected) include:

- Fire suppression is detrimental to fire-dependent (Kirtland’s Warbler) and fire-adapted (Prairie Warbler, Field Sparrow, Yellow-breasted Chat) species.
- Drainage and flood control reducing extent of wetland and riparian shrub habitats (Willow Flycatcher, Black-billed Cuckoo).
- Forest silviculture practices that result in fewer, smaller canopy gaps or reduce the time it takes for these gaps to close (Eastern Towhee, Golden-winged Warbler) [forest bird species may benefit].
- Re-forestation of old fields with close-packed even-aged conifer monocultures (Blue-winged Warbler)
- Pesticide spraying to control caterpillar outbreaks (Black-billed Cuckoo).
- Use of herbicides along roadsides, ditches and power-line right of ways to prevent growth of woody plants (Field Sparrow, Blue-winged Warbler)

- Spread of exotic or invasive shrub species (European buckthorn, multiflora rose, common juniper) may be detrimental to some species.

Shrub/successional habitats are relatively easy to create and several opportunities exist to increase the amount of shrub/successional habitats by changing current management practices at select sites such as:

- Strategic use of periodic cutting (rather than herbicides) to prevent tree-growth along roadsides, ditches and power-line right of ways
- Group selection logging to create bigger canopy gaps in forests.
- Creating or enhancing riparian buffer strips in pastures and urban areas.
- Converting unused areas of public and private lands that are currently being intensively managed as manicured lawns to bird-friendly shrubland habitat.

7.3 Conservation Objectives for Priority Shrub/ Successional Landbirds

Abundance and distribution objectives for the priority landbird species in this group are presented in the Species Accounts (Appendix F) and summarized in Table 14.

7.3.1 Recovery

The conservation goal for the endangered Kirtland's Warbler is recovery to a more secure status. As this species does not currently breed in southern Ontario, the presence of even one breeding pair anywhere in southern Ontario would be considered a significant advance.

7.3.2 Assess Status

Abundance and distribution trends for Prairie Warbler in Ontario BCR 13 are unknown or uncertain and the overall objective is therefore to assess current status. There is some evidence of a decline in distribution, especially in the Southwest sub-region (preliminary BBA data and also COSEWIC report).

7.3.3 Reverse Decline

Reverse decline is the overall objective for the five priority species in this suite that have experienced significant long-term declines in abundance and/or distribution in southern Ontario (Table 14).

Abundance objectives have been set for four of these declining species, to restore populations to 1968-77 levels. The abundance objective for the fifth species, Yellow-breasted Chat, is to assess the current population status, as trend data are not available for this rare species.

The distribution objective for four of the declining shrub species is to restore distribution in each sub-region to levels comparable to the first BBA (1981-85). Distribution losses have not been uniform, with most declines in the Southwest and Eastern sub-regions. The distribution of Black-billed Cuckoo has not declined, except in the Eastern sub-region.

7.3.4 Maintain Current

The overall objective for the three priority shrub species with stable or increasing population trends (Blue-winged Warbler, Golden-winged Warbler and Willow Flycatcher) is to maintain current levels. Abundance objectives for these species are set at the current BBS Index (2001-03). Distribution objectives will be based on the current BBA (2001-05), with one exception.

The overall distribution of the Golden-winged Warbler has declined due to substantial losses in the Southwest (from 26% to ~10% of Atlas squares) and Northwest (from 23% to ~13%) sub-regions. The distribution objective for the Golden-winged Warblers is to reverse these sub-regional declines.

The Blue-winged Warbler is the only priority species in this suite to show an increase in distribution in all sub-regions over the past 20 years. The observed changes in distribution for Golden-winged and Blue-winged Warblers in southern Ontario are generally consistent with the general pattern elsewhere in eastern North America, i.e. a northward range expansion of Golden-wings followed by Blue-wings. However, the magnitude of the decline in distribution of Golden-winged Warblers in both the Southwest and Northwest sub-regions, appears to be substantially greater than the increase in distribution of Blue-winged Warblers. This suggests that habitat maturation may be the limiting factor for Golden-winged Warblers in those sub-regions, rather than direct competition or displacement by Blue-winged Warblers.

Table 14: Summary of Conservation Objectives and Conservation Focus for Shrub/ Successional Priority Landbirds in southern Ontario (see also Species Accounts in Appendix F).

Species	Overall Objective	Abundance Objective	Distribution Objective	Conservation Focus
Kirtland's Warbler#	Recovery	Establish a breeding population in Ontario	Establish a breeding population in Ontario	<i>Planning:</i> Complete and implement a Recovery Strategy for this Endangered species.
Prairie Warbler	Assess Status	Determine current population status.	Restore distribution to 3% of squares in SW sub-region. Maintain or increase distribution in CE and EA sub-regions.	<i>Monitoring:</i> Periodically assess the status of this species in Canada, including southern Ontario.
Black-billed Cuckoo	Reverse Decline	Restore to BBS Index of 1.4, ~60,000 birds (current Index 0.85, ~40,000)	Maintain current distribution of ~75% of Atlas squares, but reverse loss in EA sub-region.	<i>Research:</i> Identify factors causing population decline and/or limiting population growth.
Brown Thrasher	Reverse Decline	Restore to BBS Index of 5.9, ~200,000 birds (current Index 2.4, ~80,000)	Restore to 98% of squares from ~93% (reverse losses in SW, CE and EA sub-regions)	<i>Habitat Management/Evaluation:</i> Evaluate the effects of increasing the amount of shrub/ early successional habitat (old field, thicket, fencerow and forest edge) in SW, CE and EA subregions.
Eastern Towhee	Reverse Decline	Restore to BBS Index of 0.90, ~30,000 birds (current Index 0.74, ~25,000)	Restore to 67% of Atlas squares from ~62% (reverse losses in SW, EA and NW sub-regions).	<i>Habitat Management/Evaluation:</i> Evaluate the effects of various shrub/successional habitat management techniques on this species.
Field Sparrow	Reverse Decline	Restore to/maintain at BBS Index 3.0, ~80,000 birds (current Index 2.4, ~65,000)	Restore to 83% of Atlas squares from ~80% (reverse losses in SW and EA sub-regions).	<i>Habitat Enhancement/Evaluation:</i> Evaluate the effects of increasing the amount of shrubby grassland or shrub thickets adjacent to grassland habitat
Yellow-breasted Chat	Reverse Decline	Determine current population status.	Restore to 5% of Atlas squares from ~2% (reverse losses in SW and CE sub-regions).	<i>Habitat Management:</i> Assess feasibility of increasing the amount of dense shrub thicket habitat at sites in SW sub-region.
Blue-winged Warbler	Maintain Current	Maintain current population, BBS Index 0.07, ~2,000 birds.	Maintain current distribution (~21% of Atlas squares), concentrated in SW and CE sub-regions.	<i>Habitat Management:</i> Manage habitat to maintain supply of early- to mid-successional habitat.

Golden-winged Warbler	Maintain Current	Maintain at or above current BBS Index of 0.13, ~5,000 birds.	Restore to 22% of Atlas squares from ~ 18% (reverse losses in SW and NW sub-regions)	<i>Habitat Management/Evaluation:</i> Evaluate the effects of various shrub/successional habitat management techniques on this species.
Willow Flycatcher	Maintain Current	Maintain current population, BBS Index 1.6, ~50,000	Maintain current distribution of ~73% of Atlas squares.	<i>Habitat Management and Enhancement:</i> Protect riparian and wetland shrub thickets and encourage creation of buffer strips.

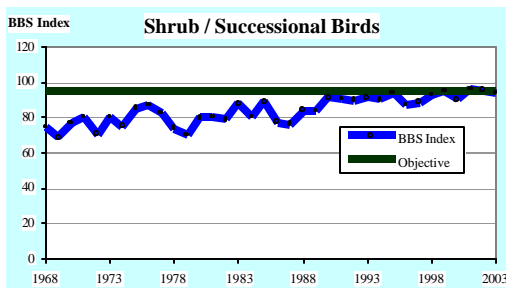
Objectives for Endangered and Threatened Species are from Recovery Strategy, Recovery Plan and Status Report documents as available. See Species Accounts, Appendix F.

7.4 Conservation Objectives for the Shrub/ Successional Guild

7.4.1 Guild Abundance Objective

The shrub/successional landbird guild shows a 23% increase in abundance over the past three decades, from an average BBS Guild Index of 76.8 to 94.3 (Figure 26). The guild abundance objective is to maintain the current BBS Guild Index of 94.3.

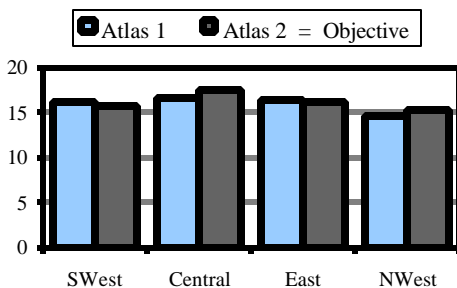
Figure 26: Long-term BBS Trend, 1968-2003, and Preliminary Guild Abundance Objective for Shrub/Successional Landbirds in Ontario BCR 13.



7.4.2 Guild Distribution Objective

Interim BBA results indicate that the average species richness for the shrub/ successional guild in southern Ontario has increased slightly, from 16.3 to 16.6 species per square. However, this increase has occurred only in the Central (+5%) and Northwest (+6%) sub-regions (Figure 27). Shrub/ successional species richness has declined significantly in the Southwest (-3%)

Figure 27: Changes in Shrub/ Successional Landbird Species Richness and Preliminary Guild Distribution Objectives (=Atlas 2) in ON BCR 13 sub-regions.



Source: BBA1 (1981-85) and BBA2 (2001-04 preliminary) data.

and is unchanged in the Eastern sub-regions. The guild distribution objective is to maintain current shrub/successional species richness in all sub-regions and, if possible, to increase species richness in the Southwest sub-region to levels comparable to the first Atlas.

7.5 Conservation Focus

Despite the overall increasing trend for this guild, habitat availability is an important limiting factor for all shrub/ successional species due to the inherently short-lived nature of successional habitats. Habitat is a particular concern for the declining priority species. However, relatively little is known about the specific habitat requirements of the priority shrub/successional species in southern Ontario, or how to create and manage shrub/successional habitat to benefit declining landbirds. The main conservation focus for this priority guild is therefore applied research at select sites to evaluate the effects increasing or managing shrub/successional habitat on the abundance, productivity and site fidelity of priority shrub/ successional landbirds.

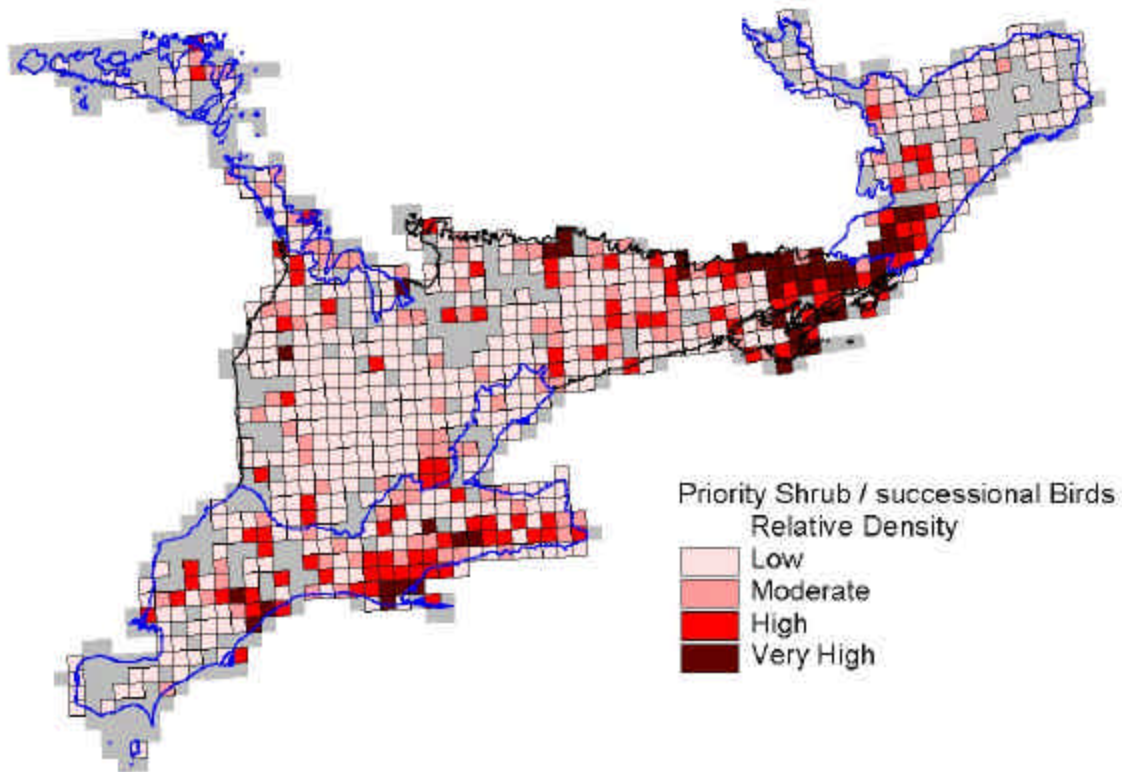
The current distribution of priority shrub/successional species (Figure 28) shows areas of high relative density that appear to be associated with the following physiographic regions (Chapman and Putnam 1984):

- Frontenac Axis
- Napanee Plain
- Carden Plain
- Prince Edward Peninsula
- Norfolk Sand Plain
- Bothwell Sand Plain

Different shrub/successional habitat management prescriptions are likely needed in different areas due to the different substrates (sand versus limestone or granitic bedrock).

General guidelines for how much shrub habitat is needed to sustain shrub/ successional landbirds are not available. Given the difficulty in measuring successional habitat availability, it may be more practical to set habitat objectives for this guild by measuring and modeling levels of natural and anthropogenic disturbance (e.g. extent of flooding and fires, intensive logging, farmland retirement, managed right-of-ways).

Figure 28: Map showing Relative Density of Priority Shrub/ Successional Birds in Southern Ontario



Source: Preliminary BBA Point Count Data (2001-04).

7.6 Conservation Action Needs of Shrub/Successional Landbirds

7.6.1 Monitoring

- Periodically assess (every 5 years) the abundance, distribution and population status of Golden-winged Warbler, Prairie Warbler and Yellow-breasted Chat.
- Complete a comprehensive region-wide mapping of native shrubland habitats (swamp thickets, riparian thickets, alvar shrubland, dune shrubland) including assessment of current condition, landbird occurrence, and restoration potential.

7.6.2 Research and Evaluation

- Identify factors causing declines and/or limiting population growth of Black-billed Cuckoo, Brown Thrasher, Eastern Towhee, Field Sparrow, Golden-winged Warbler (in SW and NW sub-regions) and Yellow-breasted Chat.

- Research the interactions of Blue-winged Warbler and Golden-winged Warblers in areas of overlap.
- Develop a spatial habitat supply model to track trends in shrub/early successional habitats in southern Ontario.
- Determine an appropriate guideline for the minimum threshold needed to maintain shrubland bird biodiversity throughout this region.

7.6.3 Planning and Policy

- Coordinate shrub/successional landbird conservation actions with those for non-landbird shrubland species, such as American Woodcock, and habitat management actions to maintain grassland habitat or increase forest cover.
- Develop landscape-level management plans to ensure an adequate and diverse supply of shrub/successional habitat.

7.6.4 Outreach/Education

- Promote the development and use of best management practices guidelines for the

conservation of priority shrubland birds on managed shrublands (e.g., roadsides and utility corridors).

- Promote the value of riparian and lakeshore thickets as both stream buffers and important habitat for breeding and migrant landbirds.
- Promote the value of prescribed burns as a safe, beneficial and cost-effective land management practice for maintaining natural shrubland habitats (shrub alvar, savannah).
- Promote the development of educational materials for rural landowners and land managers, to raise public awareness of the conservation value of “scubby” lands (e.g. *Birds on the Farm* booklet by McGauley et al. 2004).
- Promote the value of prescribed burns as a safe, beneficial and cost-effective land management practice for restoring and maintaining natural shrublands.
- Encourage ranchers to adjust the timing and duration of livestock grazing activities to minimize adverse effects on shrubland birds and habitats.

7.6.5 Applied Conservation

- Evaluate the effects of increasing the amount of shrub/successional habitat and/or using various habitat management techniques at demonstration sites on the abundance, productivity and site fidelity of priority shrub/ successional landbirds.
- Restore and manage for native shrub species along roadsides, right of ways, riparian corridors, use practices to avoid the use of herbicides, retain snags and downed woody debris and leaf litter, and control the spread of exotic vegetation.
- Promote the restoration and protection of natural shrubland habitats in areas of importance to priority shrub/successional landbirds including:
 - Eastern Lake St. Clair
 - Pelee Island
 - Point Pelee
 - Port Franks Forested Dunes
 - Elgin County
 - Norfolk County
 - Halton County
 - Twelve Mile Creek Headwaters
 - Carden Plain
 - Prince Edward County
 - Napanee Limestone Plain
 - Frontenac Axis

8 Conservation of Landbirds in Other Habitats

8.1 Landbirds Breeding in Other Habitats

Thirty-three (20%) of the 166 landbird species breeding in southern Ontario (Appendix D) are not closely associated with any of the three priority habitats discussed in chapters 5, 6, and 7. Many of these species are habitat generalists and breed in a wide variety of habitats, but some are associated with particular habitat categories, such as open wetlands, riparian and shoreline areas, or urban areas.

8.1.1 Priority Landbirds in Other Habitats

The six priority landbirds (Table 15) in the “other habitat” group all occur in the breeding season. Bald Eagle is also a priority wintering species, as significant numbers winter locally in southern Ontario. Bank Swallow and Chimney Swift are also included in the aerial foraging insectivores guild (see Chapter 8).

Reasons for the priority status of the various species included in this chapter are diverse (Table 15), as are their habitat preferences.

Four of these priority species (Bald Eagle, Baltimore Oriole, Bank Swallow and Belted Kingfisher) show at least some preference for riparian or shoreline habitats. Shoreline habitats, particularly along the shores of the Lower Great Lakes in this region, are also of

critical importance to many landbird species during migration (see Appendix H).

The other two species, Peregrine Falcon and Chimney Swift, are found primarily in urban settings in southern Ontario (nesting in chimneys, or on ledges on the face of tall building, respectively). Both of these species will also nest in natural settings with suitable nesting sites (cliffs or hollow trees, respectively), but these features are scarce in this region.

8.2 Factors Affecting Priority Landbirds in Other Habitats

8.2.1 Riparian and Shoreline Features

Four priority species are associated with riparian and/or shoreline features. Issues affecting riparian and shoreline habitats in this region include:

- Shorelines are attractive features for new development and there is relatively little undeveloped shoreline in southern Ontario.
- Flood-prone riparian areas are subject to a variety of land use and planning controls
- Many riparian areas lack adequate buffer strips, particularly in agricultural and urban settings.
- Riparian habitats are affected by flood control and drainage measures and by the cumulative impacts of development and habitat alteration in the watershed.
- Climate change models indicate that riparian

Table 15: Priority Landbirds in Other Habitats in ON BCR 13, with Reasons for Priority Status

Priority Species	Reason(s) for Priority Status						Add Species of Mgmt Interest
	Concern		Stewardship		At Risk		
	Cont	Reg	Cont	Reg	CA	ON	
Bald Eagle						EN	
Baltimore Oriole		Y		Y			
Bank Swallow				Y			
Belted Kingfisher		Y					
Chimney Swift							Y
Peregrine Falcon					TH	EN	

Notes: **Cont** = Continental level, **Reg** = Regional (ON BCR 13) level, **CA** = Canada, **ON** = Ontario, **Add Species of Mgmt Interest** = Additional Species of Regional Management Interest. See Appendix 1 for details. **EN** = Endangered, **TH** = Threatened.

and shoreline habitats in this area could be affected by greater fluctuations in stream flow, increased number of high flow and storm events, and lower lakes levels.

8.2.2 Food Supply

The foraging habitats of the priority species in this group are diverse. Food supply may be a limiting factor or significant concern for some of these species including the aerial foragers (see next chapter), the two fish-eating species, and the two long-lived raptors.

Fish-eating Species

Bald Eagle and Belted Kingfisher, forage in aquatic habitats including lakes, rivers, and open wetlands. Wintering Bald Eagles are often concentrated around the hot water outfalls, such as at power generating stations and industrial sites. Water clarity directly affects the suitability of these aquatic habitats for foraging.

Bioaccumulation of Toxins in Long-lived Species

The level of persistent contaminants in the aquatic and terrestrial ecosystems (and wintering grounds) is of particular concern to Bald Eagles and Peregrine Falcon populations in this region. These long-lived raptors can accumulate significant levels of persistent chemicals, resulting in reduced productivity and/or shortened life spans. Although productivity levels in southern Ontario have rebounded since the ban on the use of DDT, Bald Eagles breeding in this region still suffer from reduced life spans (Grier et al. 2003).

8.2.3 Availability of Nesting Sites

The availability of suitable nesting sites is a limiting factor for several species in this group.

Bank Swallow and Belted Kingfisher are bank-nesting species that nest along eroded riverbanks and the walls of sand and gravel pits. Bank Swallows often nest in large colonies, whereas kingfishers are generally solitary nesters. Nests in active quarries are prone to disturbance during the nesting season. Flood and erosion control measures influence the availability of suitable riverbank nesting sites.

Chimney Swift, Peregrine Falcon and Bald Eagle also have specialized nesting requirements (see Species Accounts in Appendix F) that require year-round protection as active sites are frequently reused.

8.3 Conservation Objectives for Priority Landbirds in the Other Habitats Group

Abundance and distribution objectives for the individual priority landbird species in this group are presented in the individual Species Accounts (Appendix F) and summarized in Table 16.

The overall objective for Peregrine Falcon and Bald Eagle in Ontario is **recovery** to a more secure status, as directed by federal and provincial species at risk recovery strategies. The other four species in this group have also undergone significant long-term declines and the immediate objective for these species is to **reverse** these declines.

8.3.1 Abundance Objectives

Abundance objectives for the Bald Eagle and Peregrine Falcon are to be determined in the provincial Recovery Plan for the Bald Eagle in Ontario, and the federal Recovery Strategy for the *anatum* subspecies of Peregrine Falcon, respectively. Both these plans are presently under development. The population objectives in the previous Peregrine Falcon Recovery Plan (Erickson *et al.* 1988) have been achieved.

Population demographics are a particular concern for both these long-lived raptors, as they are sensitive to environmental contaminants. Demographic objectives could be established as nest productivity of both species in southern Ontario is regularly monitored, and nestlings are often banded and/or subject to toxicological studies to determine longevity and toxin levels.

Abundance objectives for the other four priority species in this group (Table 16) are set at 1968-1977 BBS levels.

8.3.2 Distribution Objectives

Three of the priority species in Table 16 have been detected less frequently during the current Atlas (2001-03 data) than in the 1981-85 period: Bank Swallow, Belted Kingfisher, and Chimney Swift. The distribution declines in these species have been widespread, occurring in all sub-regions. Distribution objectives (Table 16) for these declining species have been set based on levels during the first Atlas. Despite the apparent population decline, there is no evidence of a decline in the distribution of Baltimore Oriole in southern Ontario.

8.3.3 Conservation Focus

The primary conservation focus (Table 16) of the six priority species included in this chapter involve monitoring the recovery of the two endangered/threatened species, and research to identify the factors causing the observed declines in the other four species. Possible causal factors that need to be assessed include food availability, food quality (contaminants), severe weather events, climate change and/or the availability of suitable nesting sites.

See individual Species Accounts (Appendix F) for additional details and specific conservation actions.

8.4 Conservation Actions for Priority Species in the Other Habitat Group

8.4.1 Monitoring

- Complete comprehensive region-wide mapping of riparian habitats including an assessment of current condition, vegetation structure, and restoration potential.

8.4.2 Research and Evaluation

- Identify the cause(s) of the observed or apparent declines in the population and/or distribution of the following priority species in southern Ontario: Baltimore Oriole, Bank Swallow, Belted Kingfisher, and Chimney Swift.
- Research the impact of aquatic and landscape factors on the productivity and survivorship of priority riparian/shoreline landbirds including Bald Eagle, Bank Swallow, Baltimore Oriole, and Belted Kingfisher.

8.4.3 Outreach/Education

- Include guidelines for the protection of bank-nesting species, such as Bank Swallow and Belted Kingfisher, in best management practices for operators of sand and gravel pits.
- Continue to develop and implement a communications and reporting strategy to draw attention to the links between toxin levels in Bald Eagle and Peregrine Falcon populations, and human and ecosystem health.

8.4.4 Applied Conservation

- Identify and protect specialized nesting sites, including Bald Eagle nest trees, Peregrine Falcon nesting sites, large Bank Swallow nesting colonies, and large post-breeding roost sites for Chimney Swift and Bank Swallow.
- Enhance water clarity in water bodies by implementing remedial measures such as creation of buffer strips and fencing to keep livestock out of streams.

Table 16: Summary of Conservation Objectives and Conservation Focus for Priority Landbirds in Other Habitats in southern Ontario (see also Species Accounts in Appendix F).

Species	Overall Objective	Abundance Objective	Distribution Objective	Conservation Focus
Bald Eagle#	Recovery	Recover population to former level (estimate of 200 pairs in southern Ontario ca. 1900, currently 25+ active nests).	To be determined in provincial Recovery Plan, including re-establishing nesting population along Lake Ontario shoreline.	<i>Recovery/Monitoring:</i> Continue monitoring the recovery of this bio-sentinel species.
Peregrine Falcon#	Recovery	As determined in Recovery Strategy (10 breeding pairs in 2000).	As determined in Recovery Strategy.	<i>Recovery/Monitoring:</i> Continue monitoring the recovery of this bio-sentinel species.
Baltimore Oriole	Reverse Decline	Restore to BBS Index of 9.8, ~250,000 birds (current Index of 7.4, ~200,000).	Maintain current (98% preliminary)	<i>Research:</i> Identify factors causing population decline and/or limiting population growth.
Bank Swallow	Reverse Decline	Restore to BBS Index of 22.1, ~600,000 (current Index 8.8, ~250,000).	Restore to 84% (reverse losses in all sub-regions)	<i>Outreach:</i> Develop and promote BMPs for bank-nesting birds to minimize destruction or disturbance of nest sites during the breeding season.
Belted Kingfisher	Reverse Decline	Restore to BBS Index of 0.89, ~30,000 (current Index 0.45, ~15,000)	Restore to 97% (reverse losses in all sub-regions).	<i>Outreach:</i> Develop and promote BMPs for bank-nesting birds to minimize destruction or disturbance of nest sites during the breeding season.
Chimney Swift	Reverse Decline	Restore to BBS Index of 1.7, ~60,000 birds (current Index 0.43, ~10,000 birds)	Restore to 75% of squares (reverse losses in all sub-regions).	<i>Nest Site Protection, Enhancement and Monitoring:</i> Identify, monitor and protect existing nesting sites (chimneys and hollow trees) and construct and monitor artificial nesting structures to offset losses.

Objectives for Endangered and Threatened Species are from Recovery Strategy, Recovery Plan and Status Report documents as available. See Species Accounts, Appendix F.

9 Conservation of Aerial-foraging Insectivorous Landbirds

9.1 Aerial Insectivores

The abundance and distribution of most aerial-foraging insectivorous landbirds breeding in southern Ontario (Table 17) have declined over the past two decades, for unknown reasons (Heagy and McCracken 2004, 2005). This foraging guild includes three priority landbirds: Whip-poor-will (in forest habitat suite), Bank Swallow (other habitats group) and Chimney Swift (other habitats group).

The ten landbirds in this guild (Table 17) are taxonomically and ecologically diverse. All of them forage “on the wing” (in flight), capturing and eating flying insects. Most are diurnal feeders but the three nightjars (Chuck-will’s-widow, Common Nighthawk and Whip-poor-will) are crepuscular, feeding mostly at dawn and dusk. The various species in this guild have diverse and somewhat specialized nesting requirements, but are generally widespread as breeding birds in southern Ontario. All aerial insectivores require large open areas for foraging, such as marshes, agricultural fields, or urban settings. All species in this guild require a steady supply of flying insects and are therefore highly vulnerable to periods of cold, wet or windy weather that can impede foraging and reduce their food supply. Flying insect

populations are also sensitive to pesticides and pollution affecting the land, air, or water.

9.2 Threats

The species in this group share a common feeding strategy but are otherwise dissimilar. Consequently, food availability on the breeding grounds is suspected to be a possible common factor causing the recent population declines.

Episodes of mass mortality of Purple Martins and swallows have been documented as a result of severe weather (below freezing temperatures and/or multiple days of cold, wet, windy weather) in late spring or early summer. For example, in June 2002 there were widespread reports of dead and dying swallows, Purple Martins and Eastern Bluebirds following two days of unseasonable below-freezing temperatures (Bannon et al. 2002, Hussell 2003).

In addition to direct mortality due to episodic food shortages caused by severe weather, the observed declines may be linked to reduced productivity due to reduced numbers of flying insects. Factors that have the potential to contribute to a decline in flying insect populations include:

- Climate change (insect productivity and

Table 17: Changes in the Abundance and Distribution of Aerial-foraging Insectivorous Landbirds Breeding in southern Ontario.

Species	BBS Trend, 1968-2003 (%/year)	BBS Trend, 1983-2003 (%/year)	BBA Change, 1981-85 to 2001-04 (% of squares)
Bank Swallow	-3.7% *	-5.4%	-19% **
Barn Swallow	-0.6%	-1.7% **	-1%
Chimney Swift	-4.6% **	-7.7% **	-34% **
Chuck-will's-widow			-58%
Cliff Swallow	+1.8%	-2.7%	-6% *
Common Nighthawk	-1.7%	-1.3%	-45% **
Purple Martin	-2.3% *	-3.9% **	-26% **
N. Rough-winged Swallow	-0.6%	-3.7% **	-13% **
Tree Swallow	+2.3% **	+0.6%	-0.3%
Whip-poor-will	-4.7%	-6.2%	-43% **
All Aerial-foraging Insectivores	-0.2%	-1.3% **	-17% **

Notes: **significant trend (p#0.05); * near-significant trend (p#0.1)

survival rates are influenced by temperature and moisture conditions);

- Degradation of aquatic habitats used by insect larvae and nymphs (e.g. dragonfly nymphs are sensitive to water quality);
- Use of non-specific larvicides to control mosquito larvae (limit spread of West Nile Virus) also affects the aquatic phase of many other flying insects including dragonflies, mayflies, midges, etc.;
- Changes in livestock and manure management practices (more animals kept indoors in screened barns, covered manure storage facilities) have reduced the number of flies around barns;
- Aerial spraying of insecticides for forest pests (e.g. gypsy moth) or agricultural pests (soybean aphid);
- The spread of exotic insect species (Asian ladybeetle) and emerging insect diseases (bee mites).

For at least some species in this group, other factors are thought to be contributing to recent declines including:

- Loss of nesting sites for Chimney Swift, Common Nighthawk, and Barn Swallow.
- Atmospheric pollution may be a factor in Common Nighthawk declines in urban areas;
- Degradation of nesting habitat (forest fragmentation, increased predation on ground nests) may be affecting Whip-poor-will productivity (Brown et al. 1999b).

At present, very little information is available on the proximate cause(s) of the observed decline in aerial foraging insectivores and further research is needed.

9.3 Conservation Objectives for Aerial Insectivores

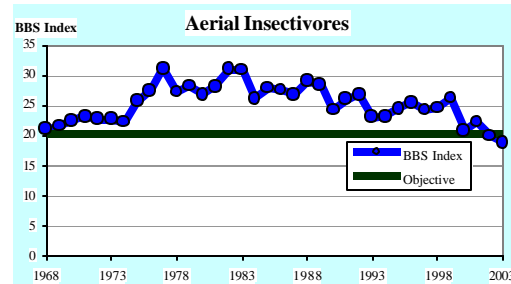
The overall objective for this guild is to reverse recent abundance and distribution declines.

9.3.1 Guild Abundance Objective

Despite the observed population declines in many of aerial foragers (Table 17), the long-term trend in the BBS Guild Index for this guild is apparently near zero (

Figure 29). Recent declines are offset by an apparent increase during the first 10 years of the BBS.

Figure 29: Long-term BBS Trend, 1968-2003, and Guild Abundance Objective for Aerial Insectivores in southern Ontario.

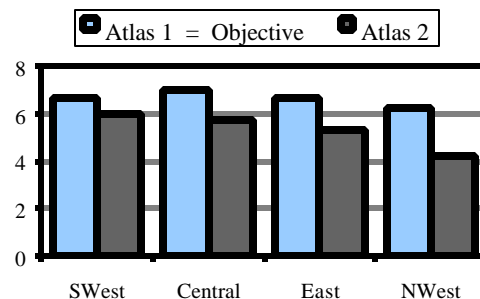


9.3.2 Guild Distribution Objective

Almost all of the landbirds in this suite are being reported less frequently during the second Breeding Bird Atlas than in the first Atlas, and none are more widespread (Table 17). Interim results from the second Atlas show a significant decrease in the average number of aerial insectivores detected across southern Ontario (6.8 to 5.6 species per Atlas square) and in each sub-region (Figure 30). There appears to be a north-south gradient to the declines, with the greatest change is in the Northwest (-33%), and the least in the Southwest (-11%).

The distribution objective for this foraging guild is to reverse these declines and restore aerial insectivores to the 1981-85 BBA levels in each of the four sub-regions by 2021-25.

Figure 30: Changes in Aerial Insectivore Species Richness and Preliminary Guild Distribution Objectives (=Atlas 1) in ON BCR 13 sub-regions.



Source: BBA1 (1981-85) and BBA2 (2001-04 preliminary) data.

9.4 Recommended Conservation Actions for Aerial Insectivores

9.4.1 Monitoring

- Develop periodic crepuscular survey to improve understanding of the abundance, distribution and population trends in crepuscular species including Whip-poor-will, Common Nighthawk, and Chimney Swift.
- Encourage submission of current and historic nest record data to the Ontario Nest Records Scheme/ Project NestWatch to improve understanding of changes in productivity, especially for Barn Swallows, Tree Swallows and Purple Martins,

9.4.2 Research and Evaluation

- Identify factors causing population decline and/or limiting population growth of aerial foraging insectivores.
- Analyze long-term data sets and broad-scale nest record datasets to evaluate the importance of weather and other factors in the decline of aerial insectivores. Potentially important data sets in southern Ontario including the Ontario Nest Records Scheme/Project Nestwatch data (James and Peck xxxx; [URL www.bsc-eoc.org/...](http://www.bsc-eoc.org/)), Purple Martin Society nest box records ([URL](#)), and site-specific long-term data sets (e.g. long-term Tree Swallow study at Long Point Bird Observatory includes 30+ years of data on nest box occupancy rates, productivity, survivorship, and insect availability at three sites).

10 Plan Implementation

10.1 Implementation Philosophy

This landbird conservation plan provides a comprehensive set of priorities, conservation objectives and recommended actions aimed at sustaining native landbirds and their habitats in the Ontario portion of the Lower Great Lakes/ St. Lawrence Plain (BCR 13), and contributing to continent-wide efforts to sustain all North American landbirds. Coordinated action on many fronts will be needed to communicate the priorities and achieve the objectives established in this plan.

The successful implementation of this plan will ultimately depend on the allocation of resources and engaging a wide range of actors, including all levels of government, non-profit conservation organizations, industry associations, research institutions, and individual landowners and Citizen Scientists. Effective partnerships will be essential to developing the consensus, cooperation, coordination and communications necessary to influence the actions of this large and diverse group. A graduated approach, that engages existing partnerships to build capacity and foster the development of new partnerships, is both practical and strategic.

10.2 Implementation Strategy

It is anticipated that existing regional partnerships will play a major role in implementing this plan. In particular, the Eastern Habitat Joint Venture (<http://www.on.ec.gc.ca/wildlife/ehjv/oehjv-e.html>) provides a proven model for building effective partnerships to deliver the conservation actions identified in this plan, and for coordinating landbirds conservation actions in southern Ontario with NABCI's all-birds conservation initiatives in BCR 13. This plan is expected to guide implementation activities under emerging Ontario EHJV landbird conservation initiatives.

Many of the conservation actions identified in this plan will be implemented directly by agencies, organizations and partnerships that have relevant mandates and programs. The EHJV could play an important role in coordinating and evaluating the implementation of this landbird conservation plan.

Because most landbirds in this region are migratory, their conservation also depends on influencing conservation activities outside of Ontario. The existing Canadian and international Partners in Flight partnerships provide forums for developing consensus and cooperation across jurisdictional boundaries, necessary to ensuring the conservation of landbirds throughout their annual life cycles.

10.3 Evaluating Progress

Landbird conservation priorities, and the ensuing objectives and recommended actions, are expected to change over time as bird populations respond to changes in the environment.

Insert Graphic here to show cyclical nature of landbird conservation planning

Assess Priorities – Set Objectives – Recommend Actions – Implement Actions-Evaluate Actions ---

This plan is therefore a working document and will need to be periodically revised and reviewed as follows:

- The priority species lists will be revisited regularly as new data and analyses become available (e.g. following completion of the second Atlas project, any changes to Species At Risk status, or posting of new species assessment data in the PIF continental database).
- Progress reports will also be prepared periodically (approximately every five years) to measure progress towards achieving the population, distribution and other objectives set out in this plan, to revisit these objectives in

light of new data, and to adjust objectives if necessary.

- Conservation actions will be regularly updated and adapted based on information resulting from evaluating monitoring results (adaptive management feedback) and new research, with a complete review scheduled approximately every five years.

Updates and five year reviews will be undertaken by the Ontario PIF partnership, coordinated through Environment Canada Ontario Region and Ontario Ministry of Natural Resources.

10.4 Next Steps

This plan establishes priorities, objectives and recommended actions for the conservation of landbirds in southern Ontario. Some of the next steps to expand and follow up on the information in this plan include:

- Develop measurable habitat objectives for those priority species and suites where habitat availability is considered a limiting factor.
- Finalize the specific distribution objectives for priority species once the final data from the second BBA are available.
- Use the landbird density maps produced by the second BBA to highlight geographic areas supporting important concentrations of priority landbirds.
- Develop a modeling approach to estimate the impact on priority species of local changes to habitat, as might occur due to active management.
- Develop landbird priorities at the municipal level, using the second BBA data to update an earlier analysis by Couturier (1999).

Consideration should also be given to preparing an implementation plan, that prioritizes the conservation actions identified in this plan and develops specific strategies and tactics in each of the five key action areas: monitoring, research and evaluation, planning and policy, outreach and education, and applied conservation.

11 References

- Askins, R.A. 2002. Restoring North America's Birds: Lessons from Landscape Ecology. 2nd Edition. Yale University Press, New Haven, CT.
- Austen, M., R. Pratt, M. Cadman, D. Cuddy, and R. Knapton. 1997. National Recovery Plan for the Henslow's Sparrow. Report No. 17. Recovery of Nationally Endangered Wildlife, Ottawa. 45 pp.
- Austen, M.J.W., C.M. Francis, D. B. Burke, and M.S.W. Bradstreet. 2001. Landscape context and fragmentation effects on forest birds in southern Ontario. *The Condor* 103: 701-714.
- Badzinski, D.S. and C.M. Francis. 2000. An evaluation of species coverage by the Canadian Migration Monitoring Network. Unpublished report by Bird Studies Canada. 31 pp. [URL www.bsc-eoc.org/](http://www.bsc-eoc.org/)
- Bakowsky and J.L. Riley. 1994.**
- Bakowsky, W.D. 1996. Natural heritage resources of Ontario: vegetation communities of southern Ontario. Ontario Ministry of Natural Resources, Natural Heritage Information Centre, Peterborough. 21 pp.
- Bannon, P., S. Denault, Y. Aubry, N. David. 2002. Regional Reports: Quebec. *North American Birds* 56(2): 282-283.
- Bart, J, K.P. Burnham, E.H. Dunn, C.M. Francis and C.J. Ralph. 2004. Goals and strategies for estimating trends in landbird abundance. *J. Wildl. Manage.* 68(3):611-626.
- Bartgis, R., J. Soule, G. Hammerson, and D.W. Mehlman. 1992. Loggerhead Shrike (*Lanius ludovicianus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.
- BBA 2005. Ontario Breeding Bird Atlas website. <http://www.birdsontario.org/atlas/atlasmain.html>
- BBS 2005. Breeding Bird Survey websites. <http://www.mbr-pwrc.usgs.gov/bbs/trend/guild03.html>. and http://www.cws-scf.ec.gc.ca/birds/Trends/default_e.cfm
- Best, L.B., T.M. Bergin and K.E. Freemark. 2001. Influence of landscape composition on bird use of rowcrop fields. *Journal of Wildlife Management* 65(3): 442-449.
- Bildstein, K. L., and K. Meyer. 2000. Sharp-shinned Hawk (*Accipiter striatus*). In *The Birds of North America*, No. 482 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Blancher, P. 2003. The Importance of North America's Grasslands to Birds. Bird Studies Canada unpublished report to the Commission for Environment Cooperation, May 2003. <http://www.bsc-eoc.org/grassbirdsprt.html>
- Boutin, C., K.E. Freemark, and D.A. Kirk. 1999. Spatial and temporal patterns of bird use in farmland in southern Ontario. *Canadian Field-Naturalist* 113(1): 430-460.
- Brennan, L.A. 1999. Northern Bobwhite (*Colinus virginianus*). In *The Birds of North America*, No. 397 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Brown, B., M. Koenen and D.W. Mehlman. 1999a. Louisiana Waterthrush (*Seiurus motacilla*). Species Management Abstract, The Nature Conservancy, Arlington, VA.
- Brown, B., M. Koenen, and D.W. Mehlman. 1999b. Whip-poor-will (*Caprimulgus vociferus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.
- Brown, C.R. 1997. Purple Martin (*Progne subis*). In *The Birds of North America*, No. 287 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Brown, C.R., and M.B. Brown. 1995. Cliff Swallow (*Hirundo pyrrhonota*). In *The Birds of North America*, No. 149 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

- Brown, C.R., and M.B. Brown. 1999. Barn Swallow (*Hirundo rustica*). In *The Birds of North America*, No. 452 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Brownell, V.R. and J. L. Riley. 2000. The Alvars of Ontario: Significant Alvar Natural Areas in the Ontario Great Lakes Region. Federation of Ontario Naturalists.
- Buehler, D.A. 2000. Bald Eagle (*Haliaeetus leucocephalus*). In *The Birds of North America*, No. 506 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Burke, D. and E. Nol. 2000 Landscape and fragment size effects on reproductive success of forest breeding birds. *Ecological Applications* 10:1749-1761.
- Cadman, M., and A.M. Page. 1994. Status report on the Yellow-breasted Chat (*Icteria virens*) in Canada. Committee on the Status of Endangered Wildlife in Canada.
- Cadman, M.D. 1994. The Status of the Short-eared Owl (*Asio flammeus*) in Ontario. COSEWIC, Ontario Rare Breeding Bird Program prepared for the OMNR, Terrestrial Ecosystems Branch. 32 pp.
- Cadman, M.D., P.F.J. Eagles, and F.M. Helleiner. 1987. Atlas of the Breeding Birds of Ontario. Federation of Ontario Naturalists and Long Point Bird Observatory. University of Waterloo Press, Waterloo, ON.
- Cadman, Michael D. and Annette M. Page. 1994. Status Report on the SHORT-EARED OWL, *Asio flammeus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 60 pp.
- Campbell, I.D. and C. Campbell. 1994. The impact of Late Woodland land use on the forest landscape of southern Ontario. *Great Lakes Geographer* 1: 21-29.
- Canadian Wildlife Service. 2004. How Much Habitat is Enough? A Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern. 2nd Edition. Ministry of Public Works and Government Services Canada. 80 pp. <http://www.on.ec.gc.ca/wildlife/docs/habitatframework-e.html>.
- Carey, M., D.E. Burnhans, and D.A. Nelson. 1994. Field Sparrow (*Spizella pusilla*). In *The Birds of North America*, No. 104 (A. Poole, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Carter, M.F., Hunter, W.C, Pashley, D.N., and K.V. Rosenberg. 2002. Setting Conservation Priorities for Landbirds in the United States: The Partners in Flight Approach. *The Auk*: 117(2):541-548.
- Cavitt, J.F. and C.A. Haas. 2000. Brown Thrasher (*Toxostoma rumum*). In *The Birds of North America*, No. 557 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Chapman, L.J. and D.F. Putnam. 1984. The physiography of Ontario, 3rd edition. Special Volume 2. Ontario Research Foundation, Ontario Geological Survey. 270 pp and 1 map.
- Cheskey, E.D. 1995. Towards Conserving the Birds of Ontario. Federation of Ontario Naturalists, Long Point Bird Observatory, Canadian Wildlife Service, Ministry of Natural Resources. 48 pp.
- Cink, C.L. 2002. Whip-poor-will (*Caprimulgus vociferus*). In *The Birds of North America*, No. 620 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Cink, C.L. and C.T. Collins. 2002. Chimney Swift (*Chaetura pelagica*). In *The Birds of North America*, No. 646 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Confer, J.L. 1992. Golden-winged Warbler (*Vermivora chrysoptera*). In *The Birds of North America*, No. 20 (A. Poole, P. Stettenheim, and F. Gill, eds.). The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Confer, J.L., G. Hammerson, and D.W. Mehlman. 1992. Golden-winged Warbler (*Vermivora chrysoptera*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Conway, C.J. 1999. Canada Warbler (*Wilsonia canadensis*). In *The Birds of North America*, No. 421 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

COSEWIC 2004. Canadian Species at Risk, November 2004. Committee on the Status of Endangered Wildlife in Canada. 49 pp.
http://www.cosewic.gc.ca/eng/sct0/sar_2004_11_e.cfm

Couturier, A. 1999. Conservation Priorities for the Birds of Southern Ontario. Bird Studies Canada. 17 pp plus appendices.

Crocoll, S.T. 1994. Red-shouldered Hawk (*Buteo lineatus*). In *The Birds of North America*, No. 107 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

Dechant, J.A., M.F. Dinkins, D.H. Johnson, L.D.Igl, C.M.Goldade, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Vesper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/vesp/vesp.htm (Version 28MAY2004).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D Igl, C.M. Goldade, A.L. Zimmerman, and B.L. Euliss. 1999. Bobolink (*Dolichonyx oryzivorus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D Igl, C.M. Goldade, A.L. Zimmerman, and B.L. Euliss. 2003. Effects of management practices on grassland birds: Bobolink. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/bobo/bobo.htm (Version 12DEC2003).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M.Goldade, M.P. Nenneman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Grasshopper Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/grsp/grsp.htm (Version 12DEC2003).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, M.P. Nenneman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Short-eared Owl. Northern Prairie Wildlife Research Center, Jamestown, ND.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/seow/seow.htm (Version 12DEC2003).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, B.D. Parkin, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Field Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/fisp/fisp.htm (Version 12DEC2003).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M. Goldade, B.D. Parkin, B.R. Euliss, M. Koenen, G. Hammerson, and D.W. Mehlman. 1999. Field Sparrow (*Spizella pusilla*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M.Goldade, M.P. Nenneman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Short-eared Owl. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/seow/seow.htm (Version 12DEC2003).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M.Goldade, M.P. Nenneman, A.L. Zimmerman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Loggerhead Shrike. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/losh/losh.htm (Version 12AUG2004).

Dechant, J.A., M.L. Sondreal, D.H. Johnson, L.D. Igl, C.M.Goldade, M.P. Nenneman, and B.R. Euliss. 2003. Effects of management practices on grassland birds: Northern Harrier. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online.
http://www.npwrc.usgs.gov/resource/literatr/gras_bird/noha/noha.htm (Version 12AUG2004).

- Deeble, B., M. Koenen and D.W. Mehlman. 2001. Black-billed Cuckoo (*Coccyzus erythrophthalmus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.
- DeJong, M.J. 1996. Northern Rough-winged Swallow (*Stelgidopteryx serripennis*). In *The Birds of North America*, No. 234 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Washington, D.C.: The American Ornithologists' Union.
- Downes, C.M., and B.T. Collins. 2003. The Canadian Breeding Bird Survey, 1967–2000. Canadian Wildlife Service, Environment Canada, Ottawa. Progress Note No. 219. ISBN 0-662-33628-3 Catalogue No. CW69-9/219E
- Downes, C.M., E.H. Dunn, and C.M. Francis. 2000. Canadian Landbird Monitoring Strategy: monitoring needs and priorities in the new millennium. *Partners in Flight – Canada*, Ottawa. 64 pp.
- Dunford, W. and K. Freemark. 2005. Matrix matters: effects of surrounding land uses on forest birds near Ottawa, Canada. *Landscape Ecology* (accepted).
- Dunn, E.H. 2002. National Action Needs of Canadian Landbird Conservation, Version 1. Canadian Wildlife Service Landbird Committee, Ottawa, Canada. http://www.cws-scf.ec.gc.ca/birds/action/index_e.cfm
- Eckerle, K.P. and C.F. Thompson. 2001. Yellow-breasted Chat (*Icteria virens*). In *The Birds of North America*, No. 575 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.
- Environment Canada, Canadian Climate Normals or Averages 1971-2000. Modified 2004-02-25. URL: http://www.climate.weatheroffice.ec.gc.ca/climate_normals/index_e.html
- Environment Canada. 2004. Kirtland's Warbler account on the Species at Risk website. Last update: 2004-11-10. <http://www.speciesatrisk.gc.ca>.
- Environment Canada. 2004. Yellow-breasted Chat *virens* subspecies account on the Species at Risk website. Last update: 2004-11-10. <http://www.speciesatrisk.gc.ca>.
- Erickson, G., R. Fyfe, R. Bromley, G.L. Holroyd, D. Mossop, B. Munro, R. Nero, C. Shank, T. Wiens, 1988. *Anatum Peregrine Falcon Recovery Plan*. Ottawa: Environment Canada, Canadian Wildlife Service, 52 pp.
- Evans Ogden L.J. and B.J. Stutchbury. 1994. Hooded Warbler (*Wilsonia citrina*). In *The Birds of North America*, No. 110 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.
- Friesen, L. and M. Stabb. 2001. Preserve Endangered Songbirds: Acadian Flycatchers and Hooded Warblers. Factsheet. Bird Studies Canada. 8 pp.
- Friesen, L., M. Cadman, P. Carson, K. Elliott, M. Gartshore, D. Martin, J. McCracken, J. Oliver, P. Prevett, B. Stutchbury, D. Sutherland, and A. Woodliffe. 2000. National Recovery Plan for Acadian Flycatcher (*Empidonax vireescens*) and Hooded Warbler (*Wilsonia citrina*). National Recovery Plan No. 20. Recovery of National Endangered Wildlife (RENEW). Ottawa, Ontario. 33 pp.
- Garrison, B.A. 1999. Bank Swallow (*Riparia riparia*). In *The Birds of North America*, No. 414 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.
- Gill, F. B, R.A. Cantebury, and J.L. Confer. 2001 Blue-winged Warbler (*Vermivora pinus*). In *The Birds of North America*, No. 584 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.
- Greenlaw, J.S. 1996. Eastern Towhee (*Pipilo erythrophthlamus*). In *The Birds of North America*, No. 262 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Greenlaw, J.S. 1996. Eastern Towhee (*Pipilo erythrophthalmus*). In *The Birds of North America*, No. 262 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Grier, J.W, T. Armstrong, P. Hunter, S. Lockhart, B. Ranta. 2003. Report on the Status

- of Bald Eagles in Ontario. Ontario Ministry of Natural Resources, Committee on the Status of Species at Risk in Ontario. 86 pp.
- Hagan, J.M., D.W. Johnston (eds.). 1992. Ecology and conservation of neotropical migrant landbirds. Smithsonian Institution Press, Washington, DC. 609 pp.
- Hamas, M.J. 1994. Belted Kingfisher (*Ceryle alcyon*). In *The Birds of North America*, No. 84 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Hamel, P.B. 2000. Cerulean Warbler (*Dendroica cerulea*). In *The Birds of North America*, No. 511 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Hayes, C., A. Milliken, R. Dettemers, K. Loftus, B. Collins, and I. Ringuelet. 2002. Integrated Migratory Bird Planning in the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region. USDA Forest Service General Technical Report PSW-GTR-191.
- Heagy, A.E. and J. McCracken. 2004. State of Ontario's Migratory Landbirds. Bird Studies Canada. <http://www.bsc-eoc.org/download/StateofONbirds.pdf>
- Heagy, A.E. and J.D. McCracken. 2005. Ontario: State of the Region: North American Birds 58(4): 521
- Herkert, J.R., P.D. Vickery and D.E. Kroodsmas. 2002. Henslow's Sparrow (*Ammodramus henslowii*). In *The Birds of North America*, No. 672 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Herkert, J.R. 2003. Effects of management practices on grassland birds: Henslow's Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/hesp/hesp.htm> (Version 12DEC2003).
- Hills, G.A. 1959. A Ready Reference to the Description of the Land of Ontario and Its Productivity (A compendium of maps, charts, tables and brief comments). Division of Research, Ontario Department of Lands and Forests. Maple, ON. 142 pp.
- Hjertaas, D., et al., 1993. *National Recovery Plan for the Greater Prairie-Chicken*. Report No. 5. Ottawa: Recovery of Nationally Endangered Wildlife Committee, 18 pp.
- Holmes, S.B., D.M. Burke, K.A. Elliott, M.D. Cadman and L. Friesen. 2004. Partial cutting of woodlots in an agriculture-dominated landscape: effects on forest bird communities. *Can. J. For. Res.* 34: 2467-2476.
- Holt, D.W. and S.M. Leasure. 1993. Short-eared Owl (*Asio flammeus*). In *The Birds of North America*, No. 62 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Hughes, J. 2001. Black-billed Cuckoo (*Coccyzus erythrophthalmus*). In *The Birds of North America*, No. 587 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.
- Hull, S.D. 2003. Effects of management practices on grassland birds: Eastern Meadowlark. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/eame/eame.htm> (Version 12DEC2003).
- Hunter, W.C. and D.A. Buehler, R.A. Canterbury, J.L. Confer and P.B. Hamel. 2001. Conservation of disturbance-dependent birds in eastern North America. *Wildlife Society Bulletin* 29(2): 440-455.
- Hussell, D.J.T. 2003. Report on the 2002 Tree Swallow Program, Long Point Bird Observatory Program Report. Unpublished report for Bird Studies Canada.
- Jalava, J.V., J.L. Riley, D.G. Cuddy and W.J. Crins. 1997. Natural Heritage Resources of Ontario: Revised Site Districts in Ecological Site Regions 6E and 7E, Part I: Rationale & Methodology. Natural Heritage Information Centre, Ontario Ministry of Natural Resources, Peterborough, Ontario. Manuscript. 18 pp. + 1 map

- James, R.D. 1984a. Habitat Management Guidelines for Cavity-Nesting Birds in Ontario. Ontario Ministry of Natural Resources. 40 pp.
- James, R.D. 1984b. Habitat Management Guidelines for Ontario's Forest Nesting Accipiters, Buteos and Eagles. Ontario Ministry of Natural Resources. 23 pp.
- James, R.D. 2000. Update COSEWIC Status Report on Acadian Flycatcher, *Empidonax vireescens*, Moucherolle vert in Canada. Committee on the Status of Endangered Wildlife in Canada. 10 pp.
- James, R.D. 2000. Update COSEWIC Status Report on Henslow's Sparrow, *Ammodramus henslowii*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 8 pp.
- James, R.D. 2000. Update COSEWIC Status Report on Hooded Warbler, *Wilsonia citrina*, Paruline a capuchon in Canada. Committee on the Status of Endangered Wildlife in Canada. 9 pp.
- James, R.D. 2000. Update COSEWIC Status Report on Loggerhead Shrike (eastern race), *Lanius excubitor migrans*, Pie-grieche migratrice (de l'est) in Canada. Committee on the Status of Endangered Wildlife in Canada. 11 pp.
- James, R.D. and R. Cannings. 2003. COSEWIC update status report on the Northern Bobwhite (*Colinus virginianus*) in Canada. Committee on the Status of Endangered Species in Canada. Ottawa. (www.sararegistry.gc.ca/status/status_e.cfm)
- James, R.D. 1999. Updated COSEWIC Status Report on the KIRTLAND'S WARBLER, *Dendroica kirtlandii*. Committee on the Status of Endangered Wildlife in Canada. 11 pp.
- Johns, B., E. Telfer, M. Cadman, D. Bird, R. Bjorge, K. De Smet, W. Harris, D. Hjertaas, P. Laporte, and R. Pittaway. 1994. National Recovery Plan for the Loggerhead Shrike. Recovery Plan No. 7. Recovery of Nationally Endangered Wildlife. Ottawa. 32 pp.
- Johnson, D.H., L.D. Igl, A. Dechant, M.L. Sondreal, C.M. Goldade, M.P. Nenneman, B.R. Euliss, Rosenberg, C., G. Hammerson, J. Michaud, M. Koenen, and D.W. Mehlman. 1998. Grasshopper Sparrow (*Ammodramus savannarum*). Species Management Abstract, The Nature Conservancy, Arlington, VA.
- Johnstone, R.M. 1998. Updated COSEWIC Status Report on the Anatum Peregrine Falcon, *Falco peregrinus anatum*. Committee on the Status of Endangered Wildlife in Canada. 42 pp.
- Jones, S.L. and J.E. Cornely. 2002. Vesper Sparrow. (*Pooecetes gramineus*). In The Birds of North America, No. 624 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.
- Karrow, P.F. and B.G. Warner. 1990. The Geological and Biological Environment for Human Occupation in Southern Ontario. Pp. 5-25 In The Archaeology of Southern Ontario to A.D. 1650 (C.J.Ellis and N. Ferris, eds.). Occasional Publications of the London Chapter, Ontario Archaeological Society Inc., London, ON.
- Kirk, D. A. 1985. Status Report on the PASSENGER PIGEON, *Ectopistes migratorius*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 24 pp.
- Kirk, D.A. 1999. Updated COSEWIC Status Report on the Barn Owl, *Tyto alba*. Committee on the Status of Endangered Wildlife in Canada. 11 pp.
- Konze, K. 1998. Wildlife Monitoring Programs and Inventory Techniques for Ontario. NEST Technical Manual TM-009. 142 pp.
- Lanyon, W.E. 1995. Eastern Meadowlark (*Sturnella magna*). In The Birds of North America, No. 160 (A. Poole, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.
- Larson, B., J.L. Riley, E.A. Snell, and H.G. Godschalk. 1999. The Woodland Heritage of Southern Ontario: A study of ecological change, distribution and significance. Federation of Ontario Naturalists.
- Lee, H.T., W.D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological Land Classification of Southern Ontario: First approximation and its application. Ontario Ministry of Natural Resources,

Southcentral Science Section, Science Development and Transfer Branch, SCSS Field Guide FG-02.

Lounds, J., E. Cheskey, M. Bradstreet. 1997. The Flight Plan. *Seasons*, Spring 1997: 12-16.

MacWhirter, R.B and K.L. Bildstein. 1996. Northern Harrier (*Circus cyaneus*). In *The Birds of North America*, No. 210 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Marshall, I.P. and P.H. Schut. 1999. A National Ecological Framework for Canada. Ecosystems Science Directorate, Environment Canada and Research Branch, Agriculture and Agri-food Canada.
<http://sis.agr.gc.ca/cansis/nsdb/ecostrat/intro.htm>

Marti, C.D. 1992. Barn Owl (*Tyto alba*). In *The Birds of North America*, No. 1 (A. Poole, P. Stettenheim, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Martin, S.G. and T.A. Gavin. 1995. Bobolink (*Dolichonyx oryzivorus*). In *The Birds of North America*, No. 176 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Mayfield, H.F. 1992. Kirtland's Warbler (*Dendroica kirtlandii*). In *The Birds of North America*, No. 19 (A. Poole, P. Stettenheim and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA. and The American Ornithologists' Union, Washington, D.C.

Mayfield, H.F. 1992. Kirtland's Warbler (*Dendroica kirtlandii*). In *The Birds of North America*, No. 19 (A. Poole, P. Stettenheim, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

McCarty, J.P. 1996. Eastern Wood-Pewee (*Contopus virens*). In *The Birds of North America*, No. 245 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

McCracken, J.D. 19xx. Or RENEW, Prothonotary Warbler Recovery Plan.

McCracken, J.D., J. Dobbyn, L. Friesen, D. Lebedyk, J. Robinson, D. Ware, and D. Wills. In prep. National Recovery Strategy for the Prothonotary Warbler (*Protonotaria citrea*). National Recovery Strategy No.?, Recovery of Nationally Endangered Wildlife (RENEW), Ottawa, ON. ? pp.

McGauley, E. 2004. Birds on the Farm: A Stewardship Guide. Ontario Nature, Toronto.

McHattie, B., M. Taylor, D. Hoysak, C. Seburn, D. Seburn, D. Dennis, C.A. Bishop, P.J. Ewins, and D.V. Weseloh. 1995. Habitat Rehabilitation in the Great Lakes: Techniques for Enhancing Biodiversity. Canadian Wildlife Service, Government of Canada. Toronto, ON.

McNicholl, M.K. and J.L. Cranmer-Byng. 1994. Ornithology in Ontario: Historical Overview. pp 1-29 In *Ornithology in Ontario* (M.K. McNicholl and J.L. Cranmer-Byng, eds.). Ontario Field Ornithologists, Special Publications No. 1., Hawk Owl Publishing, Whitby, ON.

Moore, W.S. 1995. Northern Flicker (*Colaptes auratus*). In *The Birds of North America*, No. 166 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

Mowbray, T.B. 1997. Swamp Sparrow (*Melospiza georgiana*). In *The Birds of North America*, No. 279 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

Murphy, M.T. 1996. Eastern Kingbird (*Tyrannus tyrannus*). In *The Birds of North America*, No. 253 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

NatureServe 2005. NatureServe: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, VA. Available

<http://www.natureserve.org/explorer>. (October 2004 update).

NatureServe 2005. NatureServe: An online encyclopedia of life [web application]. Version 4.2. NatureServe, Arlington, VA. Available <http://www.natureserve.org/explorer>. (October 2004 update).

Nolan, V. Jr., E.D. Ketterson, and C.A. Buerkle. 1999. Prairie Warbler (*Dendroica discolor*). In The Birds of North America, No. 455 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

OMNR (Ontario Ministry of Natural Resources) 1997. Forest History in Eastern Ontario. Landowner Resource Centre, Extension Notes. 6 pp.

OMNR (Ontario Ministry of Natural Resources) 1999. The Old-Growth Forests of Southern Ontario. Landowner Resource Centre, Extension Notes. 8 pp.

OMNR (Ontario Ministry of Natural Resources) 2000. Significant Wildlife Habitat Technical Guide. 151 pp.

OMNR 1987a. Bald eagle habitat management guidelines. Ontario Ministry of Natural Resources, Wildlife Branch, Toronto. 15 pp.

OMNR 1987b. Peregrine Falcon habitat management guidelines. Ontario Ministry of Natural Resources, Wildlife Branch, Toronto. 10 pp.

OMNR 1998. Ontario Land Cover classification manual?

OMNR 2000. A Silvicultural Guide to Managing Southern Ontario Forests, version 1.1. Ontario Ministry of Natural Resources. Queen's Printer for Ontario. Toronto. 648 pp.

OMNR 2003. A Guide to Stewardship Planning for Natural Areas. Ontario Ministry of Natural Resources, Natural Resource Information Centre. 35 pp.

Ontario Ministry of Municipal Affairs and Housing (OMMAH) 2005. Provincial Policy Statement. Order in Council No. 140/2005. 38 pp.

Ontario Ministry of Natural Resources (OMNR) 2002. State of the forest report, 2001. Queen's Printer for Ontario, Toronto, ON.

Ontario Ministry of Natural Resources. 2004. Species at Risk in Ontario List, 26 April 2004. OMNR, Species at Risk Section. 8 pp. <http://www.ontarioparks.com/saro-list.pdf>

Ontario Nature (ON) 2004. Suggested Conservation Guidelines for the Identification of Significant Woodlands in Southern Ontario. August 2004 Draft. [http://www.ontarionature.org/pdf/Significant_Woodlands_Guidelines\(Draft%20Aug%202004\).pdf](http://www.ontarionature.org/pdf/Significant_Woodlands_Guidelines(Draft%20Aug%202004).pdf)

Page, A.M. 1994. Status Report on the NORTHERN BOBWHITE, *Colinus virginianus*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 39 pp.

Page, A.M. 1996. Updated Status Report on the Prothonotary Warbler, *Protonotaria citrea*, in Canada. Committee on the Status of Endangered Wildlife in Canada. 26 pp.

Palis, J. and S. Cannings. 2000. Chimney Swift (*Chaetura pelagica*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Palis, J., D.W. Mehlman and S. Cannings. 2000. Northern Bobwhite (*Colinus virginianus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Peterson, J.M.C, G. Hammerson and D.W. Mehlman. 1995. Red-shoulder Hawk (*Buteo lineatus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Petit, L.J. 1999. Prothonotary Warbler (*Protonotaria citrea*). In The Birds of North America, No. 408 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Phillips, D. 1990. The Climates of Canada. Minister of Supply and Services Canada. 176 pp.

PIF 2005. Continental Watch List Species Research and Monitoring Needs species accounts. [web resource].

<http://www.partnersinflight.org/WatchListNeeds/>
Accessed March 2005.

PIF Canada (Partners in Flight – Canada). 1996. Framework for Landbird Conservation in Canada. Canadian Landbird Conservation Working Group, Ottawa. 24 pp.

Poulin, R.G., S.D. Grindal, and R.M. Brigham. 1996. Common Nighthawk (*Chordeiles minor*). In The Birds of North America, No. 213 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Recovery of Nationally Endangered Wildlife Committee. 1993. National Recovery Plan for the Greater Prairie-Chicken. Canadian Wildlife Federation.

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.

Ridgely, R. S., T. F. Allnutt, T. Brooks, D. K. McNicol, D. W. Mehlman, B. E. Young, and J. R. Zook. 2003. Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, Virginia, USA.

Riley, J.L and E. Snell. 1997. Remote Sensing and Wetlands: Workshop Proceedings and Analysis. 30 pp.

Rising, J.D. and N.J. Flood. 1998. Baltimore Oriole (*Icterus galbula*). In The Birds of North America, No. 384 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, PA.

Robertson, R.J., Stutchbury, B.J., and R.R. Cohen. 1992. Tree Swallow (*Tachycineta bicolor*). In The Birds of North America, No. 11 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Robinson, S.K., F.R. Thompson, T.M. Donovan, D.R. Whitehead and J. Faaborg. 1995. Regional

forest fragmentation and nesting success of migratory birds. Science 267: 1987-1990.

Robinson, W.D. 1995. Louisiana Waterthrush (*Seiurus motacilla*). In The Birds of North America, No. 151 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Rodger, L. 1998. Tallgrass Communities of Southern Ontario: A Recovery Plan. World Wildlife Fund. 68 pp.

Root et al. 2004.

Rosenberg, K.V., R.S. Hames, R.W. Rohrbaugh, S. Barker Swarouth, J.D. Lowe, A. A. Dhondt. 2003. A Land Manager's Guide to Improving Habitat for Forest Thrushes. Cornell Lab of Ornithology. 30 pp.

Rosenberg, K.V., R.W. Rohrbaugh, S. Barker, R.S. Hames, J.D. Lowe, A. A. Dhondt. 1999. A Land Manager's Guide to Improving Habitat for Scarlet Tanager and other Forest-interior Birds. Cornell Lab of Ornithology. 24 pp.

Rosenburg, C., G. Hammerson, M. Koenen, and D.W. Mehlman. 1992. Barn Owl (*Tyto alba*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Ross, K., K.Abraham, R.Clay, B.Collins, J. Iron, R. James, D. McLachlin, R.Weeber. 2003. Ontario Shorebird Conservation Plan. Environment Canada. 50 pp.

Roth, R.R., M.S. Johnson, and T.J. Underwoods. 1996. Wood Thrush (*Hylocichla mustelina*). In The Birds of North America, No. 246 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union The Birds of North America, Inc., Washington, DC.

Rowell, P., G.L. Holroyd, U. Banasch. 2003. The 2000 Canadian Peregrine Falcon Survey. Journal of Raptor Research 37 (2).

Sallabanks, R. F.J. Dirrigl, G. Hammerson, and D.W. Mehlman. 1993. Prothonotary Warbler (*Protonotaria citrea*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

SARA Public Registry:

<http://www.sararegistry.gc.ca> Access
March 2005.

Sedgwick, J.A. 2000. Willow Flycatcher (*Empidonax traillii*). In *The Birds of North America*, No. 533 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Serrentino, P., K. Schneider, G. Hammerson, M. Koenen, and D.W. Mehlman. 1992. Northern Harrier (*Circus cyaneus*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Smallwood, J.A. and D.M. Bird. 2002. American Kestrel (*Falco sparverius*) In *The Birds of North America*, No. 602 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Smith, D.R. and D.W. Mehlman. 1992. Henslow's Sparrow (*Ammodramus henslowii*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Smith, K.G., J.H. Withgott, and P.G. Rodewald. 2000. Red-headed Woodpecker (*Melanerpes erythrocephalus*). In *The Birds of North America*, No. 518 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Smith, M.C. 2002. Canadian Recovery Strategy for the Eastern Loggerhead Shrike (*Lanius ludovicianus migrans*). Final draft, July 2002. 56 pp.

Snell, E. 1987. Wetland Distribution and Conversion in Southern Ontario. Working Paper 48, Inland Waters and Lands Directorate, Environment Canada, Ottawa.

Solymar, B. 2005. A Stewardship Guide to Grasslands in Southern Ontario: An Introduction for Farmers and Rural Landowners. Ontario Barn Owl Recovery Project <http://www.bsc-eoc.org/regional/barnowl.html>

Solymar, B. and J.D. McCracken. 2002. Draft National Recovery Plan for the Barn Owl and its

Habitat: Ontario Population, Ontario Barn Owl Recovery Team. 48 pp.

Staicer, C.A., F.J. Dirrigl, Jr., C. Staicer, G. Hammerson, and D.W. Mehlman. 1995. Prairie Warbler (*Dendroica discolor*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Swanson, D.A. 2003. Effects of management practices on grassland birds: Savannah Sparrow. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Research Center Online. <http://www.npwrc.usgs.gov/resource/literatr/grasbird/savs/savs.htm> (Version 12AUG2004).

Swanson, D.A., G. Hammerson, J. Michaud, M. Koenen and D.W. Mehlman. 1998. Savannah Sparrow (*Passerculus sandwichensis*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Thompson, C.F., G. Hammerson, G.F. Dirrigl, Jr., and D.W. Mehlman. 1996. Yellow-breasted Chat (*Icteria virens*). Species Management Abstract, The Nature Conservancy, Arlington, VA.

Vickery, P.D. 1996. Grasshopper Sparrow (*Ammodramus savannarum*). In *The Birds of North America*, No. 239 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

Wheelwright, N.T. and J.D. Rising. 1993. Savannah Sparrow (*Passerculus sandwichensis*). In *The Birds of North America*, No. 45 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, PA and The American Ornithologists' Union, Washington, DC.

White, C.M. N.J. Clum, T.J. Cade, and W.G. Hunt. 2002. Peregrine Falcon I (*Falco peregrinus*). In *The Birds of North America*, No. 660 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Whitehead, D.R. and T. Taylor. 2002. Acadian Flycatcher (*Empidonax vireescens*). In *The Birds of North America*, No. 614 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Wiken, E.B. (compiler). 1986. Terrestrial Ecozones of Canada. Ecological Land Classification Series No. 19. Environment Canada, Hull, Que. 26 pp. and map.

Wildlife Habitat Management Institute and Wildlife Habitat Council. 1999. American Kestrel (*Falco sparverius*). Fish and Wildlife Habitat Management Leaflet, Number 3, April 1999. 12 pp. ([URL](#)).

World Wildlife Fund Canada. 2003. The Nature Audit: Setting Canada's Conservation Agenda for the 21st Century. Report No. 1 – 2003. World Wildlife Fund Canada, Toronto, Canada. <http://wwf.ca/AboutWWF/WhatWeDo/TheNatureAudit/>.

Wyatt, V.E. and C.M. Francis. 2002. Rose-breasted Grosbeak (*Pheucticus ludovicianus*). In The Birds of North America, No. 692 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia. PA.

Yosef, R. 1996. Loggerhead Shrike (*Lanius ludovicianus*). In The Birds of North America, No. 231 (A. Poole, and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, D.C.: The American Ornithologists' Union.

12 Glossary and Acronyms

TO BE COMPLETED LATER.

BBS Guild Index: a measure of the frequency of occurrence of bird species in a guild on BBS routes.

Biome

Alvar

Tall-grass Prairie

Forest Habitats

Shrub/Successional Habitats

Grassland/Agricultural Habitats:

Priority Landbird

Priority Landbird Habitat

Stewardship Species

Species of Continental Concern

Species of Continental Importance

Habitat-obligate

Suite, Priority Species Suite

Guild, Priority Landbird Guild

Priority Habitat

Natural Heritage Information Centre

Ontario Land Cover
Species at Risk (SAR)

Ecoregion and Ecodistrict:
Ecozone

Bird Conservation Region (BCR)

Committee on the Status of Species at Risk
in Ontario (COSARRO)

Committee on the Status of Endangered
Species in Canada (COSEWIC)

Ecological Land Classification (ELC)
mapping

Conservation Land Tax Incentive Program
(CLTIP)

Migratory Birds Convention Act

Ontario Fish and Wildlife Act (19xx)

Endangered Species Act (ESA) (1971): .

Tree cutting Bylaw

Municipal Official Plan

Provincial Policy Statement on Natural
Heritage

Adaptive Ecosystem Management

Abundance Objective
Distribution Objective

Breeding Bird Survey (BBS)

Ontario Breeding Bird Atlas projects (BBA,
the Atlas)

Christmas Bird Count (CBC)

Migration Monitoring

Hawk Watch

BBS Guild Index: a measure of the frequency with which a species or guild is detected based on the sum of species/stops across all 50 stops on a BBS route, corrected for which routes were run, using BBS software developed by Brian Collins.

Landbirds include a broad variety of species that rely primarily on terrestrial habitats throughout the year including: vultures, eagles, hawks, falcons, grouse, quail, doves, cuckoos, owls, nightjars, swifts, hummingbirds, kingfishers, woodpeckers and passerines (songbirds)

Bird Studies Canada

Ontario Ministry of Natural Resources
Canadian Wildlife Service, Ontario Region

Breeding Bird Survey (BBS): is the primary large-scale, long-term bird monitoring program in North America (<http://www.pwrc.usgs.gov/bbs/>, for Canada see http://www.cws-scf.ec.gc.ca/birds/Trends/disclaimer_e.cfm)