# Landbird trends in Canada, 1968-2006

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# PREFACE

The Canadian Councils of Resource Ministers developed a Biodiversity Outcomes Framework[1] in 2006 to focus conservation and restoration actions under the *Canadian Biodiversity Strategy*.[2] *Canadian Biodiversity: Ecosystem Status and Trends 2010*[3] was a first report under this framework. It assesses progress towards the framework's goal of "Healthy and Diverse Ecosystems" and the two desired conservation outcomes: i) productive, resilient, diverse ecosystems with the capacity to recover and adapt; and ii) damaged ecosystems restored.

The 22 recurring key findings that are presented in *Canadian Biodiversity: Ecosystem Status and Trends 2010* emerged from synthesis and analysis of technical reports prepared as part of this project. Over 500 experts participated in the writing and review of these foundation documents. This report, *Landbird trends in Canada, 1968-2006*, is one of several reports prepared on the status and trends of national cross-cutting themes. It has been prepared and reviewed by experts in the field of study and reflects the views of its authors.

## Acknowledgements

Special thanks go to the thousands of volunteers throughout Canada and the United States who have participated in the North American Breeding Bird Survey, Christmas Bird Count and other monitoring programs. This paper is based on data from these programs and would not have been possible without the dedication of these highly-skilled volunteers.

We also thank the reviewers of this report.

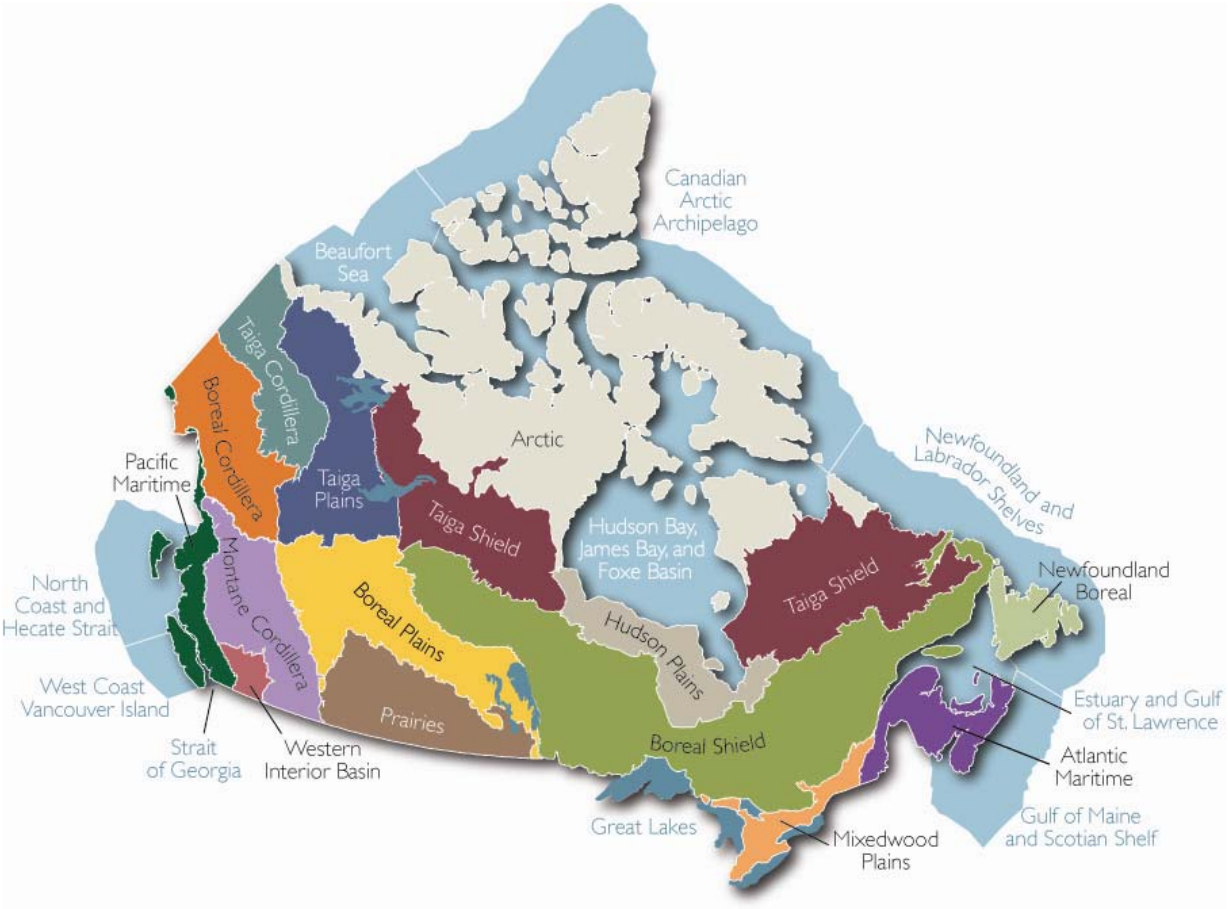
[1] Environment Canada. 2006. Biodiversity outcomes framework for Canada. Canadian Councils of Resource Ministers. Ottawa, ON. 8 p. http://www.biodivcanada.ca/default.asp?lang=En&n=F14D37B9-1

[2] Federal-Provincial-Territorial Biodiversity Working Group. 1995. Canadian biodiversity strategy: Canada's response to the Convention on Biological Diversity. Environment Canada, Biodiversity Convention Office. Ottawa, ON. 86 p. http://www.biodivcanada.ca/default.asp?lang=En&n=560ED58E-1

[3] Federal, Provincial and Territorial Governments of Canada. 2010. Canadian biodiversity: ecosystem status and trends 2010. Canadian Councils of Resource Ministers. Ottawa, ON. vi + 142 p. http://www.biodivcanada.ca/default.asp?lang=En&n=83A35E06-1

# Ecological Classification System – Ecozones+

A slightly modified version of the Terrestrial Ecozones of Canada, described in the *National Ecological Framework for Canada*,[4] provided the ecosystem-based units for all reports related to this project. Modifications from the original framework include: adjustments to terrestrial boundaries to reflect improvements from ground-truthing exercises; the combination of three Arctic ecozones into one; the use of two ecoprovinces – Western Interior Basin and Newfoundland Boreal; the addition of nine marine ecosystem-based units; and, the addition of the Great Lakes as a unit. This modified classification system is referred to as "ecozones+" throughout these reports to avoid confusion with the more familiar "ecozones" of the original framework.[5]




[4] Ecological Stratification Working Group. 1995. A national ecological framework for Canada. Agriculture and Agri-Food Canada, Research Branch, Centre for Land and Biological Resources Research and Environment Canada, State of the Environment Directorate, Ecozone Analysis Branch. Ottawa/Hull, ON. 125 p. Report and national map at 1:7 500 000 scale.

[5] Rankin, R., Austin, M. and Rice, J. 2011. Ecological classification system for the ecosystem status and trends report. Canadian Biodiversity: Ecosystem Status and Trends 2010, Technical Thematic Report No. 1. Canadian Councils of Resource Ministers. Ottawa, ON. http://www.biodivcanada.ca/default.asp?lang=En&n=137E1147-0

# Table of Contents

# List of Figures

# List of Tables

# INTRODUCTION AND METHODS

This report discusses changes in populations of landbirds in Canada from the late 1960s to the mid-2000s for species common enough to be relatively well surveyed. Landbirds are a diverse group of birds that rely primarily on terrestrial habitats for breeding and wintering. The term includes vultures, hawks, grouse, doves, cuckoos, owls, nighthawks, swifts, hummingbirds, kingfishers, woodpeckers, and passerines (or perching birds, often referred to as songbirds).

Results are presented at the national level (Canada) and for individual ecozones[+] for which data were sufficient. The data used are mainly from the Canadian portion of the North American Breeding Bird Survey (BBS) (Canadian Wildlife Service, 2007; U.S. Geological Survey, Patuxent Wildlife Research Centre, 2010) but other sources are used occasionally, especially for the Arctic and taiga ecozones[+]. BBS results presented were analysed specifically for this report using data from between 1968 to 2006. The BBS is an avian survey conducted annually in the United States, Canada, and, starting in 2008, northern Mexico. The survey is designed to monitor trends in relative abundance of North American breeding birds at continental, national, and regional scales. The BBS focuses on landbirds and has become the main source of information on long-term population change for these species in North America. Nevertheless, the BBS does not monitor all landbird species well. Because of the timing and roadside nature of the BBS, there is generally poor coverage of most nocturnal birds, aquatic/wetland specialists, highly colonial birds, secretive and rare birds, and less than ideal coverage of early-season breeders.

Due to the remoteness and inaccessibility of the Arctic and taiga ecozones[+] there are no BBS data and few other sources of data on landbirds in these regions. However, some birds that breed in northern Canada spend their winters in the United States and more southern parts of Canada and have their populations monitored by the Christmas Bird Count (CBC) (Audubon Society, 2010). In reporting on these ecozones[+], we rely on trend results from the CBC provided to us by D. Niven (cf. Butcher and Niven, 2007). The CBC, now over 100 years old, monitors the status and trends of winter bird populations through an all-day, annual census conducted by groups of volunteers throughout North America. Data from the CBC complement the BBS by providing results for some species that cannot be monitored on their breeding grounds. On occasion, for some ecozones[+], we also refer to results from the *Atlas of the Breeding Birds of Ontario: 2001-2005* (Cadman et al., 2007), the Ontario Forest Bird Monitoring Program (Cadman et al., 1998), and the Prairie Grassland Bird Monitoring Program (Dale et al., 2005).

In this report, birds are divided into species assemblages (or guilds) that share life-history traits. For the Canada-wide analysis, BBS results are presented for birds assembled by habitat, migration pattern, and foraging strategy, as well as selected individual species characteristic of each assemblage. In the ecozone[+] analyses, results are presented only for habitat assemblages typical of the region. Species were assigned to habitat assemblages according to Peterjohn and Sauer (1993) except for the "Other Open" assemblage that was added to capture species found in a variety of open habitats not restricted to any single habitat assemblage – that is, these birds are generalists of open habitats. Birds were assigned to foraging and migration strategy assemblages according to WILDSPACE™ (Environment Canada, 2006) although some

categories were grouped and other minor adjustments were made. Descriptions of species assemblages are provided in Table 1. Assemblage designations for all species included in this report are listed in Appendix 1.

*Table 1. Descriptions of species assemblages.*

| | **Description** |
|---|---|
| **Habitat Assemblages** | |
| **Forest** | Deciduous, coniferous, and mixed forest habitat |
| **Shrub/Early Successional** | Shrubland, old-field, and mid-successional stage habitat from grassland to forest |
| **Grassland** | Native grasslands (prairie and savannah habitat) and some agricultural habitat such as hayfields, pastures, and rangeland |
| **Other Open** | Open country (tundra excluded because of few data on these species), including species of agricultural landscapes not already assigned to the grassland assemblage |
| **Urban/Suburban** | Includes three introduced Eurasian species (House Sparrow, European Starling, and Rock Pigeon) and native species typical of urban/suburban landscapes |
| **Assemblages by Migration Strategy** | |
| **Year-round Residents** | No significant migration; breed and winter in the same range within Canada |
| **Short-distance Migrants** | Breed in Canada and migrate to winter largely in temperate regions, i.e., southern Canada, the United States, and northern Mexico |
| **Neotropical Migrants** | Breed in Canada and migrate to winter largely or completely in the neotropics, i.e. southern Mexico, West Indies, Central and South America |
| **Foraging Assemblages – by Prey Type** | |
| **Carnivore/Piscivore** | Major food items are animals including carrion and/or fish |
| **Herbivore/Frugivore/Granivore** | Major food items are plants including vegetation, nuts and seeds, and/orfruit |
| **Insectivore** | Major food items are insects or other invertebrates |
| **Omnivore** | Variety of food items; includes some combination of above prey types |
| **Foraging Assemblages – by Feeding Substrate** | |
| **Aerial** | Specialize in feeding on flying prey; includes “hawkers” that feed while flying, “salliers” that make forays from a perch to pursue prey; and “screeners” that fly with bills open and screen prey from the air |
| **Vegetation** | Select food items from foliage, twigs, branches, and flowers |
| **Trunk/Bark** | Select food from tree trunks andunder bark |
| **Ground** | Select food from the ground |

Trends were not calculated for a wetland bird assemblage because few landbirds fit cleanly into this group and because the BBS does not cover wetland habitat well. While the assemblage results presented are based on all species assigned to an assemblage for which there were BBS data, individual species results are presented only for a selection of species with reasonably good BBS trend precision (usually SE<2% per year), and which are typical of the ecozone$^{+}$ as assessed by their relative abundance and proportion of their population in that ecozone$^{+}$ versus elsewhere in their range. Therefore, individual species results presented do not include a comprehensive list for the ecozone$^{+}$, but are a sample of birds tracked by BBS (or another source) that illustrate the range of trends ‘typical’ of the region and assemblage.

For each assemblage we present a graph of annual indices to show how populations have changed over time, an overall trend that summarizes the rate of change over the full trend period (1968 to 2006), and the relative abundance per decade for species and assemblages to illustrate how population levels change over decades. The annual index is an estimate of the average number of individual birds that would be counted on a randomly selected route by an average observer in a given year. Annual indices are shown for all species assemblages in Canada and for habitat assemblages in each ecozone[+]. In the tables we present a value for trend, average relative abundance per decade, and change in relative abundance. "Trend" is the annual percent change in population over the given period. Methods used to calculate trends and annual indices are described in more detail on the Canadian Bird Trends website (Collins and Downes, 2009). The 10-year relative abundances are derived from the annual indices and give the average index of abundance for that decade. "Change" is the percent change in the average index of abundance between the first decade (usually 1970s) for which we have results and the 2000s (2000 to 2006). While the overall trend gives a single measure of the rate of population change over the long-term, the annual indices and relative abundance per decade show how population levels vary within this time period.

The BBS was not established in all areas of Canada at the same time. Results for Canada overall and most of the eastern and central ecozones[+] used data from 1968 onwards, while trends in several of the western ecozones[+] begin in 1973, and in 1988 for the Boreal Cordillera.

# RESULTS

## Canada

Bird assemblages are showing significant declines in four of five habitats in Canada based on Canadian BBS results from 1968 to 2006 (Table 2). The forest bird assemblage has been essentially stable, though there has been a possible gradual decline in recent years. Regionally, there have been varying degrees of decline in forest birds in all three western ecozones[+] (Pacific Maritime, Western Interior Basin, and a small non-significant decline in Montane Cordillera) and a small, non-significant decline in the Atlantic Maritime. Other ecozones[+] show stable or increasing populations of forest birds. Birds of shrub/early successional habitats show a small but statistically significant decline in Canada overall, with trends varying among ecozones[+] (declining significantly in the Atlantic Maritime, Boreal Shield, Boreal Plains, and Pacific Maritime; stable to slightly positive in the others). Grassland birds and birds of other open habitats show the highest level of decline (more than 40% loss of population since the 1970s). Grassland birds are declining in Canada overall, and in all ecozones[+] for which there are results. With the exception of the Prairies, birds in the other open habitats assemblage are also declining in all regions in Canada. Birds in the urban/suburban assemblage are showing declines in Canada overall and consistently in all ecozones[+] for which there are results.

*Table 2. Trends in abundance of landbirds in Canada grouped by breeding habitat, based on data from the Breeding Bird Survey.*

| Habitat Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | -0.2% | | 153.1 | 158.5 | 150.4 | 138.3 | -10% |
| Shrub/Successional | -0.5% | * | 121.1 | 110.0 | 110.2 | 101.1 | -17% |
| Grassland | -1.9% | * | 81.8 | 71.7 | 57.0 | 45.7 | -44% |
| Other Open | -1.4% | * | 79.0 | 79.6 | 65.8 | 45.7 | -42% |
| Urban/Suburban | -0.9% | * | 135.9 | 126.8 | 110.3 | 105.6 | -22% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Forest bird assemblage*

Close to half of Canada's landbird species are associated principally with forests. Much of this forested land area is included in the vast boreal forest region. Stretching across northern Canada from the Yukon to Newfoundland, this region encompasses the Boreal Shield, Newfoundland Boreal, Boreal Plains, Boreal Cordillera, Taiga Plains, Taiga Cordillera, Taiga Shield, and Hudson Plains ecozones[+]. Table 3 shows trends for a cross-section of forest landbirds with reasonably good BBS trend precision (usually SE<2% per year). Because of the lack of BBS routes in most northern areas, results presented here are biased towards southern forests, within and among ecozones[+]. For example, the three taiga ecozones[+] and the Hudson Plains Ecozone[+] are greatly under-represented in trends. The Newfoundland Boreal Ecozone[+] is also less represented than other regions although there are several BBS routes in that region.

*Table 3. Trends in abundance of forest birds in Canada, based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Eastern Wood-pewee | -4.6% | * | 1.09 | 0.89 | 0.48 | 0.29 | -73% |
| Canada Warbler | -4.4% | * | 1.08 | 0.81 | 0.47 | 0.30 | -72% |
| Wood Thrush | -4.2% | * | 1.11 | 0.63 | 0.42 | 0.30 | -73% |
| Olive-sided Flycatcher | -3.9% | * | 1.51 | 1.26 | 0.7 | 0.48 | -68% |
| Evening Grosbeak | -3.6% | * | 3.63 | 3.87 | 2.71 | 0.91 | -75% |
| Bay-breasted Warbler | -3.3% | * | 0.62 | 0.70 | 0.33 | 0.21 | -67% |
| Boreal Chickadee | -3.2% | * | 0.58 | 0.48 | 0.31 | 0.29 | -51% |
| Purple Finch | -3.1% | * | 2.11 | 1.76 | 1.00 | 0.98 | -54% |
| Veery | -2.4% | * | 7.16 | 6.48 | 4.29 | 3.37 | -53% |
| Pine Siskin | -2.3% | * | 6.98 | 9.14 | 6.81 | 3.18 | -54% |
| Rose-breasted Grosbeak | -2.2% | * | 3.06 | 3.05 | 1.68 | 1.47 | -52% |
| Dark-eyed Junco | -1.5% | * | 10.44 | 10.69 | 8.22 | 6.47 | -38% |
| Great Crested Flycatcher | -1.2% | n | 0.94 | 1.12 | 0.89 | 0.62 | -34% |
| Cape May Warbler | -0.8% | | 0.38 | 0.60 | 0.35 | 0.26 | -33% |
| Ovenbird | -0.7% | * | 8.23 | 8.62 | 7.15 | 6.48 | -21% |
| Least Flycatcher | -0.6% | n | 6.68 | 6.53 | 6.36 | 4.92 | -26% |
| American Redstart | -0.6% | | 5.53 | 5.71 | 4.86 | 4.58 | -17% |
| Black-throated Green Warbler | -0.6% | | 1.35 | 1.31 | 1.28 | 1.21 | -10% |
| Swainson's Thrush | -0.5% | | 16.20 | 17.07 | 14.23 | 14.22 | -12% |
| Tennessee Warbler | -0.4% | | 3.59 | 5.90 | 3.15 | 3.55 | -1% |
| Yellow-bellied Flycatcher | -0.4% | | 1.12 | 1.32 | 0.88 | 0.95 | -15% |
| Ruby-crowned Kinglet | -0.3% | | 6.57 | 5.76 | 5.92 | 5.96 | -9% |
| Northern Parula | -0.3% | | 0.79 | 0.88 | 0.72 | 0.75 | -6% |
| Gray Jay | -0.2% | | 1.64 | 1.66 | 1.61 | 1.39 | -15% |
| Black-and-white Warbler | -0.1% | | 1.66 | 2.07 | 1.73 | 1.50 | -9% |
| Northern Waterthrush | -0.1% | | 2.33 | 2.92 | 2.33 | 2.19 | -6% |
| Blackburnian Warbler | 0.0% | | 0.70 | 0.86 | 0.77 | 0.59 | -16% |
| Magnolia Warbler | 0.4% | | 3.79 | 4.21 | 4.10 | 4.55 | 20% |
| Red-eyed Vireo | 0.7% | * | 14.11 | 15.60 | 15.60 | 16.32 | 16% |
| Winter Wren | 0.7% | | 2.83 | 2.54 | 3.45 | 3.41 | 20% |
| Hermit Thrush | 0.8% | n | 5.05 | 5.21 | 5.53 | 5.63 | 11% |
| Yellow-rumped Warbler | 1.0% | * | 6.37 | 8.74 | 8.45 | 7.98 | 25% |
| Downy Woodpecker | 1.2% | * | 0.39 | 0.63 | 0.57 | 0.51 | 30% |
| White-breasted Nuthatch | 1.4% | n | 0.16 | 0.17 | 0.20 | 0.26 | 59% |
| Black-capped Chickadee | 1.6% | * | 3.27 | 4.11 | 4.27 | 4.81 | 47% |
| Hairy Woodpecker | 2.0% | * | 0.51 | 0.63 | 0.70 | 0.78 | 53% |
| Philadelphia Vireo | 2.4% | n | 0.27 | 0.31 | 0.49 | 0.46 | 68% |
| Red-breasted Nuthatch | 2.6% | * | 1.16 | 1.72 | 2.43 | 2.42 | 109% |
| Warbling Vireo | 2.8% | * | 3.21 | 5.15 | 6.42 | 6.34 | 97% |
| Blue-headed Vireo | 3.6% | * | 0.54 | 0.70 | 0.98 | 1.26 | 134% |
| Pileated Woodpecker | 6.5% | * | 0.14 | 0.44 | 0.46 | 0.68 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

The forest landbird assemblage in Canada shows little change overall (Figure 1), as in the United States (North American Bird Conservation Initiative, U.S. Committee (NABCI-US), 2009), but there is a mix of positive, negative, and stable trends in individual species including some species whose long-term declines have caused them to be assessed as at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (for example, Canada

Warbler and Olive-sided Flycatcher) (COSEWIC, 2007a), or as a conservation priority for North America (for example, Wood Thrush and Bay-breasted Warbler) (Rich et al., 2004). Forest birds include a wide variety of species that differ in habitat requirements, foraging habits, and migration pattern and thus differences in trends among individual species is not unexpected. For example, in the three boreal ecozones⁺, forest birds show steady or positive long-term trends as a group, although some species are showing alarming declines.

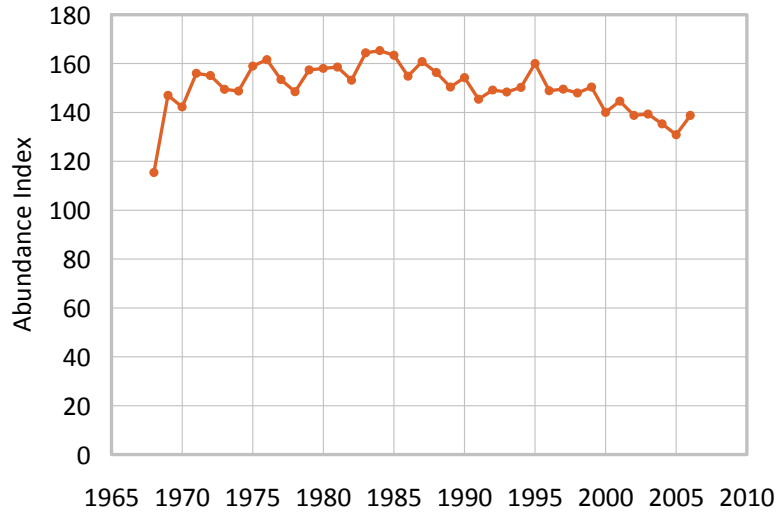



*Figure 1. Annual indices of population change for forest birds in Canada, based on data from the Breeding Bird Survey.*

Some 60% of Canada's individual landbirds breed in the boreal forest (Blancher, 2003) and many species have the majority of their global breeding populations in that region. Canada's stewardship responsibility for the boreal is high and there is a need to pay close attention to changes in bird populations. Boreal birds include year-round residents such as Boreal Chickadee, Gray Jay, and several woodpeckers and owls, but most are migratory species such as the warblers, sparrows, and flycatchers. These migratory species are influenced by factors on the wintering grounds and during migration as well as on their boreal breeding grounds. For example, the Rusty Blackbird is a boreal breeding species that migrates to the southern United States for the winter. The species has declined sharply in the last 40 years according to both CBC and BBS (Niven et al., 2004) to the extent that it was assessed as a species of Special Concern in Canada by COSEWIC (2006b). With 70% of its breeding range located in Canada, the Rusty Blackbird is a species for which Canada has a high responsibility. Results for some other species are discussed in the ecozone⁺ accounts below.

The three western ecozones⁺ all show varying degrees of decline for forest birds. In the Prairies, forest birds are increasing and may have benefitted from increased tree cover associated with human settlement. In the Mixedwood Plains Ecozone⁺, forest birds appear to have responded to increased forest cover resulting from succession changes in abandoned marginal farmland and are increasing as a group.

## *Shrub/early successional bird assemblage*

The BBS does not capture trends in shrub-nesting birds from the taiga, and the results presented here represent only the southernmost portion of the northern range of some species such as Wilson's Warbler, Orange-crowned Warbler, Fox Sparrow, and Lincoln's Sparrow.

The overall index for birds of shrub/early-successional habitats shows a small decline (Figure 2), influenced strongly by declines in several relatively abundant shrub-nesting sparrows such as Song and White-throated (Table 4). Patterns for the assemblage vary among ecozones⁺ with significant declines in the Atlantic Maritime, Boreal Plains, and Boreal Shield, a non-significant decline in the Pacific Maritime, and stable or positive trends in the other ecozones⁺. Results for many individual species also vary across the country. The Brown Thrasher for example, with an overall loss of 60% of its population in Canada since the 1970s, is declining in the Prairies, Mixedwood Plains, Boreal Plains, and the southern portion of the Boreal Shield, but appears to be doing well in the Atlantic Maritime. Results for some other species are discussed in the ecozone⁺ accounts below.

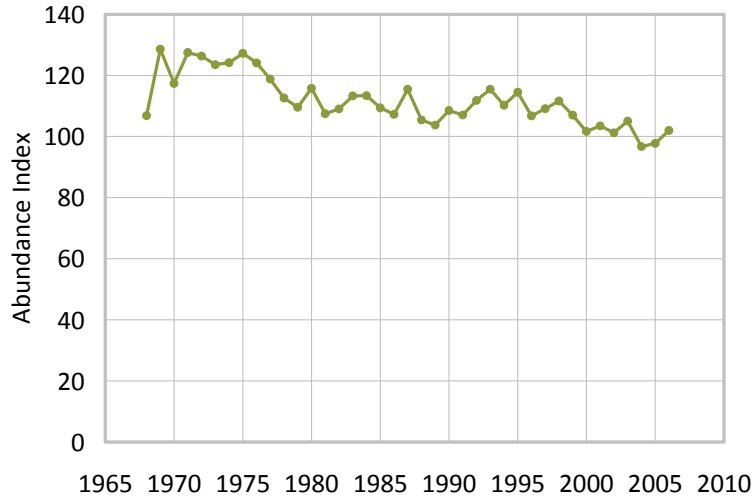



*Figure 2. Annual indices of population change for shrub/early successional birds in Canada, based on data from the Breeding Bird Survey.*

*Table 4. Trends in abundance of shrub/early successional birds in Canada, based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Wilson's Warbler | -2.9% | * | 1.78 | 1.65 | 1.07 | 0.81 | -54% |
| Brown Thrasher | -2.8% | * | 1.24 | 0.81 | 0.65 | 0.49 | -60% |
| Mourning Warbler | -2.3% | * | 3.81 | 3.89 | 2.25 | 1.99 | -48% |
| Gray Catbird | -1.8% | * | 1.87 | 1.52 | 1.06 | 1.15 | -39% |
| Chestnut-sided Warbler | -1.7% | * | 5.50 | 4.23 | 3.30 | 3.25 | -41% |
| Song Sparrow | -1.3% | * | 19.88 | 15.27 | 14.74 | 13.67 | -31% |
| White-throated Sparrow | -1.0% | * | 22.03 | 17.48 | 17.16 | 17.22 | -22% |
| Clay-colored Sparrow | -0.1% | | 11.38 | 10.68 | 11.02 | 9.40 | -17% |
| White-crowned Sparrow | 1.0% | | 1.32 | 1.23 | 1.57 | 1.31 | -1% |
| Willow Flycatcher | 2.1% | n | 0.75 | 0.97 | 0.72 | 0.74 | -1% |
| MacGillivray's Warbler | 2.5% | * | 1.38 | 2.15 | 2.08 | 1.92 | 39% |
| Lincoln's Sparrow | 3.0% | * | 1.87 | 3.61 | 4.03 | 3.32 | 78% |
| Fox Sparrow | 3.1% | * | 0.71 | 1.81 | 1.47 | 1.35 | 91% |
| Orange-crowned Warbler | 3.9% | * | 1.44 | 2.09 | 2.83 | 2.59 | 79% |
| Spotted Towhee | 3.9% | * | 0.49 | 0.70 | 0.87 | 0.69 | 42% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Grassland bird assemblage*

Results from the North American BBS indicate that grassland birds are declining throughout North America (Sauer et al., 2008; North American Bird Conservation Initiative, U.S. Committee (NABCI-US), 2009) showing steep, consistent, and geographically widespread declines. In Canada, the grassland assemblage reflects this consistent, long-term decline over the past 40 years (Figure 3, Table 5). Substantial, statistically significant declines also occur in all ecozones[+] for which a trend is reported.

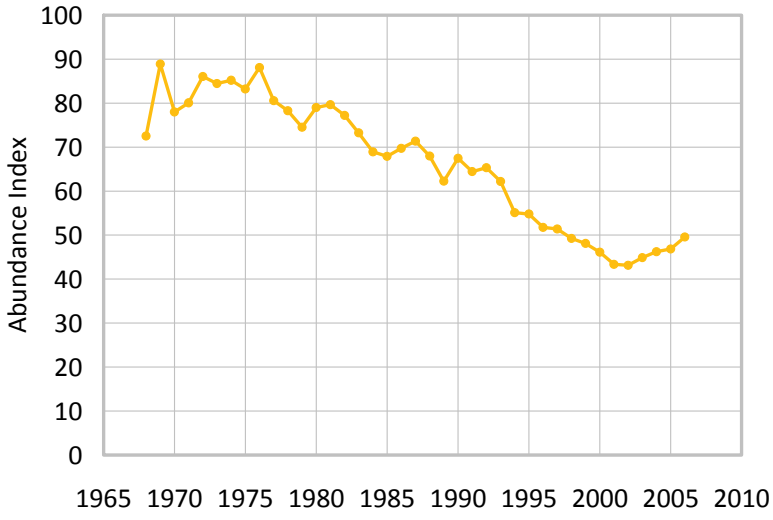



*Figure 3. Annual indices of population change for grassland birds in Canada, based on data from the Breeding Bird Survey.*

*Table 5. Trends in abundance of grassland birds in Canada, based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Grasshopper Sparrow | -5.3% | * | 0.31 | 0.30 | 0.12 | 0.07 | -78% |
| Bobolink | -5.2% | * | 12.50 | 10.78 | 4.49 | 2.55 | -80% |
| Short-eared Owl | -5.1% | n | 0.66 | 0.14 | 0.13 | 0.12 | -82% |
| Eastern Meadowlark | -5.1% | * | 3.22 | 1.90 | 1.25 | 0.73 | -77% |
| Horned Lark | -4.5% | * | 20.18 | 16.06 | 9.62 | 5.42 | -73% |
| Chestnut-collared Longspur | -4.2% | * | 3.68 | 2.51 | 1.67 | 0.49 | -87% |
| Sprague's Pipit | -3.0% | n | 1.41 | 1.02 | 0.45 | 0.43 | -70% |
| Sharp-tailed Grouse | -2.3% | | 0.25 | 0.30 | 0.15 | 0.13 | -47% |
| Northern Harrier | -1.9% | * | 0.55 | 0.55 | 0.43 | 0.29 | -48% |
| Western Meadowlark | -1.6% | * | 15.01 | 12.29 | 9.88 | 8.88 | -41% |
| Baird's Sparrow | -1.1% | | 0.74 | 0.55 | 0.62 | 0.26 | -65% |
| Savannah Sparrow | -0.8% | * | 19.46 | 16.62 | 17.23 | 14.52 | -25% |
| Vesper Sparrow | -0.6% | | 8.20 | 7.89 | 7.58 | 6.87 | -16% |
| Sedge Wren | 1.4% | | 0.35 | 0.31 | 0.47 | 0.45 | 27% |
| Le Conte's Sparrow | 2.8% | | 0.67 | 0.60 | 1.03 | 0.71 | 7% |

Species are listed in order from those showing most severe declines to those showing the most positive
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

Although the major loss of native prairie grasslands occurred in the first half of the century (that is, pre-BBS and therefore not reflected in this report), loss of grasslands has continued since the beginning of the BBS and its effect is reflected in declines of grassland bird populations on the Prairies (35% loss of population since the 1970s). Losses of grassland habitat in Atlantic Maritime and the Mixedwood Plains are more recent. These were largely forested landscapes pre-settlement, so large increases in habitat for grassland birds followed the clearing of land by settlers, and declines in grassland habitat followed more recently as farms were abandoned and suitable habitat was lost. This period of habitat loss and the subsequent rapid decline in bird populations is reflected in BBS trends for these two ecozones[+] (more than 60% loss of abundance since the 1970s).

Populations of most individual species are also declining in Canada, consistent within the overall assemblage decline. Some species have lost more than 50% of their populations in Canada since the 1970s (for example, Bobolink, Eastern Meadowlark, Sprague's Pipit, Chestnut-collared Longspur, and others listed in Table 5). Reasons for declines vary among species and ecozones[+] but are thought to be due to the combined effects of loss of marginal farmland to forest and more intensive use of remaining agricultural lands where most of these birds nest. Many grassland species are short-distant migrants, wintering in the United States, and are affected by similar changes in their winter habitats. The Bobolink however, migrates 8,000 km or more to winter south of the equator in South America.

Some species listed in Table 5 nest in grasslands and agricultural fields in the southern portion of their range and tundra in the northern portion (Short-eared Owl, Horned Lark, and Savannah Sparrow). The BBS trends presented in this report capture only the southern portion of their range. Two grassland birds that prefer wet habitats (Sedge Wren and Le Conte's

Sparrow) have stable or increasing trends, perhaps benefiting from habitat management actions for waterfowl.

## *Other open habitat bird assemblage*

Declines in birds of other open habitats (Figure 4) are likely related to changes in land use and agricultural practices resulting in a loss of habitat and habitat quality, as observed among grassland species. However, declines appear to be more recent than those in grassland birds, beginning around the mid-1980s, perhaps because these birds are more tolerant of later stages of open field succession. The Prairies Ecozone⁺ stands out as the only region where bird populations of other open habitats are stable rather than declining. Some species in this ecozone⁺ may benefit from habitat changes associated with human presence, such as increased trees or the presence of nest boxes.

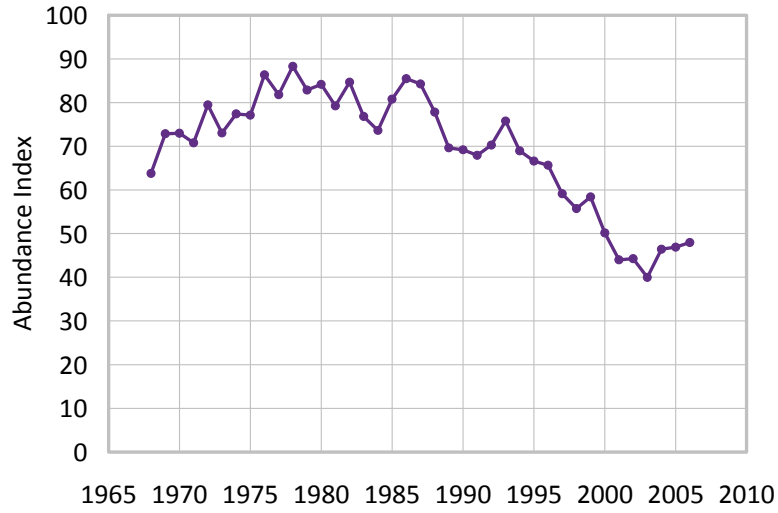



*Figure 4. Annual indices of population change for birds of other open habitats in Canada, based on data from the Breeding Bird Survey.*

This assemblage contains several species of aerial-foraging insectivores (swallows, nighthawks) which are declining as a group throughout Canada. Of the eight species of swallows in Canada, the Violet-green Swallow, whose distribution is restricted to western Canada (B.C., Alberta, and Yukon), is the only one with an overall positive population trend (Table 6). Tree Swallows have declined overall but are doing well in the Mixedwood Plains and the Prairies where they may have benefitted from nest box programs. Some other species of open habitats have also fared poorly, for example the Loggerhead Shrike was assessed as Endangered in 2000 in the eastern portion of its range where its population has disappeared from Quebec and New Brunswick and there are only a few remaining breeding pairs in Ontario. The prairie subspecies has fared better, however it is also declining and was assessed as Threatened in 2004 (COSEWIC, 2004). The American Kestrel is showing large declines nationally and throughout most of the ecozones⁺ in which it breeds in Canada.

*Table 6. Trends in abundance of birds of other open habitats in Canada, based on data from the Breeding Bird Survey.*

| Birds of Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Loggerhead Shrike | -6.5% | * | 0.45 | 0.07 | 0.08 | 0.05 | -89% |
| Bank Swallow | -4.6% | * | 7.74 | 7.56 | 3.49 | 1.93 | -75% |
| Common Nighthawk | -4.3% | * | 0.47 | 0.45 | 0.27 | 0.10 | -78% |
| Barn Swallow | -3.2% | * | 16.68 | 15.58 | 9.89 | 5.56 | -67% |
| Brown-headed Cowbird | -2.5% | * | 14.25 | 11.94 | 8.93 | 6.46 | -55% |
| Eastern Kingbird | -2.0% | * | 3.62 | 3.55 | 2.70 | 1.80 | -50% |
| American Kestrel | -1.7% | * | 0.82 | 1.04 | 0.75 | 0.45 | -45% |
| Baltimore Oriole | -1.4% | * | 2.16 | 2.54 | 1.94 | 1.18 | -45% |
| Tree Swallow | -0.9% | * | 8.59 | 9.12 | 8.11 | 5.87 | -32% |
| Brewer's Blackbird | 0.0% | | 9.93 | 9.60 | 9.07 | 7.62 | -23% |
| Swainson's Hawk | 0.1% | | 0.47 | 0.54 | 0.46 | 0.33 | -30% |
| Western Kingbird | 1.7% | n | 0.53 | 0.80 | 0.94 | 0.73 | 38% |
| Mountain Bluebird | 2.2% | | 0.42 | 0.41 | 0.66 | 0.49 | 16% |
| Violet-green Swallow | 2.4% | | 0.75 | 1.07 | 1.59 | 1.02 | 35% |
| Red-tailed Hawk | 3.0% | * | 0.54 | 0.88 | 1.28 | 1.19 | 121% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Urban and suburban bird assemblage*

Though one might expect the increases in urbanization and the spread of suburbs throughout Canada to be reflected in increased populations of birds tolerant of developed landscapes, the urban/suburban assemblage shows a consistent pattern of decline both in Canada (Figure 5) and among ecozones⁺ for which we have results. Losses in population since the 1970s vary from 18 to 38% among ecozones⁺ for which there are BBS data, with a loss of 22% overall in Canada (Table 2).

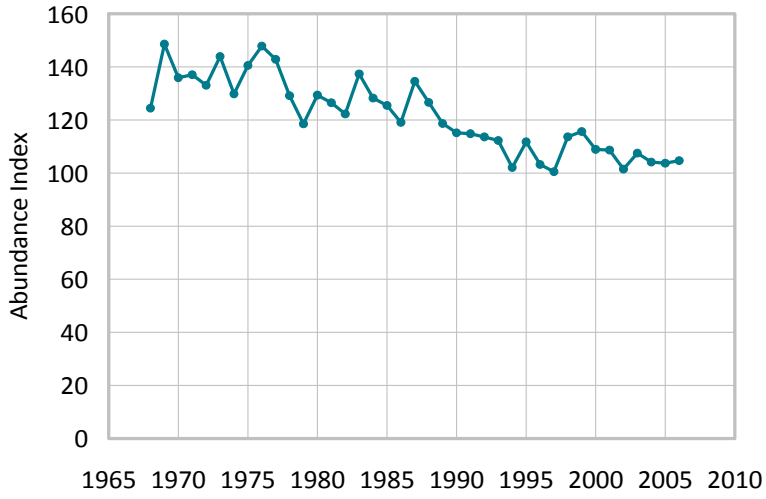



*Figure 5. Annual indices of population change for urban/suburban birds in Canada, based on data from the Breeding Bird Survey.*

Both the introduced House Sparrow and European Starling are abundant but have shown substantial declines in recent decades, while Rock Pigeon populations have been relatively stable (Table 7). The declines in House Sparrow (in all ecozones[+] for which there are results except in the northern Pacific rainforest) and European Starling (in all ecozones[+]) mirror declines in Europe (Pan-European Common Bird Monitoring Scheme, 2007). Declines in these introduced species are in contrast to many other alien species of plants and animals that are increasingly creating problems in Canada's ecosystems (for example, mussels in Great Lakes, ash borers, and other insects and plants) (Environment Canada, 2009).

*Table 7. Trends in abundance of urban/suburban birds in Canada, based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Chimney Swift | -8.3% | * | 0.87 | 0.35 | 0.13 | 0.08 | -90% |
| House Sparrow (I) | -3.3% | * | 27.86 | 22.18 | 12.33 | 11.24 | -60% |
| European Starling (I) | -3.1% | * | 48.33 | 36.87 | 24.42 | 18.73 | -61% |
| Common Grackle | -2.0% | * | 13.71 | 9.83 | 8.55 | 8.03 | -41% |
| Purple Martin | -1.3% | | 0.70 | 0.71 | 0.73 | 0.42 | -40% |
| Northern Mockingbird | -0.8% | | 0.02 | 0.02 | 0.02 | 0.01 | -69% |
| Chipping Sparrow | -0.6% | n | 12.77 | 12.48 | 11.67 | 10.29 | -19% |
| Blue Jay | -0.2% | | 2.14 | 2.22 | 2.14 | 2.36 | 10% |
| American Robin | 0.4% | * | 32.40 | 35.64 | 37.38 | 35.28 | 9% |
| Rock Pigeon (I) | 0.8% | | 3.90 | 5.52 | 5.11 | 4.52 | 16% |
| Mourning Dove | 1.7% | * | 4.08 | 5.52 | 5.89 | 5.82 | 43% |
| House Finch | 13.4% | n | 0.10 | 0.37 | 0.99 | 0.88 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
(I) indicates an introduced species
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

In long-distance migrants such as Chimney Swift and Purple Martin, factors on the wintering grounds and during migration are also influencing populations. The Chimney Swift has experienced substantial declines throughout Canada with an overall loss of 90% of its population (Table 7) and has recently been assessed as Threatened (COSEWIC, 2007a). The Chimney Swift is one of several species of aerial-foraging insectivores showing widespread declines in Canada, perhaps indicating common causes for this group (Blancher et al., 2009; Nebel et al., 2010). In contrast, House Finch populations have expanded dramatically in the east, where they first appeared in the 1970s following introductions in eastern United States cities. The Canada-wide trend has been strongly positive in the long term; however, this species has declined over the last decade in the east.

Of course, many of the species designated as urban/suburban also exist in more natural habitats. In some regions, especially the northern ecozones[+] where human habitation influences a relatively small proportion of the landscape, change or lack of change in species such as Chipping Sparrow, American Robin, and Blue Jay may be more a reflection of what is happening in forest and shrub/early successional habitats than in the urban/suburban landscape.

## *Migration strategy assemblage*

Some 274 species of landbirds regularly breed in Canada and at least 78% of these are migratory (Blancher, 2002). These Canadian summer residents spend the winters in warmer southern climes in the United States, Mexico, the West Indies, and Central and South America, and are affected by multiple factors on their breeding grounds, during migration, and on their wintering grounds.

Birds in the neotropical and short-distance migrant assemblages are showing significant overall declines in Canada (Table 8, Figure 6). The short-distance migrants, which winter in more temperate areas in southern Canada, the United States, and northern Mexico show a continual, gradual decline since the 1970s. Neotropical migrant populations appear to have increased during the 1970s, with declines beginning in the late 1980s and continuing to the present. Populations of resident birds, which include grouse, woodpeckers, chickadees, nuthatches, ravens, and cardinals, among others, have been relatively stable over the long-term.

*Table 8. Trends in abundance of landbirds in Canada grouped by migration strategy, based on data from the Breeding Bird Survey.*

| Migration Strategy | Trend (%/yr) | P | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1970s | 1980s | 1990s | 2000s | Change |
| Resident | -0.2% | | 47.3 | 48.3 | 42.8 | 45.7 | -3% |
| Short-Distance | -0.8% | * | 383.9 | 354.3 | 323.8 | 291.5 | -24% |
| Neotropical | -0.5% | * | 238.6 | 244.1 | 221.0 | 189.7 | -21% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

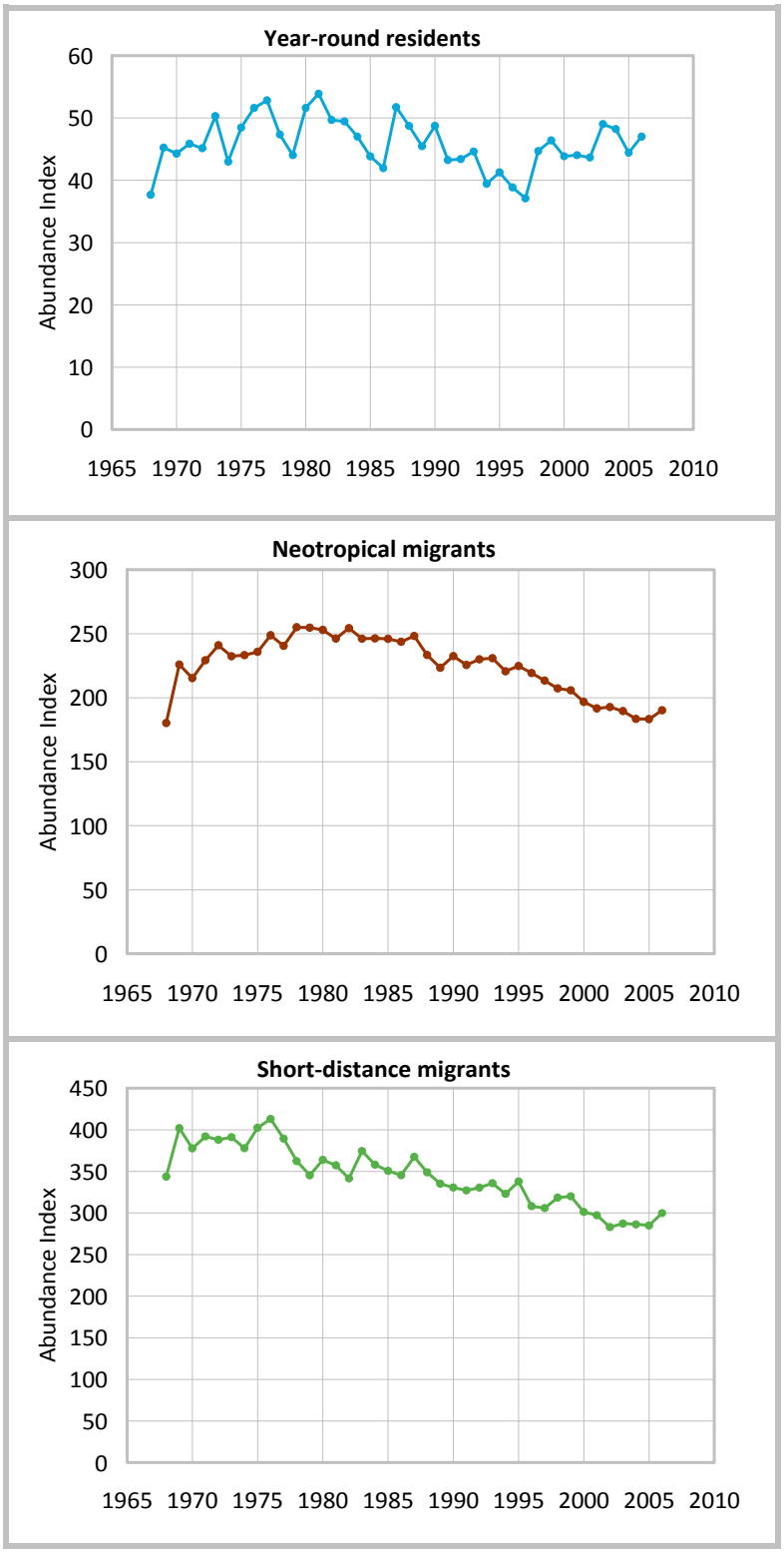



*Figure 6. Annual indices of population change for birds in Canada grouped by migration pattern, based on data from the Breeding Bird Survey.*

For many neotropical migrants, concerns have been raised over the loss and fragmentation of forest habitat on their wintering grounds (Robbins et al., 1989; Terborgh, 1989). In addition, spruce budworm infestations in Canada have declined over the past several decades and this may explain declines observed in several neotropical migrants that respond strongly to budworm abundance (Sleep et al., 2009). A large proportion of aerial-foraging insectivores, including most of the swallows, flycatchers, nightjars, and the Chimney Swift are neotropical migrants, and many are declining. Causes of these declines remain unclear, but changes in aerial insect populations have been suggested as one possible common factor as well as landscape changes, toxic chemicals, and climate change (Blancher et al., 2009; Nebel et al., 2010)

The short-distant migrants include many of the grassland species that are declining as a group. Seven of the nine blackbird species (excluding orioles) in Canada are short-distance migrants and six of these are showing significant long-term declines. Among other factors, blackbird populations may be affected by bird control programs in the United States that are designed to reduce populations of nuisance birds that damage crops (Dolbeer et al., 1995; COSEWIC, 2006b). Sparrows and allies are largely short-distance migrants and also show a preponderance of declines.

## *Foraging assemblage*

To examine patterns in populations with respect to foraging habits, birds were divided into groups based on what they eat (prey type) and where they forage (feeding substrate). Birds in the herbivore and omnivore groups have declined overall. Insectivore populations in Canada remained fairly stable until the late 1980s when they began to decline, resulting in an overall slight decline for the assemblage. Carnivore populations have been relatively stable and tending positive (Table 9, Figure 7). Patterns of population trends also vary among birds grouped by feeding substrate. Aerial and ground-foraging birds have declined. Vegetation gleaners are stable overall, but show a decline in the last several years. Trunk/bark forager populations have increased (Table 9, Figure 8).

*Table 9. Trends in abundance of landbirds in Canada grouped by foraging behaviour pattern, based on data from the Breeding Bird Survey.*

| Foraging Strategy | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Based on Prey Type | | | | | | | |
| Carnivore/Piscivore | 0.4% | | 3.3 | 3.6 | 3.8 | 3.7 | 11% |
| Insectivore | -0.3% | * | 228.0 | 234.4 | 223.2 | 196.5 | -14% |
| Herbivore/Frugivore | -1.6% | * | 32.1 | 29.3 | 20.7 | 20.9 | -35% |
| Omnivore | -0.9% | * | 407.7 | 380.5 | 339.5 | 304.1 | -25% |
| Based on Feeding Substrate | | | | | | | |
| Aerial | -1.1% | * | 81.3 | 86.7 | 74.6 | 53.2 | -35% |
| Vegetation | 0.0% | | 174.0 | 177.5 | 177.2 | 164.0 | -6% |
| Trunk/Bark | 0.8% | n | 7.0 | 7.6 | 8.6 | 8.6 | 23% |
| Ground | -1.0% | * | 403.1 | 370.1 | 321.3 | 296.0 | -27% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

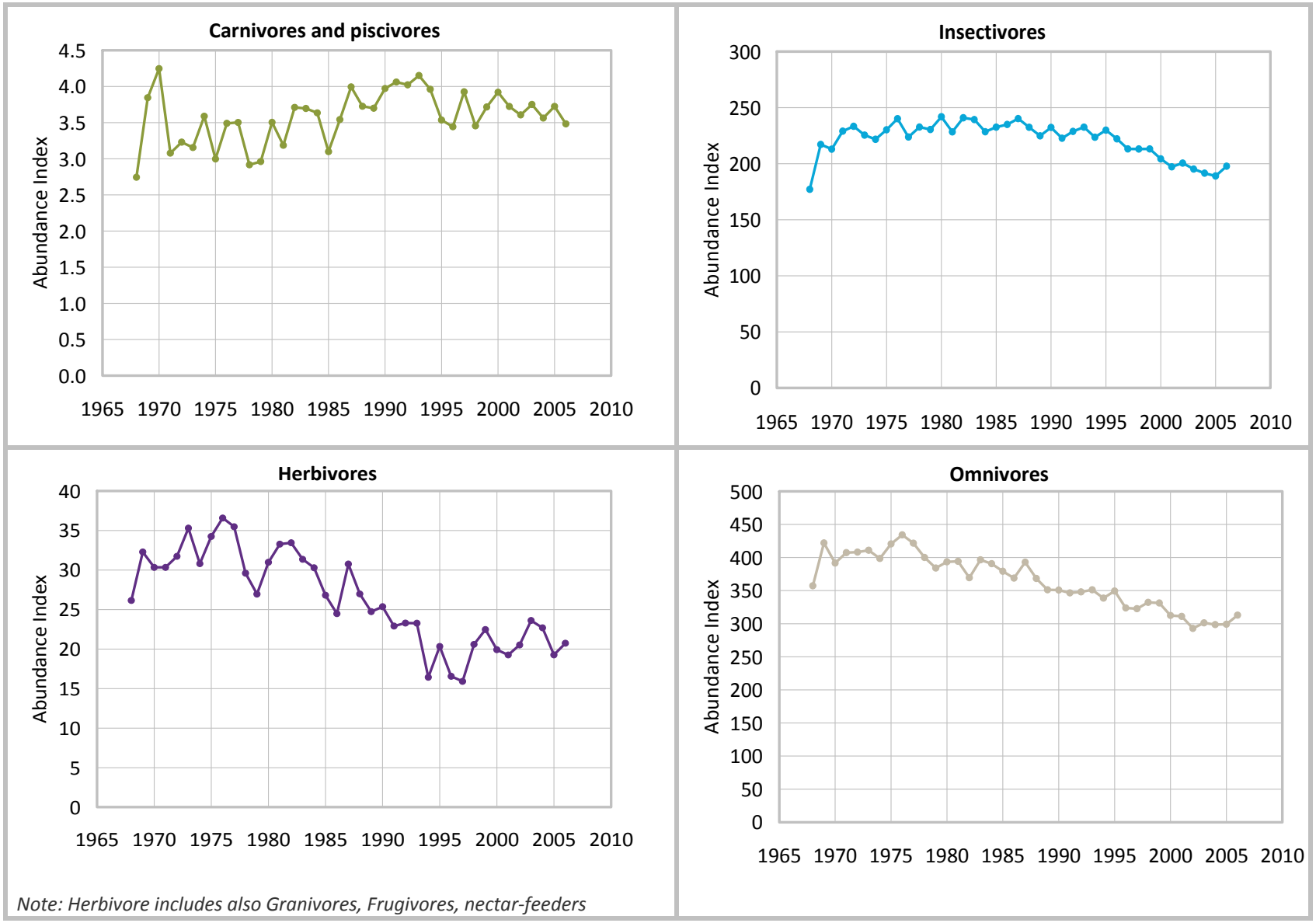



*Figure 7. Annual indices of population change for birds in Canada grouped by prey type, based on data from the Breeding Bird Survey.*

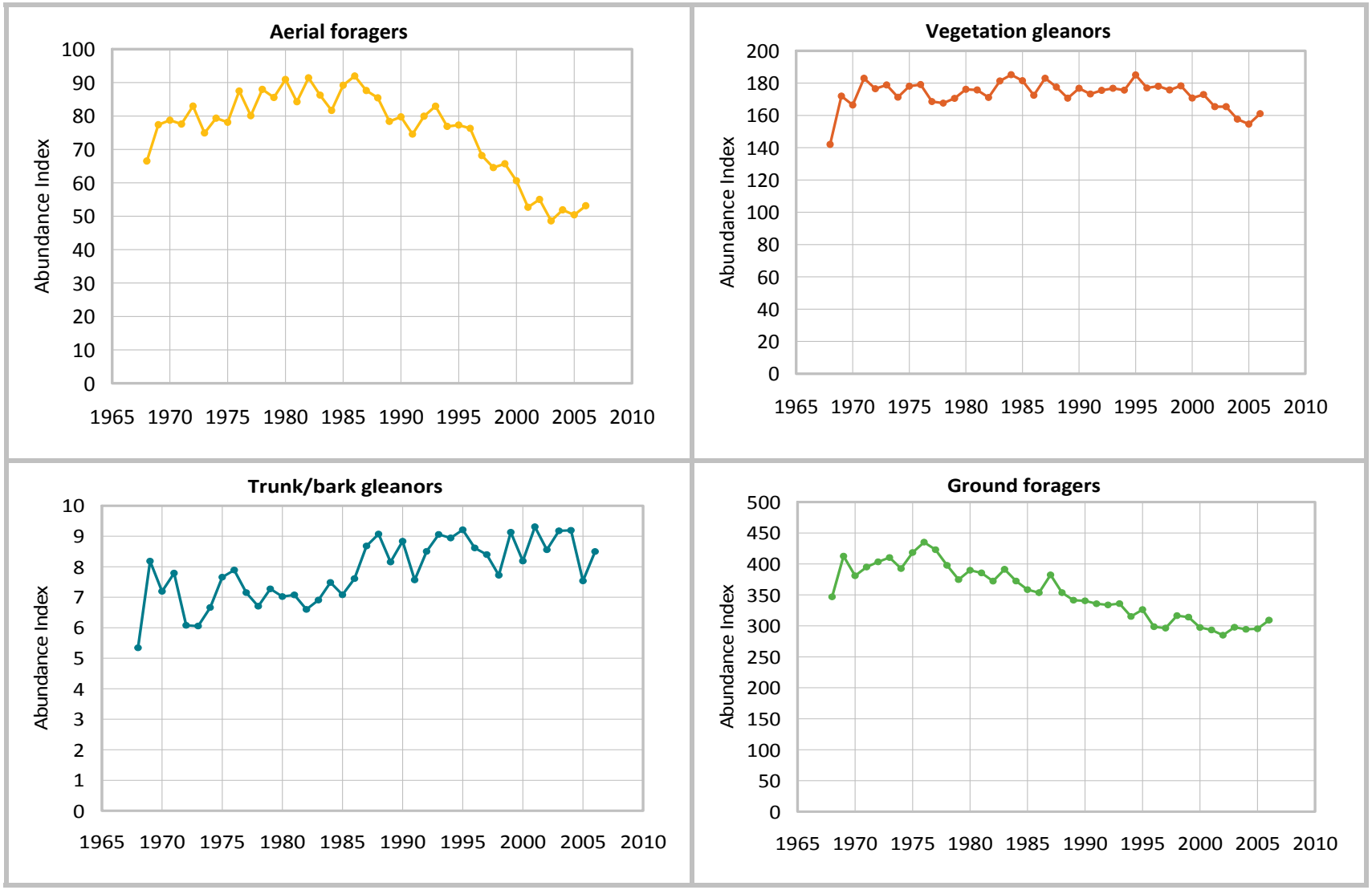



*Figure 8. Annual indices of population change for birds in Canada grouped by feeding substrate, based on data from the Breeding Bird Survey.*

Aerial foragers are predominantly insectivores (swallows, swifts, flycatchers, and others), but also include the falcons and accipiters, most of which are carnivores. The insectivorous aerial foragers stand out as a group showing large declines (Blancher et al., 2009; Nebel et al., 2010), with several declines severe enough that the species have recently been assessed as Threatened (Chimney Swift, Olive-sided Flycatcher, Common Nighthawk, and Whip-poor-will) (COSEWIC, 2007a). Within the insectivorous aerial foraging group, declines appear to be more severe and consistent among species that screen insect prey from the air while flying continuously (nightjars, swallows, and swifts) than among those that pursue individual insects during short sallies from a perch (mainly flycatchers). With the exception of the western-distributed Violet-green Swallow, numbers of all swallow species in Canada are declining. Flycatchers show a mix of declining, stable, and increasing populations. For example, the Eastern Wood-pewee has declined steadily while its western counterpart, the Western Wood-pewee, has not shown a long-term change – although it has been declining since the late 1980s. Eastern Kingbirds have undergone a large recent decline, while the Western Kingbird population has been stable to increasing. Olive-sided Flycatcher, as mentioned above, has declined severely enough that it was assessed as Threatened in 2007 (COSEWIC, 2007a). Causes for these declines are still largely unknown but may involve several factors including changes in insect abundance, changes in availability of nesting habitat (especially for Chimney Swift and Barn Swallow), climatic variation that may affect the timing and thus availability of food, and storm conditions encountered during migration (COSEWIC, 2007b), as well as habitat changes especially in other open landscapes where many of these species breed (Blancher et al., 2009).

The herbivore/frugivore/granivore group includes several northern and rare species (ptarmigans, Bohemian Waxwing) for which there are few data from the BBS and thus the overall trend for this assemblage is heavily influenced by the strong decline in the abundant House Sparrow (-3.3% per year). Individual species within this assemblage show a mix of increases and declines.

The carnivore assemblage is dominated by raptors (hawks, falcons, eagles, and owls), the majority of which are ground feeders. Because owls are nocturnal, BBS is not the best method for surveying these species. Most of the hawks, except the Northern Harrier and the Red-shouldered Hawk, have stable or positive long-term trends reflecting the overall stable assemblage pattern. Many hawks have rebounded in population since the 1960s, likely benefitting from decreased human persecution and the decreased use of DDT and other contaminants (e.g. Blancher et al., 2007).

General patterns in the omnivore group are difficult to discern as this group includes a wide variety of species (such as, thrushes, crows, sparrows, blackbirds, finches, and shrikes) with a variety of foraging strategies, although about two-thirds are ground feeders. Of the six blackbirds included in this group (excluding orioles), four are showing significant long-term declines. These blackbirds are ground feeders and all, except the Bobolink and the Yellow-headed Blackbird, are temperate migrants.

The insectivorous trunk/bark feeders group has a positive long-term trend. This group includes the migratory Pine Warbler and Black-and-white Warbler, but is dominated by resident species (several of the woodpeckers and nuthatches). These resident species appear to be doing well as a group and influence the assemblage trend.

# Atlantic Maritime Ecozone$^{+}$ (BCR 14)

## Contributors: Gilles Falardeau, Kim Mawhinney, and Julie Paquet

Forests currently cover 85 and 75% of the land area of New Brunswick and Nova Scotia respectively (Busby et al., 2006), and thus the majority of the species selected as representative of this ecozone$^{+}$ are forest species. The BBS is well represented in the Atlantic Maritime and results presented are generally considered representative of the ecozone$^{+}$ as a whole although BBS misses some habitats such as high elevation forests and wetlands.

All assemblages except forest birds are showing statistically significant declines, with the largest declines in grassland and other open habitat birds (Table 10). These results are similar to the Boreal Shield Ecozone$^{+}$, which shares many of the same species. Although we did not calculate an assemblage trend for wetland birds because few landbirds fit cleanly in this assemblage and because BBS does not cover wetland habitat well, there are several of species of interest in this region that use wetlands. The population of Nelson's Sparrow in the Atlantic Maritime, one of three disjunct breeding populations in Canada, is tending downwards (-2.9% per year). In Quebec, recent surveys of known historic sites for Nelson's Sparrow suggest a decrease in the Chaleurs Bay and Gaspé Peninsula area since the mid-1980s (Rivard et al., 2006). Rusty Blackbird, recently assessed as a Species of Special Concern in Canada (COSEWIC, 2006b) has largely disappeared (97% loss of population since the 1970s). With 70% of its breeding range located in Canada, the Rusty Blackbird is a species for which Canada has a high responsibility. Reasons for the large decline are unclear but include habitat loss and degradation in its wintering grounds in the United States, effects of climate change and environmental pollutants on the breeding grounds, and past control measures for blackbird populations (COSEWIC, 2006b). In contrast, another wetland species, the Osprey, has increased substantially (4.0% per year) according to BBS, as it has throughout much of its boreal range in Canada. Osprey are relatively tolerant of human activity and have benefitted from artificial nesting platforms (Poole et al., 2002).

*Table 10. Trends in abundance of landbirds for the Atlantic Maritime Ecozone$^{+}$, based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend | | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | (%/yr) | P | 1970s | 1980s | 1990s | 2000s | Change |
| Forest Birds | -0.4% | | 221.6 | 218.3 | 208.1 | 187.1 | -16% |
| Shrub/Successional | -0.6% | * | 160.2 | 141.9 | 137.1 | 134.9 | -16% |
| Grassland | -3.5% | * | 39.9 | 38.2 | 19.5 | 13.3 | -67% |
| Other Open | -3.5% | * | 64.8 | 67.0 | 36.3 | 22.6 | -65% |
| Urban/Suburban | -0.6% | * | 179.7 | 162.0 | 157.3 | 154.9 | -14% |

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

## *Forest bird assemblage*

The cumulative effect of timber harvest in this region has been to change the age structure of the forest, increasing the early succession stands, and decreasing continuous mature stands

(Dettmers, 2004; Busby et al., 2006). Softwood plantations for pulpwood exist where hardwoods once grew in New Brunswick and Nova Scotia (Busby et al., 2006). The spruce budworm cycle plays a large role in the populations of several budworm specialists (such as the Bay-breasted Warbler) as well as influencing populations of many other insectivorous birds which may respond positively to budworm outbreaks but may be negatively affected by aerial spraying to control spruce budworm (Erskine and McManus, 2005; Busby et al., 2006).

Overall, the forest assemblage appears generally stable, though tending negatively especially in the last decade (Table 10, Figure 9). There are large declines in a variety of species, while others have stable or increasing populations. The Canada Warbler, a species recently assessed as Threatened by COSEWIC (2008), has declined by 80% in the Atlantic Maritime since the 1970s (Table 11). The species is sensitive to forest fragmentation and human disturbance, and populations may have been negatively affected on both the breeding and wintering grounds by habitat loss and degradation, and a decline in spruce budworm populations (COSEWIC, 2008; Sleep et al., 2009). Declines in this species are most evident in the eastern portions of its range where the majority of the population occurs. Boreal Chickadee has also declined markedly both in this region (Table 11) and range-wide (Butcher and Niven, 2007; Bird Studies Canada, 2008), and has been designated a high priority for conservation in the region (Dettmers, 2004; Busby et al., 2006). Concerns relate to the potential effects of forest management on spruce-fir-dominated forests in the region.

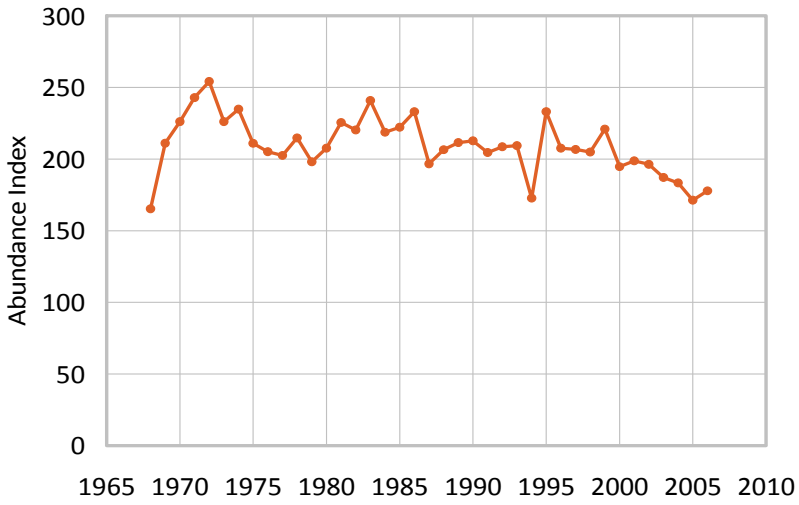



*Figure 9. Annual indices of population change in birds of forest habitat for the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 11. Trends in abundance of selected species of forest birds that are characteristic of the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Canada Warbler | -4.78% | * | 2.95 | 3.12 | 1.41 | 0.60 | -80% |
| Boreal Chickadee | -3.82% | * | 1.41 | 0.79 | 0.66 | 0.55 | -61% |
| Rose-breasted Grosbeak | -3.34% | * | 5.14 | 7.15 | 2.48 | 1.37 | -73% |
| Evening Grosbeak | -2.27% | | 12.92 | 10.76 | 14.01 | 4.37 | -66% |
| Purple Finch | -2.18% | * | 7.62 | 5.11 | 3.64 | 4.64 | -39% |
| Bay-breasted Warbler | -1.88% | | 2.04 | 2.85 | 1.54 | 0.96 | -53% |
| Yellow-bellied Sapsucker | -1.69% | * | 5.85 | 3.66 | 3.16 | 4.00 | -32% |
| Ruby-crowned Kinglet | -1.59% | * | 10.67 | 7.53 | 8.39 | 5.98 | -44% |
| American Redstart | -1.09% | * | 18.58 | 19.03 | 15.96 | 11.74 | -37% |
| Veery | -0.90% | | 11.06 | 13.28 | 9.50 | 7.37 | -33% |
| Yellow-bellied Flycatcher | -0.50% | | 2.08 | 2.46 | 1.59 | 1.61 | -23% |
| Ovenbird | -0.30% | | 14.32 | 15.45 | 13.68 | 11.59 | -19% |
| Black-and-white Warbler | -0.10% | | 4.05 | 4.75 | 4.35 | 3.18 | -21% |
| Black-throated Green Warbler | 0.40% | | 5.33 | 4.84 | 5.99 | 5.70 | 7% |
| Magnolia Warbler | 0.40% | | 12.43 | 14.11 | 13.05 | 14.18 | 14% |
| Northern Parula | 1.11% | n | 5.09 | 5.61 | 5.87 | 6.46 | 27% |
| Blackburnian Warbler | 2.12% | n | 1.19 | 2.22 | 2.12 | 1.68 | 41% |
| Red-eyed Vireo | 2.12% | * | 14.48 | 16.35 | 20.70 | 25.76 | 78% |
| Black-throated Blue Warbler | 2.74% | * | 0.58 | 0.56 | 0.72 | 1.41 | 145% |
| Black-capped Chickadee | 4.60% | * | 3.14 | 4.04 | 8.40 | 11.03 | >200% |
| Blue-headed Vireo | 5.44% | * | 1.76 | 2.54 | 4.35 | 6.67 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

The Atlantic Maritime region in Canada and in neighbouring United States supports over 90% of the world's breeding population of Bicknell's Thrush, one of the rarest songbirds in North America. Bicknell's Thrush was assessed by COSEWIC as Special Concern in 1999 but its status was revised to Threatened in 2009 (COSEWIC, 2010). This bird lives in high-elevation coniferous forests and is particularly susceptible to climate change, which may result in shifts in high-elevation vegetation zones. Other threats include habitat loss and degradation on both the breeding and wintering grounds, squirrel predation at nests, and environmental contaminants (Rimmer et al., 2001; McFarland et al., 2008; COSEWIC, 2009). Wind farms, often located in high-elevation areas, are increasing in Quebec and the Maritimes (CanWEA, 2010) and may also be a future concern. Because of its scarcity and remote breeding habitat, Bicknell's Thrush is rarely recorded by the BBS; however, special surveys in the Maritimes over the last seven years have indicated that it has declined considerably (Campbell et al., 2008), a finding supported by early results of the second Maritime Breeding Bird Atlas (Bird Studies Canada, 2008), and by similar declines observed in Appalachian forests of the northeastern United States (King et al., 2008).

## *Shrub/early successional bird assemblage*

A large portion of the forested land in Atlantic Maritime is in early succession. The overall slightly negative trend in this assemblage (Figure 10) is influenced by the strong declines in abundant species such as White-throated Sparrow and Song Sparrow (Table 12), both of which show varying levels of decline elsewhere in Canada. Increases in early successional forest habitat (Rosenberg and Hodgman, 2000) have favoured generalist species such as Nashville Warbler, Yellow Warbler, and Chestnut-sided Warbler. Despite this increase in habitat, other species are showing declines. Reasons for the decline in White-throated Sparrow are difficult to determine; the species responds positively to open forests and may also follow spruce budworm fluctuations.

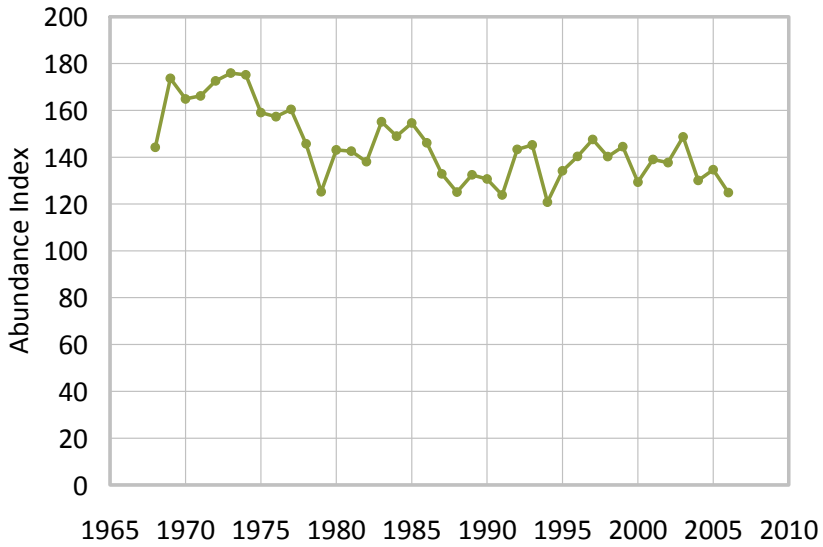



*Figure 10. Annual indices of population change in birds of shrub/early successional habitat for the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 12. Trends in abundance of selected species of shrub/early successional birds that are characteristic of the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Gray Catbird | -2.86% | * | 3.32 | 2.64 | 1.53 | 1.28 | -62% |
| White-throated Sparrow | -1.78% | * | 50.06 | 35.45 | 30.44 | 30.01 | -40% |
| Mourning Warbler | -1.39% | * | 2.30 | 2.58 | 1.92 | 1.40 | -39% |
| Song Sparrow | -0.90% | | 33.93 | 28.51 | 26.55 | 26.75 | -21% |
| Chestnut-sided Warbler | 0.00% | | 5.73 | 4.75 | 4.65 | 5.59 | -3% |
| Common Yellowthroat | 0.10% | | 20.80 | 21.48 | 21.49 | 21.37 | 3% |
| Alder Flycatcher | 0.20% | | 14.79 | 15.88 | 16.78 | 15.12 | 2% |
| Nashville Warbler | 0.30% | | 5.24 | 4.79 | 4.79 | 6.04 | 15% |
| Yellow Warbler | 0.30% | | 8.34 | 9.49 | 9.66 | 8.27 | -1% |
| American Goldfinch | 0.50% | | 11.94 | 10.82 | 13.57 | 14.94 | 25% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Grassland bird assemblage*

Grassland birds are showing alarming declines in the Atlantic Maritime (Figure 11) consistent with declines in other ecozones[+] in Canada. In the Atlantic Maritime, declines started in the mid-1980s and continued until an apparent levelling off in the last few years, whereas the Prairies and Mixedwood Plains ecozones[+] show more consistent declines since the 1970s. Vesper Sparrow, Bobolink, and Eastern Meadowlark populations in the Atlantic Maritime have declined by over 75% since the 1970s (Table 13). The increasing population of Northern Harrier may in part reflect its use of large marshes and fens as well as grassland in this ecozone[+]. The decline in grassland birds is thought to be due to the abandonment of marginal farmland and subsequent return of grassland habitat to forest (Erskine and McManus, 2005). Earlier hay-cutting may also be an important negative factor in the nesting success of these birds, resulting in population declines (Nocera et al., 2005; Busby et al., 2006).

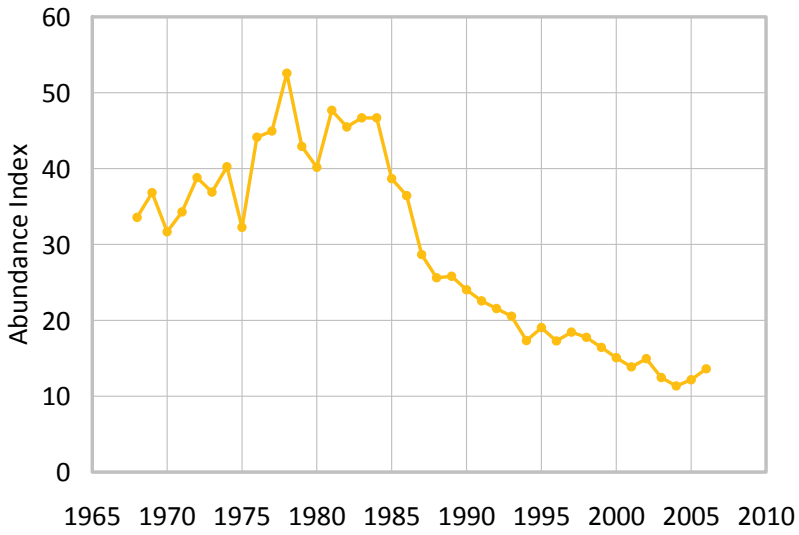



*Figure 11. Annual Indices of population change in birds of grassland habitat for the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 13. Trends in abundance of selected species of grassland birds that are characteristic of the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Vesper Sparrow | -7.78% | * | 0.63 | 0.32 | 0.09 | 0.08 | -88% |
| Bobolink | -5.64% | * | 22.85 | 24.75 | 7.87 | 3.69 | -84% |
| Eastern Meadowlark | -4.59% | | 0.64 | 0.60 | 0.31 | 0.16 | -75% |
| Savannah Sparrow | -1.59% | | 14.50 | 10.76 | 10.17 | 8.57 | -41% |
| Northern Harrier | 5.44% | n | 0.06 | 0.22 | 0.30 | 0.16 | 185% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Other open habitat bird assemblage*

The amount of other open habitat has declined in the Atlantic Maritime, likely due to a decrease in the number of farms, especially small-scale farms. Fields that are no longer cleared are reverting to forest (Busby et al., 2006). Nevertheless, open habitat is still an important part of the landscape; on Prince Edward Island, farmland represents approximately 50% of the landscape (Busby et al., 2006). Birds of open habitat show similar declines to grassland birds (Figure 12, Table 14). This likely results from the loss of habitat beginning in the mid-1980s when farming began to decrease, with intensification of agricultural practices on remaining farms. This assemblage includes many aerial-foraging insectivores that are declining as a group here and in other regions of Canada (Blancher et al., 2009; Nebel et al., 2010).

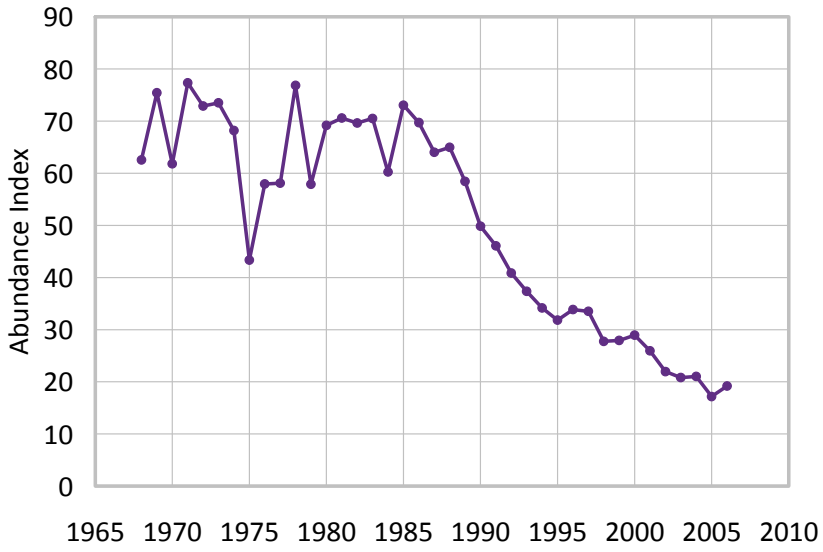



*Figure 12. Annual indices of population change in birds of other open habitats for the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 14. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1970s | 1980s | 1990s | 2000s | Change |
| Bank Swallow | -6.48% | * | 13.26 | 17.50 | 6.13 | 1.56 | -88% |
| Barn Swallow | -5.45% | * | 22.04 | 20.06 | 8.11 | 4.09 | -81% |
| Common Nighthawk | -4.30% | n | 0.37 | 0.42 | 0.19 | 0.10 | -73% |
| Baltimore Oriole | -3.73% | * | 0.40 | 0.98 | 0.21 | 0.14 | -64% |
| Eastern Kingbird | -2.57% | * | 1.62 | 2.12 | 0.92 | 0.68 | -58% |
| Cliff Swallow | -1.98% | n | 4.60 | 5.19 | 3.70 | 2.34 | -49% |
| Tree Swallow | -1.69% | * | 16.21 | 19.11 | 14.39 | 9.03 | -44% |
| American Kestrel | -0.10% | | 0.34 | 0.42 | 0.43 | 0.30 | -12% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Urban and suburban bird assemblage*

Urban areas are generally expanding in this region and this might be expected to result in an increase in urban-associated bird species. However, the urban assemblage is showing a small negative trend (Figure 13), resulting mainly from declines in two abundant introduced species, European Starling and House Sparrow, as well as a sharp decline in Chimney Swift (Table 15). The decline in Chimney Swift, assessed as Threatened by COSEWIC (2007b), may be partially related to the capping of chimneys which makes them unsuitable for nesting and roosting. The Chimney Swift is one of several species of aerial-foraging insectivores showing widespread declines in Canada, so other factors may be involved. As in other ecozones[+], urban birds may be affected by increased exposure to contaminants, increased predation from domestic cats, and fewer green spaces. Rock Pigeon, another introduced species, and Mourning Dove both show large increases in populations and may be responding to milder winters and an increasing number of bird feeders.

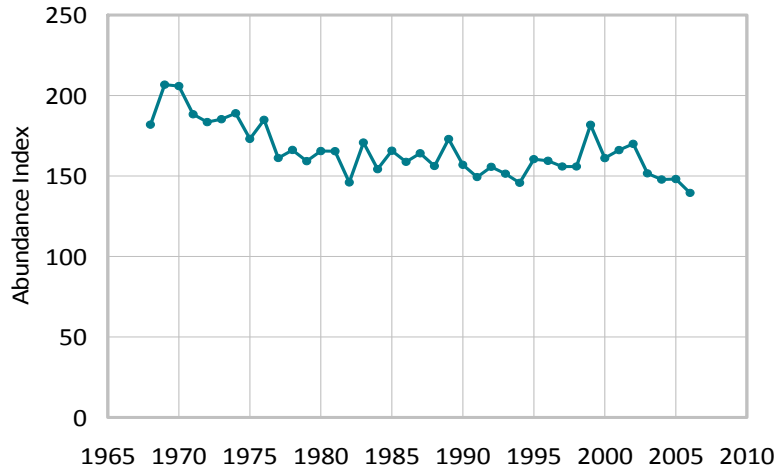



*Figure 13. Annual indices of population change in birds of urban/suburban habitat for the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 15. Trends in abundance of selected species of urban/suburban birds that are characteristic of the Atlantic Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Chimney Swift | -7.23% | * | 2.72 | 1.20 | 0.49 | 0.37 | -87% |
| House Sparrow | -6.95% | * | 15.92 | 8.96 | 3.62 | 1.78 | -89% |
| European Starling | -1.78% | * | 56.38 | 44.02 | 38.30 | 32.87 | -42% |
| Common Grackle | -0.50% | | 29.36 | 25.60 | 26.49 | 27.13 | -8% |
| Chipping Sparrow | -0.30% | | 10.79 | 12.11 | 10.04 | 10.62 | -2% |
| Blue Jay | -0.10% | | 4.69 | 4.63 | 4.92 | 5.16 | 10% |
| American Robin | 0.00% | | 60.39 | 59.57 | 61.15 | 59.55 | -1% |
| Rock Pigeon | 4.71% | * | 1.88 | 3.19 | 6.30 | 5.41 | 187% |
| Mourning Dove | 20.32% | * | 0.09 | 0.47 | 3.59 | 7.24 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Mixedwood Plains Ecozone$^{+}$ (BCR 13)

### Contributors: Mike Cadman, Gilles Falardeau, and Lyle Friesen

The Mixedwood Plains is one of the smallest of the ecozones$^{+}$ and has the highest human density. The vegetation is diverse, with a mix of coniferous and deciduous forests, including Carolinian forests. Alvars, tallgrass prairies, and wetlands also occur. Many areas have been converted to agriculture and urban development. The Mixedwood Plains Ecozone$^{+}$ is well covered by the BBS and results presented are considered representative of the ecozone$^{+}$ as a whole. Trends differ by habitat assemblages, with forest birds faring best overall, while grassland birds and other open habitat birds show significant declines (Table 16). Grassland birds show the greatest decline of all groups; abundance has dropped by over 60% since the 1970s. This region is home to many nationally and provincially listed bird species.

*Table 16. Trends in abundance of landbirds for the Mixedwood Plains Ecozone$^{+}$, based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | 1.1% | | 50.6 | 56.9 | 64.2 | 67.3 | 33% |
| Shrub/Successional | 0.1% | | 117.2 | 123.5 | 122.5 | 125.2 | 7% |
| Grassland | -3.1% | * | 155.4 | 120.3 | 86.4 | 59.9 | -61% |
| Other Open | -1.8% | * | 133.8 | 124.9 | 90.4 | 74.8 | -44% |
| Urban/Suburban | -0.7% | * | 425.9 | 394.3 | 364.4 | 352.2 | -17% |

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

## *Forest bird assemblage*

The overall trend for the forest bird assemblage is positive (Figure 14) although individual species show a variety of increasing, decreasing, and stable trends. The forest bird assemblage includes a wide variety of species that differ in habitat requirements, foraging habits, and migration pattern, thus these differences among individual species are not unexpected. Many species are likely responding to increased forest cover through successional changes in abandoned marginal farmland (Crins et al., 2007). The overall positive trend for the assemblage is reflected by several typical forest species, especially those not particularly sensitive to human disturbance (Black-capped Chickadee, Warbling Vireo, and White-breasted Nuthatch, Table 17). Nevertheless, some worrying declines are apparent despite increased forest cover. For example, the Eastern Wood-pewee, a species that winters in South America and undertakes a long annual migration, has lost 55% of its population since the 1970s (Table 17). The decline in this species is one of many among the aerial insectivores. In contrast, the Red-eyed Vireo, which often inhabits the same forest, is increasing. Within mature forests, where forest cover has not changed, other forest birds, such as the Brown Creeper, Least Flycatcher, and Cerulean Warbler, have shown signs of decline in the past couple of decades (Environment Canada, 2006; Canadian Wildlife Service, Environment Canada, unpublished data; Environment Canada, unpublished data). Although a BBS trend is not available for Cerulean Warbler in Canada because of small sample size, the North American BBS trend indicates a highly significant long-term decline (-4.1% per year), the highest of any warbler in North America (Sauer et al., 2008). This decline is also

reflected in results from the Atlas of the Breeding Birds in Ontario (Cadman et al., 2007), and was one reason for the species' assessment as a Species of Special Concern in 2003 (COSEWIC, 2003) and as Endangered in 2010. The Wood Thrush has remained stable in this ecozone+ despite showing severe population declines in many parts of its breeding range since the mid-1960s and continuing degradation of its forest habitat in both North America and Central America. An increase in forest cover in the Mixedwood Plains has likely helped the population.

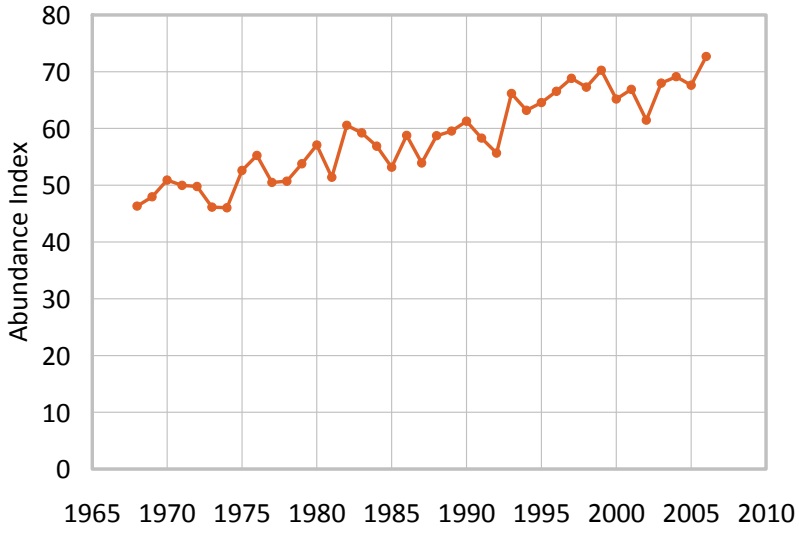



*Figure 14. Annual indices of population change in birds of forest habitat for the Mixedwood Plains Ecozone+, based on data from the Breeding Bird Survey.*

*Table 17. Trends in abundance of selected species of forest birds that are characteristic of the Mixedwood Plains Ecozone+, based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Eastern Wood-pewee | -2.8% | * | 4.38 | 4.35 | 2.72 | 1.96 | -55% |
| Veery | -1.5% | | 5.71 | 4.87 | 4.31 | 3.91 | -31% |
| Rose-breasted Grosbeak | -0.6% | | 4.72 | 5.31 | 3.76 | 3.70 | -22% |
| Great Crested Flycatcher | -0.1% | | 4.72 | 5.11 | 4.90 | 4.48 | -5% |
| Scarlet Tanager | 0.6% | | 0.61 | 0.55 | 0.64 | 0.68 | 11% |
| Wood Thrush | 0.8% | | 2.20 | 2.27 | 2.25 | 2.73 | 24% |
| Purple Finch | 1.7% | | 0.53 | 0.70 | 0.74 | 0.80 | 52% |
| Downy Woodpecker | 2.1% | * | 0.86 | 1.02 | 1.28 | 1.36 | 58% |
| White-breasted Nuthatch | 2.8% | * | 0.39 | 0.53 | 0.77 | 0.77 | 100% |
| Warbling Vireo | 3.3% | * | 3.54 | 5.92 | 6.90 | 7.63 | 115% |
| Red-eyed Vireo | 3.4% | * | 5.18 | 5.47 | 9.57 | 12.98 | 150% |
| Black-capped Chickadee | 6.5% | * | 1.49 | 4.59 | 6.80 | 7.85 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Shrub/early successional bird assemblage*

The overall index for the shrub/early successional assemblage is stable (Figure 15). There has tended to be a positive change among birds making use of young forests (such as Chestnut-sided Warbler, Mourning Warbler, and Indigo Bunting), with a tendency towards negative

change in birds making use of old-field habitat (such as Field Sparrow, Brown Thrasher, and Gray Catbird) (Table 18).

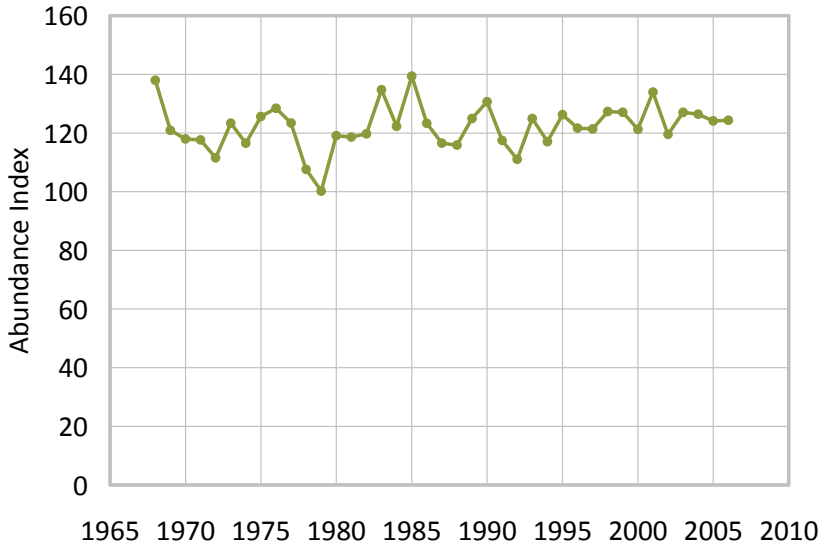



*Figure 15. Annual indices of population change in birds of shrub/early sucessional habitat for the Mixedwood Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 18. Trends in abundance of selected species of shrub/early succession birds that are characteristic of the Mixedwood Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1970s | 1980s | 1990s | 2000s | Change |
| Field Sparrow | -2.4% | | 2.96 | 2.77 | 1.84 | 1.38 | -53% |
| Brown Thrasher | -2.2% | * | 4.44 | 3.13 | 2.23 | 2.38 | -46% |
| Gray Catbird | -1.2% | | 4.86 | 4.06 | 2.89 | 3.59 | -26% |
| House Wren | 0.0% | | 6.38 | 5.42 | 4.86 | 5.80 | -9% |
| Song Sparrow | 0.1% | | 38.15 | 43.32 | 41.49 | 40.49 | 6% |
| American Goldfinch | 0.6% | * | 19.43 | 20.14 | 22.99 | 26.28 | 35% |
| Indigo Bunting | 1.0% | | 2.32 | 2.46 | 2.61 | 2.95 | 27% |
| Mourning Warbler | 2.1% | | 0.48 | 0.91 | 0.84 | 0.59 | 23% |
| Chestnut-sided Warbler | 3.4% | * | 0.99 | 1.20 | 1.94 | 2.01 | 102% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

The Golden-winged Warbler, whose Canadian breeding range is mainly in southern Ontario, was assessed as Threatened in Canada in 2006 (COSEWIC, 2006a). This species underwent a dramatic range expansion in Ontario during the 1930s (McCracken, 1994) which continued until the 1990s. The population is now rapidly declining throughout its North American range, including Ontario. Reasons for the decline are thought to be a combination of habitat loss (in part due to succession of old fields to forest), parasitism by Brown-headed Cowbirds, and hybridization with the Blue-winged Warbler (Vallender, 2007).

## *Grassland bird assemblage*

Grassland birds in the Mixedwood Plains are showing dramatic declines (Figure 16), particularly since the beginning of the 1980s. This is similar to results in other Canadian ecozones+ and throughout North America (Sauer et al., 2008). Several species have lost 50% or more of their population over the last four decades (Table 19), likely due to the combined effects of conversion of marginal farmland to forest and more intensive use of remaining agricultural lands where most of these birds nest and winter. The number of wind farms has increased dramatically over the last few years and this trend is expected to accelerate in coming years (CanWEA, 2010). Many current and proposed wind farms in Ontario are in prime grassland areas because these areas often have high wind potential and because they present the fewest logistical constraints to construction. Concerns have been raised that the presence of wind mills might result in lower nesting densities of Bobolinks, Eastern Meadowlark, and other grassland birds because of avoidance or abandonment of areas too close to the structures (Arnett et al., 2007). The relatively stable population of Northern Harrier in this assemblage may reflect its use of large marshes and fens as well as grassland.

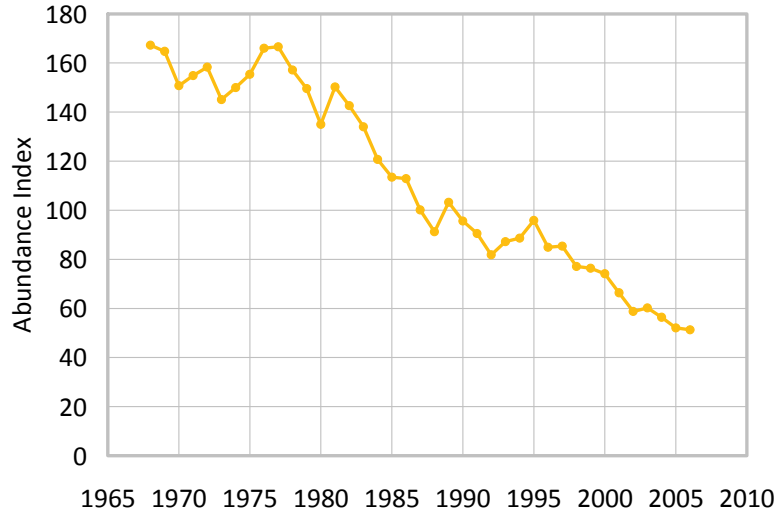



*Figure 16. Annual indices of population change in birds of grassland habitat for the Mixedwood Plains Ecozone+, based on data from the Breeding Bird Survey.*

*Table 19. Trends in abundance of selected species of grassland birds that are characteristic of the Mixedwood Plains Ecozone+, based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Bobolink | -3.6% | * | 59.33 | 48.21 | 29.56 | 18.64 | -69% |
| Eastern Meadowlark | -3.5% | * | 28.63 | 18.85 | 14.43 | 10.13 | -65% |
| Vesper Sparrow | -3.4% | * | 5.34 | 4.33 | 3.01 | 2.05 | -62% |
| Savannah Sparrow | -2.6% | * | 54.42 | 39.97 | 31.88 | 23.68 | -56% |
| Horned Lark | -2.3% | * | 7.14 | 8.24 | 5.61 | 3.74 | -48% |
| Grasshopper Sparrow | -1.6% | | 0.91 | 0.63 | 0.90 | 0.65 | -29% |
| Northern Harrier | 0.6% | | 0.38 | 0.48 | 0.67 | 0.36 | -4% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Other open habitat bird assemblage*

Birds in this assemblage use a variety of open lands found in agricultural and other landscapes. The fact that so many different species (for example, raptors and passerines, as well as short-distance and neotropical migrants) are declining in this group (Figure 17, Table 20), suggests that problems on the breeding ground may be a common cause. Loss of old-field habitat due to succession and the intensification of agricultural practices which involve the removal of hedgerows are likely important causes. The Eastern Bluebird is an exception within this assemblage. This species was assessed as rare in the 1970s by COSEWIC, but as its population increased, it was de-listed in 1996 (COSEWIC, 2007a). Warmer winters over the last 20 years have likely helped the population. In southern Ontario, the population recovery was greatly assisted in the 1980s and 1990s by projects of concerned citizens that erected and maintained thousands of nest boxes. Tree Swallows are also a beneficiary of nest box programs and have a stable/increasing population in this ecozone[+], in contrast to the declines seen in other swallow species. Nevertheless, their populations are experiencing declines further north and in Canada as a whole, especially over the last two decades. This assemblage contains several species of aerial-foraging insectivores, which are declining across Canada (Blancher et al., 2009; Nebel et al., 2010).

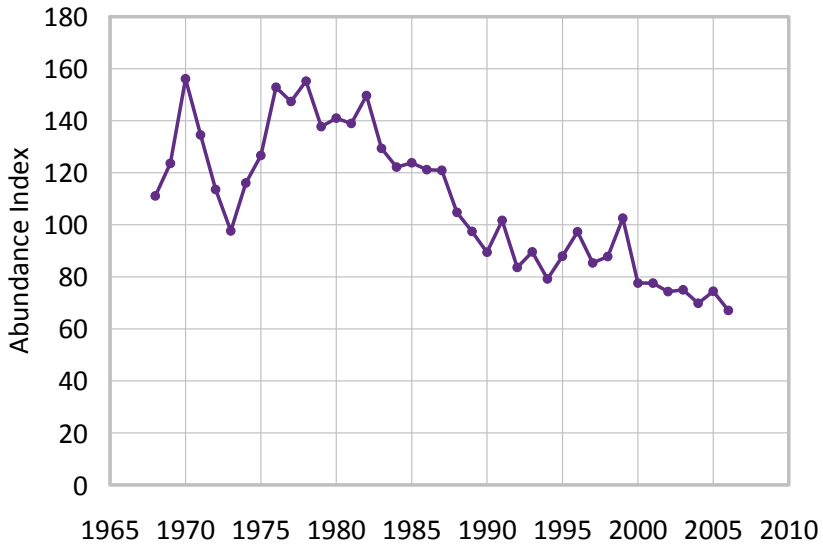



*Figure 17. Annual indices of population change in birds of other open habitats for the Mixedwood Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 20. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Mixedwood Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Bank Swallow | -4.6% | * | 33.42 | 31.16 | 11.80 | 7.08 | -79% |
| Brown-headed Cowbird | -3.7% | * | 24.84 | 16.95 | 11.14 | 7.92 | -68% |
| American Kestrel | -3.0% | * | 1.11 | 1.28 | 0.79 | 0.45 | -59% |
| Barn Swallow | -1.9% | n | 38.63 | 35.98 | 25.33 | 20.90 | -46% |
| Northern Rough-winged Swallow | -1.8% | | 1.42 | 1.20 | 0.97 | 0.74 | -48% |
| Baltimore Oriole | -1.5% | | 9.09 | 7.72 | 6.05 | 5.95 | -35% |
| Red-tailed Hawk | -0.8% | | 0.92 | 0.79 | 0.62 | 0.66 | -29% |
| Eastern Kingbird | -0.5% | | 8.35 | 9.87 | 8.69 | 6.53 | -22% |
| Tree Swallow | 1.0% | | 12.83 | 17.94 | 19.58 | 15.37 | 20% |
| Eastern Bluebird | 7.6% | * | 0.13 | 0.13 | 0.92 | 1.09 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Urban and suburban bird assemblage*

Birds typical of urban and suburban landscapes are a diverse group. Unlike many other species, they are united by their ability to tolerate human disturbance. Despite this, the assemblage is showing a slight decline (Figure 18). Many species in this group are not exclusively urban and also occur in more natural habitat while others, such as House Sparrow and House Finch, are associated almost exclusively with human habitation. Population trends are varied, ranging from the very sharp decline shown by Chimney Swift, to substantial increases in Blue Jay, Mourning Dove, and House Finch (Table 21).

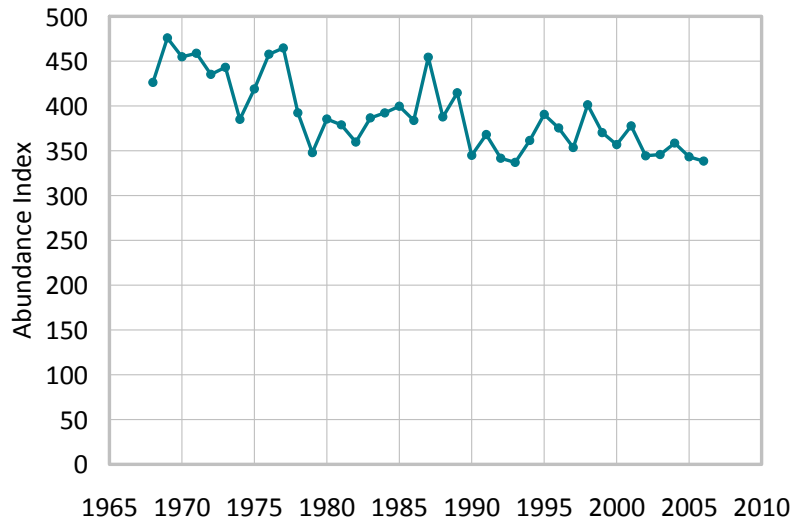



*Figure 18. Annual indices of population change in birds of urban/suburban habitat for the Mixedwood Plains Ecozone[+], based on data from the Breeding Bird Survey.*

Though the House Finch is a species native to western Canada, its eastern Canada population is more recent. The House Finch was introduced into the cities of the eastern United States from the western United States in the 1940s and from there spread to eastern Canada. The House

Finch first arrived in the Mixedwood Plains in the mid-1970s, increased quickly to a peak in the mid-1990s, but has since declined steadily. The recent decline is likely a result of disease, as House Finches are particularly susceptible to conjunctivitis which is easily spread at bird feeders (Dhondt et al., 1998).

Introduced Eurasian birds are a feature of this assemblage; both House Sparrow and European Starling have shown significant declines in recent decades while Rock Pigeon numbers are stable (Table 21). The decline in House Sparrow mirrors declines in Europe (Pan-European Common Bird Monitoring Scheme, 2007), which is thought to be due in part to a reduction in food supply because of less grain spillage as a result of reduced horse use, loss of nesting habitat, and an increase in pollution and predators (e.g. Baillie et al., 2007).

*Table 21. Trends in abundance of selected species of urban/suburban birds that are characteristic of the Mixedwood Plains Ecozone+, based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Chimney Swift | -5.5% | * | 2.60 | 1.53 | 0.97 | 0.59 | -77% |
| House Sparrow (I) | -2.9% | * | 69.65 | 66.53 | 40.25 | 30.57 | -56% |
| European Starling (I) | -1.4% | * | 163.20 | 135.79 | 120.79 | 105.39 | -35% |
| Common Grackle | -0.7% | | 75.95 | 59.97 | 58.86 | 64.62 | -15% |
| American Robin | 0.8% | * | 52.06 | 58.93 | 63.89 | 65.12 | 25% |
| Chipping Sparrow | 0.9% | * | 13.07 | 15.65 | 16.53 | 16.14 | 23% |
| Rock Pigeon (I) | 0.9% | | 15.79 | 20.88 | 19.94 | 20.51 | 30% |
| Blue Jay | 2.8% | * | 4.20 | 6.34 | 8.28 | 9.39 | 123% |
| Mourning Dove | 3.0% | * | 14.39 | 20.28 | 25.56 | 33.66 | 134% |
| House Finch | 7.7% | n | 0.00 | 0.35 | 5.86 | 2.72 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
(I) indicates an introduced species
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Boreal Shield Ecozone+ (BCRs 8 and 12, minus Newfoundland Boreal)

## Contributors: Mike Cadman and Lyle Friesen

The Boreal Shield has a high diversity of bird species including year-round residents, such as Boreal Chickadee and Gray Jay, as well as many migratory species that breed in the boreal each summer and then migrate southward over much of the western hemisphere. Large portions of many species' global populations are represented in Canada's boreal forest, including the Boreal Shield. Sparrows, warblers, and thrushes account for more than half of all boreal landbirds. About 50% of the world's population of the 37 warbler species that live in Canada live in the boreal forest (Blancher, 2003). Boreal landbirds are highly migratory; an estimated 93% of them leave the boreal each fall to winter in the United States, Mexico, the West Indies, and Central and South America (Blancher, 2003). Forest habitat dominates the Boreal Shield Ecozone+, and thus forest birds form the majority of species selected as representative for the

ecozone+. Birds of open habitats are a minor part of the avifauna, mainly in the southern part of the ecozone+.

Much of the coverage from the BBS in the Boreal Shield is in the southern portion of Ontario and Quebec, with few samples in the more northern shield and areas outside of Ontario and Quebec. Agricultural areas in the region are relatively well covered by BBS because they tend to be accessible by roads and are found in the southern parts of the region.

Table 22 shows trends in abundance for landbird assemblages. BBS results show declines for birds of other open and shrub/early successional habitats. An assemblage trend for wetland landbirds is not included because few landbirds fit cleanly into this assemblage and because the BBS does not cover wetland habitat well. Nevertheless, it is worth noting that the Rusty Blackbird, assessed as a species of Special Concern in 2006 (COSEWIC, 2006b), has declined steeply in the surveyed portions of this region in recent decades, according to the BBS. The forest birds assemblage shows close to stable populations, although the trends for individual species within this group are diverse, ranging from large declines to large increases. The shrub/early successional assemblage is also relatively stable but exhibits a negative trend. The results for forest and shrub/early successional assemblages are strikingly similar to the same assemblages in the Atlantic Maritime Ecozone+, both regions sharing many of the same species.

*Table 22. Trends in abundance of landbirds for the Boreal Shield Ecozone+, based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | -0.2% | | 208.0 | 213.7 | 206.6 | 186.1 | -11% |
| Shrub/Successional | -0.7% | * | 164.4 | 143.3 | 138.8 | 129.7 | -21% |
| Other Open | -4.0% | * | 42.8 | 42.5 | 21.5 | 11.3 | -74% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

Another source of data on northern forest birds in this ecozone+ is the *Atlas of the Breeding Birds of Ontario* (Cadman et al., 2007). Changes observed in northern forest birds between the first (1981-1985) and the second (2001-2005) atlas tend to be more positive than BBS results, which as described above, are more representative of southern portions of the Boreal Shield.

## *Forest bird assemblage*

The BBS forest assemblage pattern has been relatively stable (Figure 19) but individual species show a mix of increasing, decreasing, and stable populations (Table 23). Table 24 presents the results from the *Atlas of the Breeding Birds of Ontario* and is included for the forest bird assemblage because it provides better coverage for the northern forests than the BBS. These data show that there was an increase in the probability of detecting most forest birds in the Boreal Shield in 2001-2005 compared with the 1981-1985 time period, although increased efficiency of Atlas coverage in 2001-2005 cannot be ruled out as an explanation (Cadman et al., 2007).

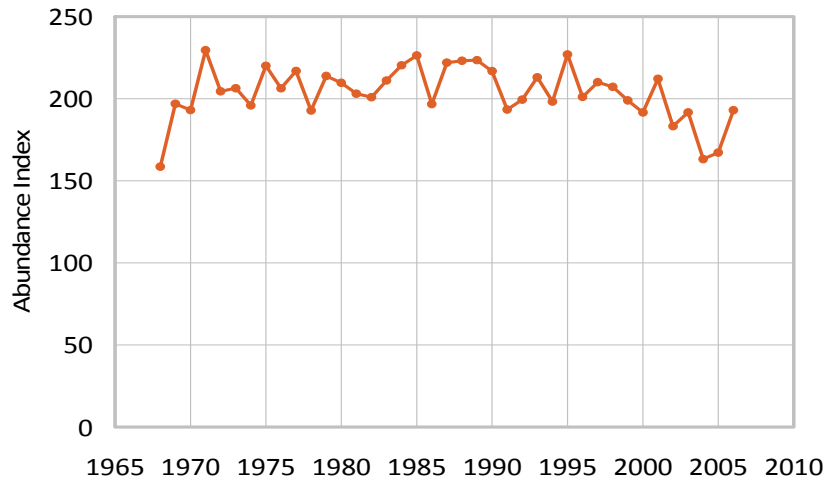



*Figure 19. Annual indices of population change in birds of forest habitat for the Boreal Shield Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 23. Trends in abundance of selected species of forest birds that are characteristic of the Boreal Shield Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Olive-sided Flycatcher | -6.9% | * | 1.46 | 1.18 | 0.46 | 0.18 | -87% |
| Boreal Chickadee | -6.9% | * | 0.58 | 0.26 | 0.09 | 0.09 | -85% |
| Canada Warbler | -3.0% | * | 2.27 | 1.69 | 1.44 | 1.00 | -56% |
| Evening Grosbeak | -2.9% | * | 5.49 | 8.05 | 4.41 | 1.64 | -70% |
| Purple Finch | -2.9% | * | 2.83 | 2.90 | 1.62 | 1.34 | -53% |
| Tennessee Warbler | -2.3% | | 4.93 | 8.49 | 5.43 | 1.87 | -62% |
| Rose-breasted Grosbeak | -2.1% | * | 6.06 | 5.33 | 3.43 | 2.82 | -53% |
| Ruby-crowned Kinglet | -1.8% | * | 7.68 | 5.66 | 6.26 | 3.57 | -54% |
| Least Flycatcher | -1.7% | * | 10.09 | 9.00 | 7.03 | 5.80 | -43% |
| Veery | -1.2% | n | 18.49 | 17.39 | 14.12 | 11.94 | -35% |
| Ruffed Grouse | -1.1% | | 0.72 | 0.60 | 0.53 | 0.33 | -53% |
| Bay-breasted Warbler | -0.8% | | 0.95 | 1.29 | 0.99 | 0.49 | -48% |
| Gray Jay | -0.6% | | 1.46 | 1.38 | 1.21 | 1.13 | -23% |
| Ovenbird | -0.5% | | 24.21 | 24.12 | 22.34 | 20.16 | -17% |
| Swainson's Thrush | -0.5% | | 15.35 | 15.65 | 13.76 | 12.79 | -17% |
| American Redstart | 0.3% | | 5.95 | 6.15 | 6.77 | 5.99 | 1% |
| Yellow-rumped Warbler | 0.3% | | 6.30 | 7.82 | 6.71 | 5.90 | -6% |
| Cape May Warbler | 0.6% | | 0.57 | 1.35 | 1.09 | 0.53 | -6% |
| Black-and-white Warbler | 0.7% | | 3.85 | 5.06 | 5.12 | 3.84 | 0% |
| Red-eyed Vireo | 0.8% | * | 32.58 | 34.97 | 37.75 | 38.40 | 18% |
| Philadelphia Vireo | 1.2% | | 0.77 | 1.01 | 1.28 | 0.96 | 26% |
| Black-throated Green Warbler | 1.3% | | 1.81 | 2.25 | 2.65 | 2.80 | 55% |
| Magnolia Warbler | 1.4% | n | 6.40 | 7.41 | 9.02 | 9.27 | 45% |
| Blackburnian Warbler | 1.8% | * | 1.96 | 2.54 | 3.16 | 2.50 | 28% |
| Blue-headed Vireo | 2.0% | * | 1.34 | 1.38 | 1.51 | 1.90 | 42% |
| Winter Wren | 2.6% | * | 5.25 | 5.58 | 10.26 | 9.97 | 90% |
| Hairy Woodpecker | 2.6% | * | 0.78 | 0.99 | 1.04 | 1.27 | 63% |
| Broad-winged Hawk | 2.7% | | 0.21 | 0.50 | 0.30 | 0.56 | 163% |
| Black-throated Blue Warbler | 3.0% | n | 0.64 | 1.09 | 1.39 | 1.12 | 75% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

*Table 24. Change in detection of characteristic species of forest birds from surveys in 1981-1985 compared to 2001-2005 surveys from the Ontario Breeding Bird Atlas.*

| Species | Southern Shield | | Northern Shield | |
|---|---|---|---|---|
| Cape May Warbler | -35% | * | -1% | |
| Olive-sided Flycatcher | -35% | * | -11% | |
| Tennessee Warbler | -27% | * | 3% | |
| Ruby-crowned Kinglet | -22% | * | 18% | * |
| Bay-breasted Warbler | -17% | * | 22% | * |
| Rose-breasted Grosbeak | -12% | * | -10% | |
| Evening Grosbeak | -10% | * | -26% | * |
| Canada Warbler | -10% | * | -17% | |
| Purple Finch | -6% | * | -19% | * |
| Least Flycatcher | -3% | | 6% | |
| American Redstart | -1% | | 24% | * |
| Swainson's Thrush | 0% | | 5% | * |
| Veery | 0% | | 22% | * |
| Broad-winged Hawk | 2% | | 16% | |
| Red-eyed Vireo | 2% | * | 15% | * |
| Ovenbird | 2% | * | 7% | * |
| Black-and-white Warbler | 2% | | 28% | * |
| Gray Jay | 3% | | 18% | * |
| Ruffed Grouse | 4% | | 27% | * |
| Yellow-rumped Warbler | 4% | * | 8% | * |
| Blackburnian Warbler | 6% | * | 35% | * |
| Hairy Woodpecker | 9% | * | 16% | * |
| Magnolia Warbler | 13% | * | 28% | * |
| Boreal Chickadee | 18% | | 6% | |
| Black-throated Green Warbler | 18% | * | 23% | * |
| Black-throated Blue Warbler | 19% | * | 93% | * |
| Winter Wren | 21% | * | 23% | * |
| Philadelphia Vireo | 29% | * | 21% | |
| Blue-headed Vireo | 94% | * | 72% | * |

Species are sorted by magnitude of change in Southern Shield region
* indicates statisticallly different from no change at P < 0.1

*Source: adapted from Cadman et al. (2007)*

The reasons for population changes are diverse. Several of these species exhibit substantial natural population fluctuations due to changes in seed supply (for example, Purple Finch), fire, and insect infestations, particularly those in more northern coniferous forests. The spruce budworm cycle plays a large role in the populations of several budworm specialists (Tennessee Warbler, Cape May Warbler, and Bay-breasted Warbler) (Palmer, 1965; Alley, 1984; Williams, 1996; Rimmer and McFarland, 1998; Baltz and Latta, 1998) and influences populations of many other insectivorous birds. These species respond positively to budworm outbreaks but may be negatively affected by aerial spraying to control spruce budworm. Global climate change may also affect birds. For example, declines in Gray Jay in Algonquin Park have been attributed, at least in part, to the rise in winter temperature that has caused this resident species' winter food stores to spoil (Waite and Strickland, 2006). The marked decline of the Olive-sided Flycatcher, assessed as Threatened (COSEWIC, 2007d), is consistent with declines in many other aerial insectivores. As a neotropical migrant, it is also likely influenced by threats along migration

routes and in its tropical wintering grounds, as are other species such as Rose-breasted Grosbeak, Canada Warbler, Cape May Warbler, Tennessee Warbler, and Bay-breasted Warbler. Similarly, population changes in short-distance migrant forest birds (such as, Winter Wren, Blue-headed Vireo, and Ruby-crowned Kinglet) are also influenced by conditions on their migration routes and wintering grounds. The Boreal Chickadee is endemic to the spruce-fir forests of the boreal region. Its trend has been very negative according to BBS results in both the Boreal Shield and Canada-wide between 1970 and 2006, as well as in results from the CBC (Butcher and Niven, 2007). However, no decline was found in the two decades between the Ontario breeding bird atlases (McLaren, 2007) which covered Ontario's boreal forest more comprehensively than the BBS.

## *Shrub/early successional bird assemblage*

Birds in early successional habitat such as old fields and regenerating forests show an overall small decline in population (Figure 20). Four species have experienced significant declines, consistent with their national trend (Table 25). The White-throated Sparrow trend is stable or slightly negative in this region (-0.6% per year) according to BBS data. Interestingly, data from the Christmas Bird Count show a decline in the south of its winter range and an increase in the north, suggesting a northward shift in its wintering distribution (Niven et al., 2004).

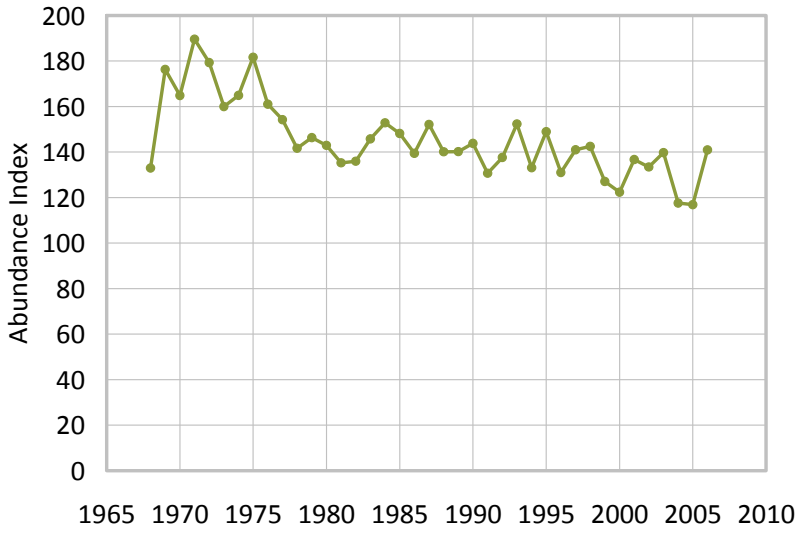



*Figure 20. Annual indices of population change in birds of shrub/successional habitat for the Boreal Shield Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 25. Trends in abundance of selected species of shrub/successional birds that are characteristic of the Boreal Shield Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub / Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Brown Thrasher | -3.3% | * | 1.28 | 0.95 | 0.53 | 0.46 | -64% |
| Song Sparrow | -1.7% | * | 19.48 | 12.84 | 13.04 | 11.43 | -41% |
| Mourning Warbler | -1.3% | * | 12.06 | 11.74 | 8.92 | 8.30 | -31% |
| American Goldfinch | -1.3% | n | 6.31 | 5.62 | 4.85 | 5.21 | -17% |
| Gray Catbird | -1.2% | | 0.99 | 0.90 | 0.79 | 0.69 | -31% |
| Yellow Warbler | -1.0% | | 5.30 | 5.93 | 4.24 | 3.55 | -33% |
| Chestnut-sided Warbler | -0.6% | | 18.23 | 16.14 | 15.18 | 13.83 | -24% |
| White-throated Sparrow | -0.6% | | 50.40 | 42.48 | 43.64 | 42.15 | -16% |
| Nashville Warbler | 0.0% | | 17.15 | 16.56 | 17.83 | 14.99 | -13% |
| Alder Flycatcher | 0.2% | | 8.48 | 9.22 | 8.96 | 9.10 | 7% |
| Lincoln's Sparrow | 0.2% | | 2.14 | 2.42 | 2.57 | 1.94 | -9% |
| Indigo Bunting | 1.9% | | 1.01 | 1.17 | 1.18 | 1.63 | 62% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates $P < 0.05$; n indicates $0.05<P<0.1$; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Other open habitat bird assemblage*

Birds in the other open habitat assemblage show the largest overall decline of all assemblages in the Boreal Shield Ecozone[+], with declines mainly apparent since the late 1980s (Figure 21, Table 22). Nevertheless, many of these species are not naturally characteristic of the region. Land clearing for agriculture created habitat in this area with a resultant increase in bird populations. Recent declines may be a reflection of the loss of this habitat through reforestation of abandoned farmland in some parts of this ecozone[+] (Crins et al., 2007). Declines in the swallows and Common Nighthawk are consistent with a general decline in aerial insectivores across Canada (Table 26). Eastern Bluebirds have never been common in this ecozone[+] though their small population appears to be faring well.

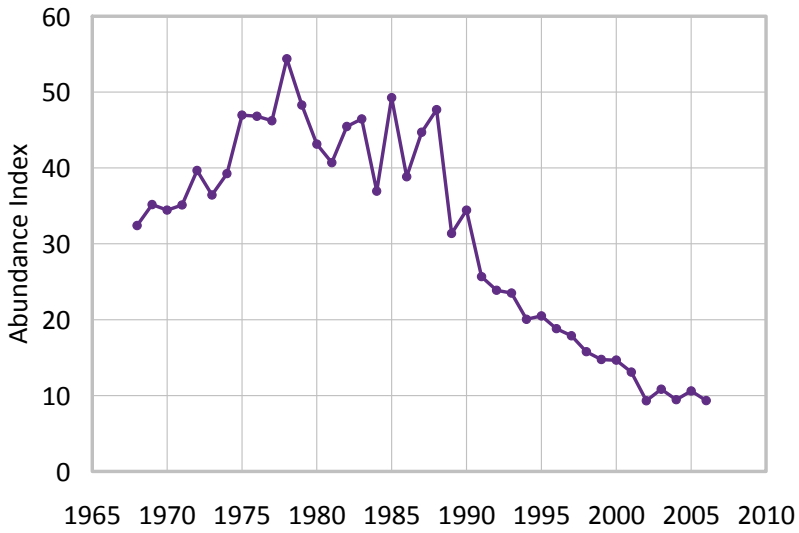



*Figure 21. Annual indices of population change in birds of other open habitats for the Boreal Shield Ecozone⁺, based on data from the Breeding Bird Survey.*

*Table 26. Trends in abundance for selected species of birds of other open habitats that are characteristic of the Boreal Shield Ecozone⁺, based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Bank Swallow | -14.0% | * | 6.50 | 4.59 | 0.49 | 0.10 | -98% |
| Brown-headed Cowbird | -7.9% | * | 7.53 | 3.88 | 1.64 | 0.58 | -92% |
| Common Nighthawk | -6.4% | * | 0.29 | 0.29 | 0.11 | 0.04 | -85% |
| Cliff Swallow | -6.0% | * | 7.38 | 10.62 | 3.04 | 0.87 | -88% |
| Barn Swallow | -5.3% | * | 11.26 | 9.94 | 4.56 | 2.08 | -82% |
| Tree Swallow | -3.3% | * | 9.28 | 8.66 | 5.77 | 2.81 | -70% |
| American Kestrel | -1.8% | * | 1.01 | 1.02 | 0.76 | 0.56 | -44% |
| Eastern Kingbird | -1.4% | | 1.92 | 2.55 | 1.44 | 1.01 | -47% |
| Eastern Bluebird | 3.8% | * | 0.18 | 0.26 | 0.43 | 0.34 | 92% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Boreal Plains Ecozone⁺ (southern half of BCR 6)

## Contributor: Kevin Hannah

BBS data are concentrated largely in the developed part of the Boreal Plains Ecozone⁺ where much of the landscape alteration and habitat loss is occurring. Parts of the ecozone⁺ that are still relatively intact and have experienced relatively little change are less well covered or not covered by BBS. The results presented are based on data between 1971 and 2006 because few BBS routes were run in earlier years.

The Boreal Plains is largely a forested region, thus the majority of species selected as representative of this ecozone⁺ were from the forest and shrub/early successional assemblages.

Forest birds as a whole have remained stable over the long-term in the Boreal Plains while birds in all other assemblages have declined (Table 27).

*Table 27. Trends in abundance of landbirds for the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | 0.0% | | 107.1 | 134.6 | 115.4 | 108.6 | 1% |
| Shrub/Successional | -1.2% | * | 170.2 | 151.7 | 142.2 | 117.5 | -31% |
| Grassland Birds | -1.7% | n | 58.3 | 46.7 | 42.1 | 36.1 | -38% |
| Other Open | -2.6% | * | 75.3 | 81.4 | 69.4 | 32.2 | -57% |
| Urban/Suburban | -1.3% | * | 81.5 | 79.4 | 65.3 | 57.5 | -29% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Forest bird assemblage*

While the overall trend for forest birds has remained fairly stable (Figure 22), individual species show a mix of increases, decreases, and relatively stable populations (Table 28). The Western Wood-pewee shows a non-significant decline of more than 50% of its population over the survey period, similar to declines in its eastern counterpart, the Eastern Wood-pewee. The Western Wood-pewee is declining across its North American range (Sauer et al., 2008) and in some Canadian ecozones[+], although its overall Canadian trend shows no change in population. This species undergoes a long migration to winter in the tropics and is exposed to threats during migration and on its tropical forest wintering habitat as well as on its Canadian breeding grounds. The decline of over 50% of the population of Warbling Vireo since the 1970s is in contrast to increases in other regions and a strong increase in Canada overall. On the other hand, populations of Swainson's Thrush, Black-and-white warbler and Pileated Woodpecker show large, significant increases and appear to be faring well in this ecozone[+].

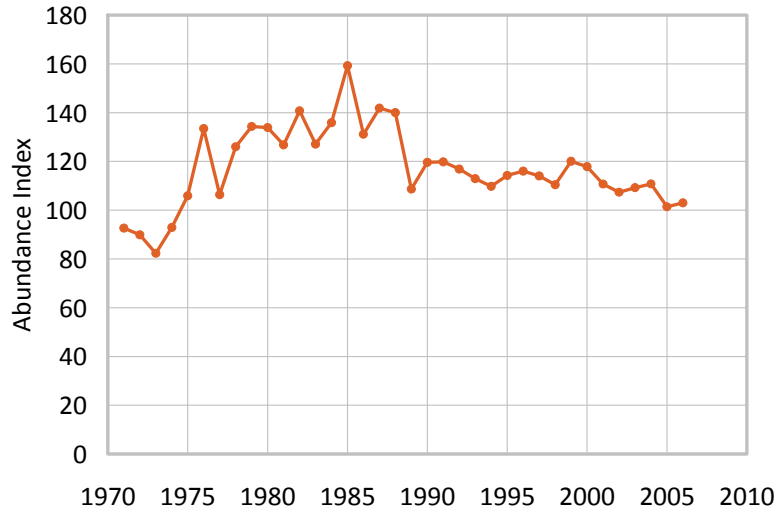



*Figure 22. Annual indices of population change in birds of forest habitat for the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 28. Trends in abundance of selected species of forest birds that are characteristic of the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Ruffed Grouse | -5.92% | * | 2.4 | 0.8 | 0.3 | 0.3 | -87% |
| Warbling Vireo | -2.96% | * | 6.8 | 6.6 | 4.4 | 2.9 | -58% |
| Western Wood-pewee | -2.27% | | 2.8 | 5.1 | 3.5 | 1.2 | -57% |
| Pine Siskin | -1.39% | | 4.1 | 10.6 | 6.5 | 3.6 | -12% |
| Least Flycatcher | -0.90% | n | 11.8 | 14.3 | 13.0 | 8.9 | -25% |
| Yellow-bellied Sapsucker | -0.10% | | 2.2 | 2.2 | 1.4 | 1.6 | -27% |
| Red-eyed Vireo | 0.90% | | 18.6 | 25.8 | 21.5 | 25.9 | 39% |
| Rose-breasted Grosbeak | 1.41% | | 2.2 | 3.1 | 2.5 | 3.1 | 42% |
| Black-capped Chickadee | 1.41% | | 2.6 | 3.7 | 3.5 | 3.6 | 37% |
| Gray Jay | 2.02% | | 1.7 | 2.7 | 2.7 | 2.0 | 16% |
| Hairy Woodpecker | 2.53% | | 0.4 | 0.8 | 0.8 | 0.8 | 91% |
| Swainson's Thrush | 2.53% | * | 4.2 | 10.5 | 7.4 | 8.3 | 95% |
| Black-and-white Warbler | 3.56% | * | 0.5 | 0.6 | 0.7 | 1.2 | 157% |
| Pileated Woodpecker | 7.14% | * | 0.0 | 0.2 | 0.3 | 0.6 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Shrub/early successional bird assemblage*

The shrub/early successional assemblage has experienced a fairly consistent, long-term decline (Figure 23, Table 29). More species are showing negative trends than positive and there are several with large, long-term declines of over 40% of their populations. Decreasing shrub habitat as it matures into young forest may help explain the apparent decline in shrub/early successional species and the increases in species that inhabit young forest. For example, declines

in Mourning Warbler, Common Yellowthroat, Song Sparrow, Alder Flycatcher, and Clay-colored Sparrow are occurring at the same time as increases in birds of young forests, such as Red-eyed Vireo, Rose-breasted Grosbeak, Connecticut Warbler, and Black-and-white Warbler.

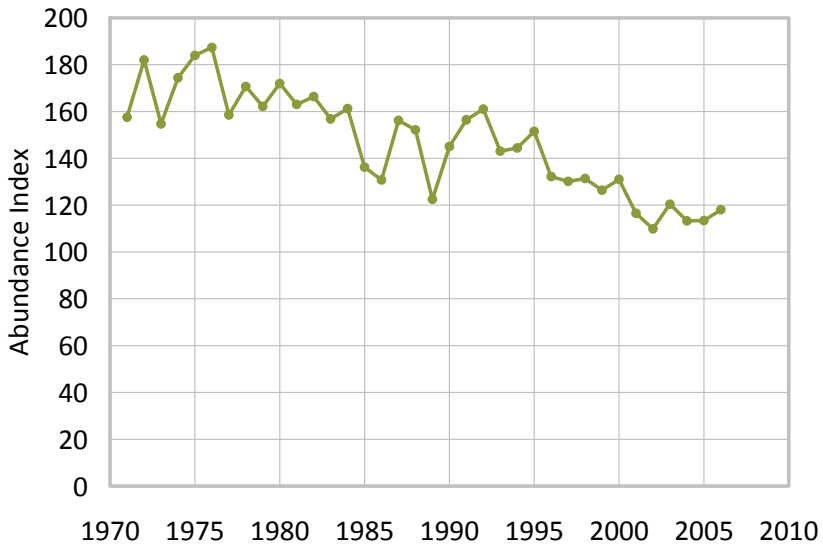



*Figure 23. Annual indices of population change in birds of shrub/early successional habitat for the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 29. Trends in abundance of selected species of shrub/early successional birds that are characteristic of the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Gray Catbird | -3.73% | * | 2.2 | 1.3 | 0.9 | 0.7 | -67% |
| Mourning Warbler | -3.25% | | 4.2 | 4.8 | 1.8 | 1.8 | -57% |
| Common Yellowthroat | -3.05% | * | 13.6 | 11.3 | 7.0 | 5.9 | -57% |
| Song Sparrow | -2.47% | * | 34.4 | 21.4 | 19.7 | 15.9 | -54% |
| Alder Flycatcher | -2.27% | * | 16.2 | 17.3 | 11.6 | 8.5 | -47% |
| American Goldfinch | -2.08% | * | 7.3 | 9.7 | 6.6 | 4.0 | -45% |
| Clay-colored Sparrow | -1.98% | * | 41.1 | 30.1 | 27.0 | 22.9 | -44% |
| House Wren | -0.80% | | 11.3 | 12.9 | 13.3 | 8.4 | -25% |
| Yellow Warbler | 0.30% | | 12.3 | 15.0 | 15.6 | 12.6 | 3% |
| White-throated Sparrow | 0.30% | | 20.0 | 18.8 | 19.4 | 20.2 | 1% |
| Connecticut Warbler | 2.63% | | 0.6 | 2.0 | 1.3 | 1.4 | 110% |
| Lincoln's Sparrow | 4.92% | n | 2.8 | 10.3 | 10.8 | 9.3 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Grassland bird assemblage*

As in other parts of Canada, grassland birds are declining as a group in the Boreal Plains (Figure 24, Table 30) although the trend appears more positive in the last decade. Bobolink, Northern Harrier, Western Meadowlark, and Vesper Sparrow all show significant long-term declines with estimated losses of more than 60% of their populations since the 1970s (Table 30).

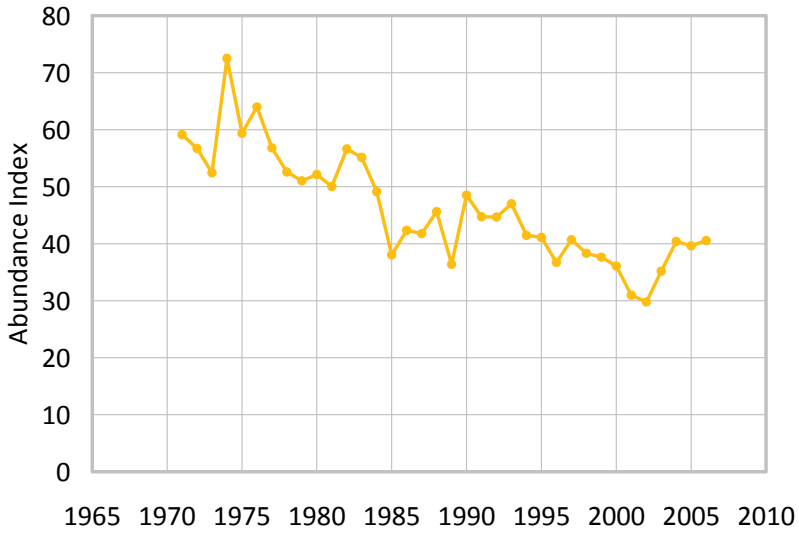



*Figure 24. Annual indices of population change in birds of grassland habitat for the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 30. Trends in abundance of selected species of grassland birds that are characteristic of the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Bobolink | -6.85% | * | 2.7 | 1.7 | 0.4 | 0.4 | -85% |
| Northern Harrier | -5.82% | * | 1.1 | 0.9 | 0.4 | 0.2 | -79% |
| Western Meadowlark | -4.50% | * | 8.4 | 5.4 | 3.1 | 2.5 | -71% |
| Vesper Sparrow | -3.54% | * | 17.8 | 9.2 | 7.1 | 6.6 | -63% |
| Le Conte's Sparrow | -1.69% | | 4.1 | 2.9 | 3.2 | 2.0 | -51% |
| Savannah Sparrow | 0.10% | | 22.0 | 25.9 | 26.3 | 20.9 | -5% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Other open habitat bird assemblage*

As observed elsewhere in Canada, there is an overall decline in birds of other open habitat (Figure 25, Table 31). More species are decreasing than increasing, with six species showing large declines of over 50% of their population (Table 31). Many of the aerial-foraging insectivores that are declining (for example, Tree Swallow, Barn Swallow, and Eastern Kingbird) are declining across much of Canada.

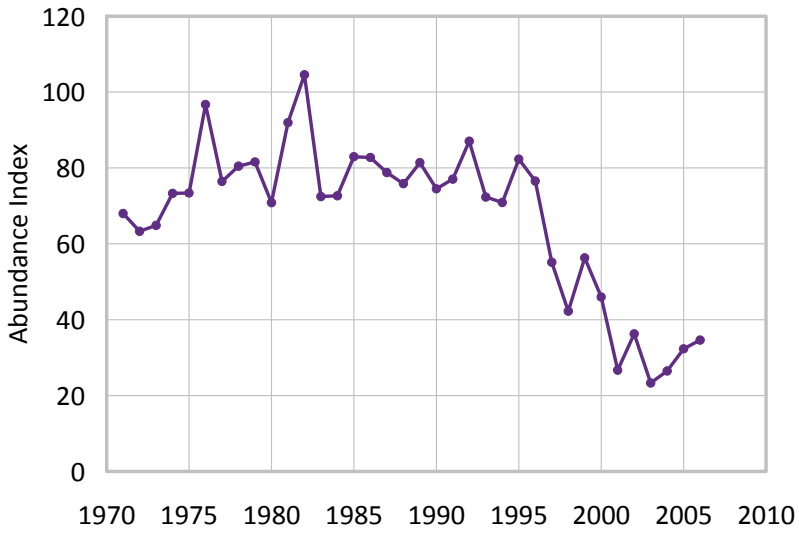



*Figure 25. Annual indices of population change in birds of other open habitats for the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 31. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Boreal Plains Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Eastern Kingbird | -7.50% | * | 5.4 | 3.0 | 1.4 | 0.6 | -89% |
| Brewer's Blackbird | -4.69% | * | 24.2 | 21.7 | 13.1 | 5.4 | -78% |
| Baltimore Oriole | -4.50% | * | 4.3 | 5.3 | 2.8 | 1.1 | -74% |
| Mountain Bluebird | -3.82% | | 1.2 | 0.4 | 0.4 | 0.4 | -70% |
| Barn Swallow | -3.54% | * | 12.8 | 14.1 | 10.7 | 4.1 | -68% |
| Brown-headed Cowbird | -2.47% | | 12.1 | 8.9 | 8.8 | 5.1 | -58% |
| American Kestrel | -0.90% | | 1.4 | 1.8 | 1.5 | 1.0 | -28% |
| Tree Swallow | -0.40% | | 5.1 | 4.5 | 4.6 | 4.2 | -17% |
| Red-tailed Hawk | 1.71% | | 1.1 | 1.8 | 2.0 | 1.6 | 41% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Urban and suburban bird assemblage*

Consistent with many other ecozones[+], the urban/suburban assemblage has shown an overall decline (Figure 26) driven in large part by declines in two introduced species, House Sparrow and European Starling (Table 32). In this region, where human habitation influences a relatively small proportion of the landscape, change or lack of change in species such as Chipping Sparrow, American Robin, and Blue Jay may be more a reflection of changes in their forest and shrub/early successional habitats.

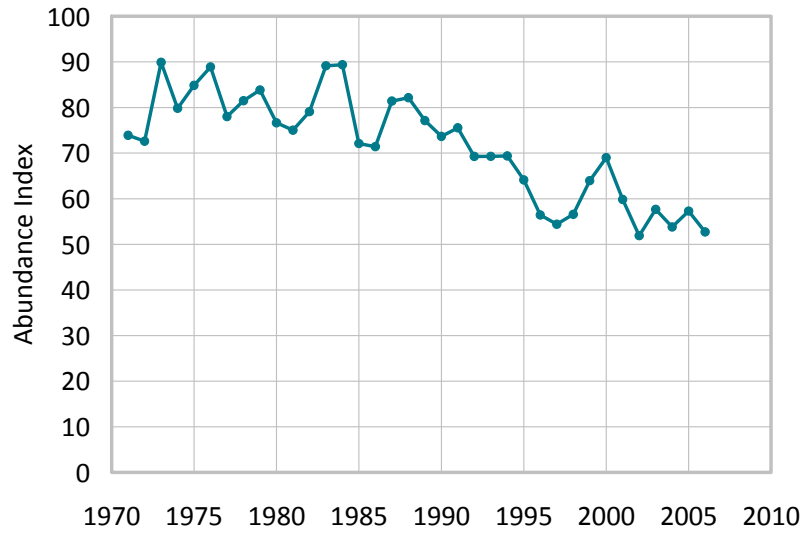



*Figure 26. Annual indices of population change in birds of urban/suburban habitat for the Boreal Plains Ecozone⁺, based on data from the Breeding Bird Survey.*

*Table 32. Trends in abundance of selected species of urban/suburban birds that are characteristic of the Boreal Plains Ecozone⁺, based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| House Sparrow (I) | -7.50% | * | 21.0 | 14.2 | 5.3 | 2.7 | -87% |
| European Starling (I) | -4.40% | * | 20.2 | 17.7 | 9.8 | 5.8 | -71% |
| Mourning Dove | -3.15% | * | 5.3 | 6.1 | 4.6 | 2.1 | -61% |
| Common Grackle | -2.08% | | 2.0 | 2.0 | 1.6 | 0.9 | -55% |
| Chipping Sparrow | -1.69% | | 19.5 | 16.6 | 11.6 | 12.9 | -34% |
| Rock Pigeon (I) | 1.01% | | 1.5 | 4.4 | 3.1 | 2.4 | 59% |
| American Robin | 1.21% | * | 18.9 | 22.6 | 26.5 | 24.9 | 32% |
| Blue Jay | 2.33% | | 0.5 | 1.1 | 0.9 | 0.9 | 73% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
(I) indicates an introduced species
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

# Prairies Ecozone⁺ (BCR 11)

## Contributor: Brenda Dale

The Prairies Ecozone⁺ is dominated by grassland habitat and is the heart of range for many grassland birds in Canada; therefore, most of the species selected as representative of this ecozone⁺ are from the grassland assemblage. The BBS has shown that grassland birds are declining more rapidly than any other group of birds in North America (Sauer et al., 2000; Sauer et al., 2008; North American Bird Conservation Initiative, U.S. Committee (NABCI-US), 2009) and this is strongly reflected in the results both for Canada as a whole and for the Prairies

(Table 33). The dominance of grassland birds in the Prairies highlights the importance of the general decline seen in these species in relation to the health of this ecozone+.

*Table 33. Trends in abundance of landbirds for the Prairies Ecozone+, based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1970s | 1980s | 1990s | 2000s | Change |
| Forest | 1.3% | * | 16.3 | 21.9 | 23.0 | 22.0 | 35% |
| Shrub/Successional | 0.0% | | 81.5 | 79.2 | 86.5 | 78.2 | -4% |
| Grassland | -1.6% | * | 239.1 | 223.2 | 183.9 | 154.7 | -35% |
| Other Open | 0.1% | | 128.0 | 129.4 | 136.2 | 118.1 | -8% |
| Urban | -0.9% | n | 129.9 | 122.7 | 94.9 | 106.7 | -18% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

BBS routes in the Prairies tend to be located in agricultural areas where there is a good road network and where there has been substantial loss of native grassland to agriculture. The remaining areas of extensive grassland in the Prairies are concentrated in a relatively small area, often with poor road access, so there is sparse coverage by BBS in these remaining native grasslands where the grassland bird density is high. The Grassland Bird Monitoring (GBM) program (e.g. Dale et al., 2005), which began in 1996, provides supplemental data to the BBS. GBM surveys are located in areas of southeastern Alberta and southwestern Saskatchewan where grassland is still common. Comparing or combining trends between the BBS and the GBM can help corroborate population changes and determine possible reasons for declines and distribution of losses (for example, whether declines are in core or peripheral parts of the species range). We present results for the BBS in the tables below but include results from GBM where appropriate in the discussion.

Birds of other open and shrub/early successional habitats are relatively stable in the Prairies Ecozone+ (Table 33). The forest bird assemblage shows a positive trend while urban/suburban birds are decreasing as a group. The latter pattern is consistent with other ecozones+ and across Canada as a whole. Birds of forest, urban, and shrub/early successional habitats are a relatively small component of prairie avifauna.

## *Grassland bird assemblage*

A consistent, long-term decline in grassland birds is evident, with a loss of 35% of birds since the 1970s (Figure 27, Table 33). Nine of the 13 selected representative species show varying rates of population decline (Table 34).

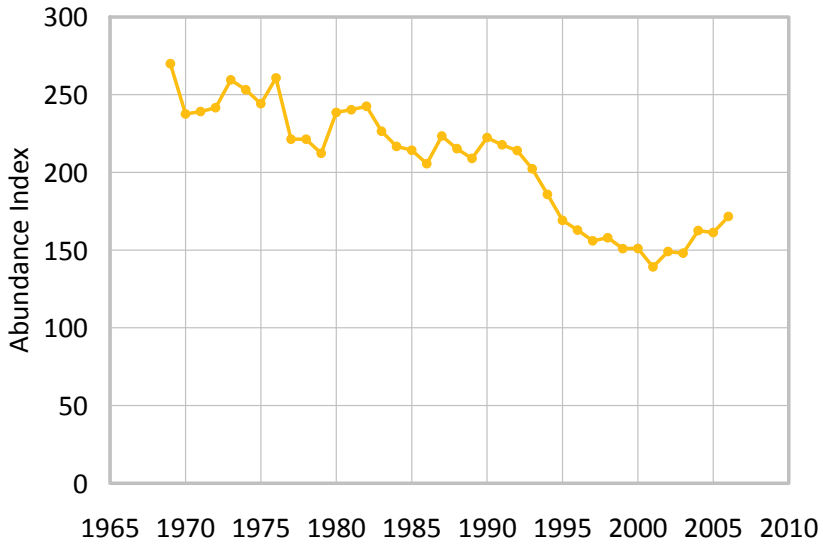



*Figure 27. Annual indices of population change in birds of grassland habitat for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 34. Trends in abundance of grassland birds for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| McCown's Longspur | -11.0% | * | 6.10 | 2.05 | 0.77 | 0.24 | -96% |
| Chestnut-collared Longspur | -5.4% | * | 18.87 | 14.80 | 7.97 | 2.58 | -86% |
| Short-eared Owl | -5.0% | n | 0.47 | 0.21 | 0.09 | 0.10 | -78% |
| Sharp-tailed Grouse | -4.0% | * | 1.49 | 1.73 | 0.47 | 0.53 | -64% |
| Sprague's Pipit | -3.8% | * | 6.68 | 5.35 | 2.09 | 2.04 | -69% |
| Horned Lark | -3.3% | * | 81.15 | 77.03 | 48.81 | 31.38 | -61% |
| Northern Harrier | -3.0% | * | 2.07 | 1.70 | 1.14 | 0.92 | -55% |
| Western Meadowlark | -1.3% | * | 60.21 | 49.25 | 43.23 | 43.67 | -27% |
| Baird's Sparrow | -1.1% | | 3.53 | 2.88 | 3.10 | 1.39 | -61% |
| Vesper Sparrow | 0.8% | | 22.00 | 26.88 | 27.03 | 28.41 | 29% |
| Savannah Sparrow | 1.0% | * | 27.77 | 29.32 | 35.10 | 33.92 | 22% |
| Le Conte's Sparrow | 1.6% | | 1.14 | 1.22 | 2.01 | 1.26 | 11% |
| Sedge Wren | 5.7% | * | 0.31 | 0.23 | 0.70 | 0.94 | 199% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P < 0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

The past conversion of native grassland to agriculture has resulted in a loss of approximately 75% of grassland in prairie Canada (Statistics Canada, 1993). This loss has slowed in recent years but not stopped; 10% of remaining native grassland was lost between 1985 and 2001 in some areas (Watmough and Schmoll, 2007). Losses of native grassland to urban and suburban development, especially around large urban areas, have increased. Although not as extensive as losses to agriculture, these losses can be locally devastating. Current grassland bird populations are also impacted by habitat degradation and changed landscape configuration caused by the intensification of grazing, expansion of woody cover due to fire suppression, continued

fragmentation, and invasion of natural habitats by non-native plants associated with linear development such as roads, trails, and pipelines (Askins et al., 2007).

Some of the species (Horned Lark, McCown's Longspur, and Upland Sandpiper) showing long-term declines (Table 34) were not declining on recent (1996 to 2006) BBS or GBM routes that have more than 50% grassland, but were declining on routes with less grass. Habitat loss or fragmentation may be a major factor for these species as they are still doing well where habitat is common and in large blocks. Other species are showing large declines (for example, Sprague's Pipit) where grassland remains common; this may reflect decreased habitat quality. Sprague's Pipit is area sensitive (Davis, 2004) and thus occurs in lower numbers near linear development (Sutter et al., 2000; Hamilton, 2010) or where non-native plants occur (Sutter and Brigham, 1998).

The relative stability of the grassland guild in the past decade (Figure 27) reflects the strong influence of some common (such as, Vesper Sparrow and Savannah Sparrow) or wet meadow associated (such as, LeConte's Sparrow and Sedge Wren) grassland birds encountered on BBS. These species are more widely distributed and are not restricted to the Great Plains, and may be tolerant of, or even helped by, taller non-native plant species. They may benefit from increased linear development and associated non-native vegetation and from several farm programs in Canada and the United States that have planted tall, non-native grasses on croplands thereby creating new habitat (Johnson and Ruttan, 1993; McMaster and Davis, 2001; Dale et al., 2005). Sprague's Pipit, McCown's Longspur, Chestnut-collared Longspur, and Baird's Sparrow are declining species that need moderate or short, preferably native, cover, and make little or no use of planted cover (McMaster and Davis, 2001). Although some grassland birds will use areas planted in hay, 50 to 60% of ground nests, eggs, young, and fledglings can be lost during a haying operation (Frawley, 1989; Bollinger et al., 1990). One large study found 100% nest failure from haying operations because any nests that remained after hay cutting were abandoned (Perlut et al., 2006).

## *Forest bird assemblage*

The forest assemblage shows a positive trend with an overall increase of 35% since the 1970s (Figure 28, Table 33). This assemblage has benefitted from increased forest habitat in the Prairies as a result of trees associated with human settlement including farms, and the southern expansion of parkland habitat (Anderson and Bailey, 1980; Peltzer and Wilson, 2006). The forest assemblage includes several species that were presumably rare in pre-settlement times but are tolerant of human disturbances in and near populated areas (Table 35).

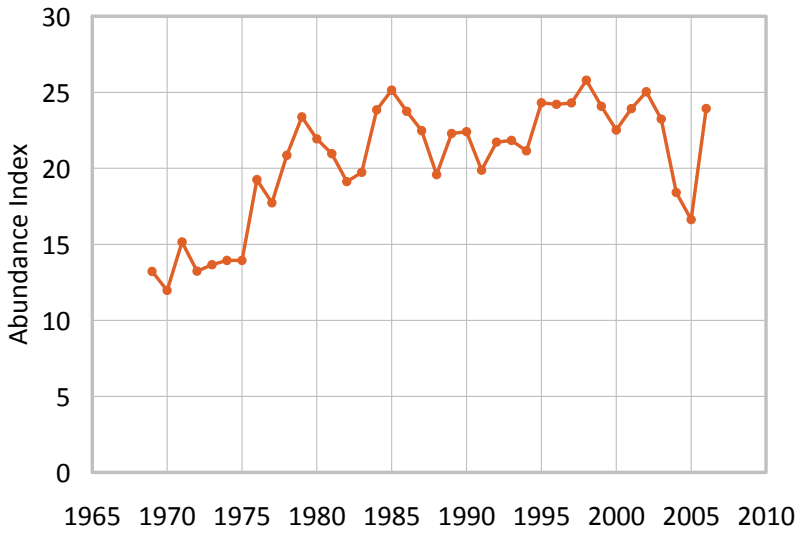



*Figure 28. Annual indices of population change in birds of forest habitat for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 35. Trends in abundance of forest birds for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Red-eyed Vireo | 0.8% | | 3.37 | 4.53 | 3.41 | 3.49 | 4% |
| Black-capped Chickadee | 1.9% | | 0.82 | 1.08 | 0.82 | 1.05 | 28% |
| Least Flycatcher | 2.1% | * | 4.12 | 6.54 | 8.11 | 6.70 | 62% |
| Warbling Vireo | 3.1% | * | 2.67 | 4.78 | 5.83 | 5.49 | 106% |
| Merlin | 9.4% | * | 0.01 | 0.05 | 0.20 | 0.26 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Shrub/early successional bird assemblage*

The trend for the shrub/early successional assemblage is relatively stable (Figure 29) with individual species showing a mix of increases and decreases (Table 36). Brown Thrasher and Song Sparrow are showing declines here as elsewhere in Canada. In the Prairies, Brown Thrasher declines may be related to changes in land-use practices that can result in a reduction in hedgerows and shelterbelts and increased predation (Cavitt and Haas, 2000). Population changes in American Goldfinch and Yellow Warbler vary across Canada but are showing increases in this ecozone[+].

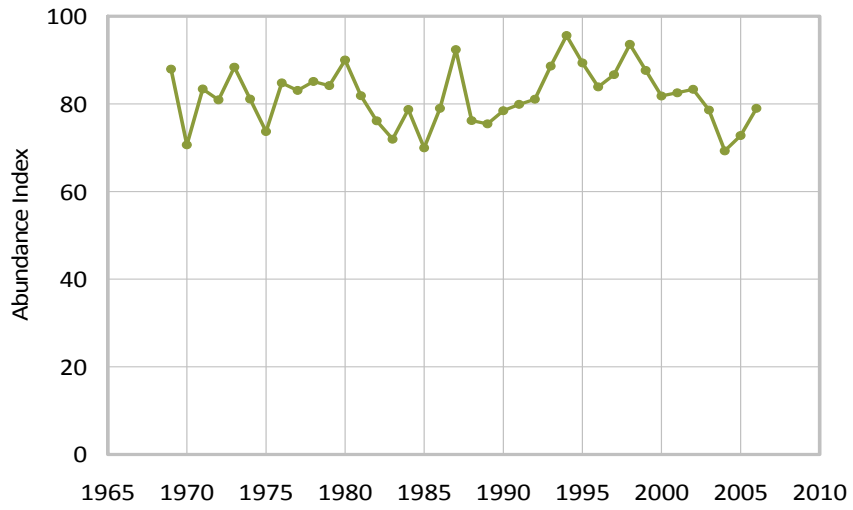



*Figure 29. Annual indices of population change in birds of shrub/early successional habitat for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 36. Trends in abundance of shrub/early successional birds for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Brown Thrasher | -2.4% | | 2.41 | 1.46 | 1.60 | 1.12 | -54% |
| Song Sparrow | -1.0% | * | 11.26 | 7.97 | 9.32 | 8.28 | -26% |
| Clay-coloured Sparrow | -0.9% | * | 37.56 | 30.86 | 29.56 | 26.50 | -29% |
| Gray Catbird | -0.1% | | 1.90 | 2.10 | 1.65 | 2.16 | 14% |
| House Wren | 1.0% | n | 12.92 | 17.07 | 18.90 | 16.44 | 27% |
| Common Yellowthroat | 1.0% | | 2.18 | 2.40 | 2.80 | 2.55 | 17% |
| American Goldfinch | 1.1% | * | 5.11 | 7.95 | 8.71 | 6.98 | 37% |
| Yellow Warbler | 1.9% | * | 6.70 | 7.25 | 10.72 | 10.98 | 64% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

## *Other open habitat bird assemblage*

Population levels of birds of other open habitat are relatively stable overall (Table 33, Figure 30) but individual species show a mix of increases and decreases (Table 37) which may depend upon whether the species benefits from hu*Numenius am*man changes to the landscape (for example, an increase in trees or the presence of nest boxes) or not. The prairie population of Loggerhead Shrike, a bird of open habitat assessed as Threatened in 2004 (COSEWIC, 2004), shows a continued and strong decline in population. This species is affected by conversion of agricultural land to urban development as well as by more intensive agricultural practices that, among other things, remove hedgerow and shrubs near fields. American Kestrel shows a large decline in this and most of the other ecozones[+], in which it breeds. Several swallow species, a group that is declining in Canada overall, are doing well in the Prairies (Cliff Swallow, Tree Swallow, and Northern Rough-winged Swallow). Tree Swallow and Mountain Bluebird may have benefited from nest box programs. Tree Swallow and others (for example, Red-tailed

Hawk and Western Kingbird) may also have benefitted from an increased number of trees on the agricultural landscape.

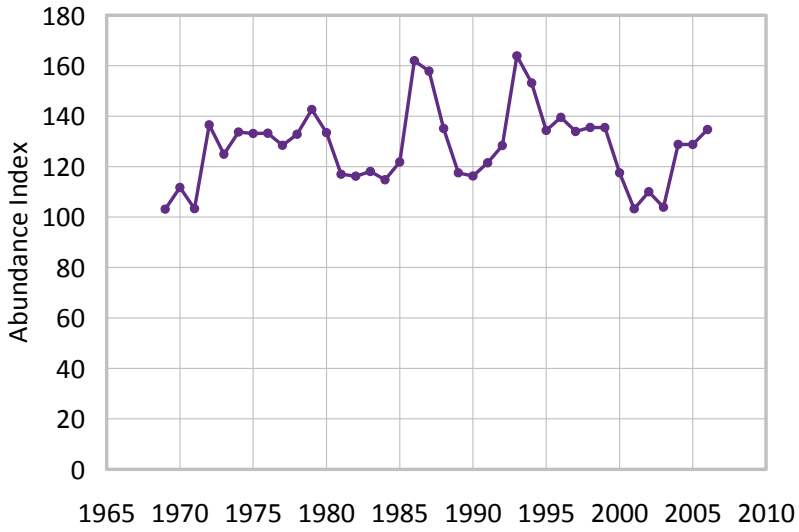



*Figure 30. Annual indices of population change in birds of other open habitats for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 37. Trends in abundance of birds of other open habitats for the Prairies Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Loggerhead Shrike | -5.0% | * | 1.78 | 0.38 | 0.41 | 0.31 | -83% |
| American Kestrel | -1.8% | | 0.52 | 0.78 | 0.48 | 0.27 | -49% |
| Barn Swallow | -1.5% | * | 16.78 | 17.07 | 14.50 | 9.70 | -42% |
| Bank Swallow | -1.3% | | 4.34 | 5.23 | 3.62 | 3.43 | -21% |
| Swainson's Hawk | -1.1% | | 2.30 | 3.01 | 2.23 | 1.69 | -26% |
| Eastern Kingbird | -0.5% | | 6.71 | 6.46 | 6.96 | 5.62 | -16% |
| Brown-headed Cowbird | -0.5% | | 27.36 | 31.08 | 25.49 | 24.05 | -12% |
| Gray Partridge | -0.4% | | 0.94 | 1.16 | 0.69 | 0.91 | -4% |
| Baltimore Oriole | -0.3% | | 3.83 | 5.00 | 4.52 | 2.78 | -27% |
| Brewer's Blackbird | 0.2% | | 27.72 | 21.56 | 24.77 | 26.75 | -4% |
| Western Kingbird | 1.4% | | 2.10 | 3.00 | 3.24 | 3.33 | 58% |
| Cliff Swallow | 2.0% | | 25.82 | 25.04 | 39.56 | 27.70 | 7% |
| Tree Swallow | 2.1% | n | 4.17 | 4.28 | 6.57 | 6.16 | 48% |
| Red-tailed Hawk | 3.3% | * | 1.37 | 2.19 | 3.46 | 3.51 | 156% |
| Mountain Bluebird | 3.9% | * | 0.43 | 1.11 | 1.86 | 1.01 | 135% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Urban and suburban bird assemblage*

The urban/suburban bird assemblage includes 13 species found across Canada, nine of which are found in the Prairies Ecozone[+] and included in this analysis. Of these, three are non-native species introduced to Canada, House Sparrow, European Starling, and Rock Pigeon, the others

are native species that are generally tolerant of human-modified habitats but also occur within their natural habitat (e.g., American Robin).

Urban/suburban birds are declining over the long-term in the Prairies, mainly due to declines during the 1980s to mid-1990s (Figure 31, Table 38). The overall negative trend for this group is influenced by strong declines in abundant House Sparrow and European Starling up to the 1990s (Table 38); these are consistent with declines observed in other regions of Canada. The reasons for decline are unclear but may reflect loss of nesting habitat due to changes in building design and loss of older buildings, and increased predation from cats and avian predators such as Merlin, a species that has substantially increased in urban areas (Warkentin et al., 2005). Merlin is included in the forest assemblage, however, in the Prairies Ecozone$^{+}$, they might be better associated with the urban/suburban assemblage. Increases in American Robin may be in part due to increases in forest habitat (Table 38).

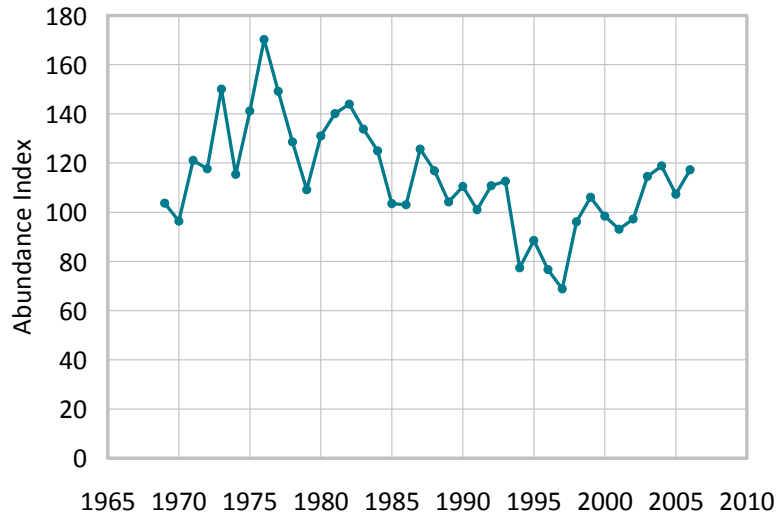



*Figure 31. Annual indices of population change in birds of urban/suburban habitat for the Prairies Ecozone$^{+}$, based on data from the Breeding Bird Survey.*

*Table 38. Trends in abundance of urban/suburban birds for the Prairies Ecozone$^{+}$, based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| European Starling (I) | -2.5% | * | 32.51 | 22.65 | 16.02 | 18.03 | -45% |
| House Sparrow (I) | -1.9% | * | 70.10 | 63.36 | 38.64 | 43.16 | -38% |
| Rock Pigeon (I) | 0.4% | | 8.37 | 10.95 | 8.55 | 8.82 | 5% |
| Mourning Dove | 1.3% | * | 8.58 | 13.30 | 12.32 | 12.02 | 40% |
| American Robin | 2.8% | * | 6.98 | 10.15 | 13.15 | 14.86 | 113% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

(I) indicates an introduced species

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006)

# Montane Cordillera Ecozone[+] (BCR 10)

## Contributor: Wendy Easton

BBS results in the Montane Cordillera Ecozone[+] are based on data from 1973 to 2006 because too few routes were run in earlier years to include in these analyses. In this region, BBS routes tend to be concentrated in the road-accessible valley bottoms and results may not, therefore, reflect the more inaccessible areas far from roads, especially in alpine areas. The majority of the ecozone[+] is forested, much of it coniferous, so representative species are mainly in the forest bird assemblage. Forest bird populations are influenced by forest practices that result in an increasingly altered and intensively managed forest landscape. Increased stand fragmentation, loss of older growth stands, alteration of natural fire regimes, and bark beetle outbreaks are some of the factors that may be contributing to forest bird declines (Canadian Intermountain Joint Venture, 2006). For migratory species, population levels will also be influenced by factors in their winter breeding grounds (southern United States and Central and South America) and along their migration corridors.

Forest and shrub/early successional bird populations have remained relatively stable in the Montane Cordillera, with the forest bird index tending slightly negative while the shrub/early successional bird index has tended upwards (Table 39). Birds of other open habitats are showing a non-significant decrease in population over the long-term. Results for the urban/suburban assemblage are not shown here although birds from this group are declining as a whole as they are throughout other regions in Canada. There are relatively few grassland birds typical of the Montane Cordillera region, therefore results are not presented for this assemblage.

*Table 39. Trends in abundance of landbirds for the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | -0.5% | | 230.2 | 251.0 | 227.3 | 201.6 | -12% |
| Shrub/Successional | 0.7% | n | 51.4 | 53.3 | 64.8 | 57.9 | 13% |
| Other Open | -1.8% | | 56.3 | 61.7 | 51.4 | 33.7 | -40% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Forest bird assemblage*

The overall index for the forest assemblage has been generally stable, though tending negative since the mid-1980s (Figure 32). Individual species have shown a wide range of positive, stable, and negative trends (Table 40). Several species have lost more than 50% of their population since the 1970s (Olive-sided Flycatcher, Pine Siskin, and Townsend's Solitaire) while others such as the Red-breasted Nuthatch, Warbling Vireo, and Cassin's Vireo, have increased by 70% or more since the 1970s. British Columbia is currently experiencing the largest recorded

mountain pine beetle outbreak in North America (BC Ministry of Forests and Range, 2006). Insect infestations such as this and the subsequent forest management have profound impacts on birds. Some resident cavity-nesters that feed extensively on wood-boring beetles have increased (for example, some woodpeckers and chickadees); however, as the number of healthy trees declines, so do the species that depend on them. For example, Red-breasted Nuthatch increased early in the outbreak but has shown a recent decline (Table 40).

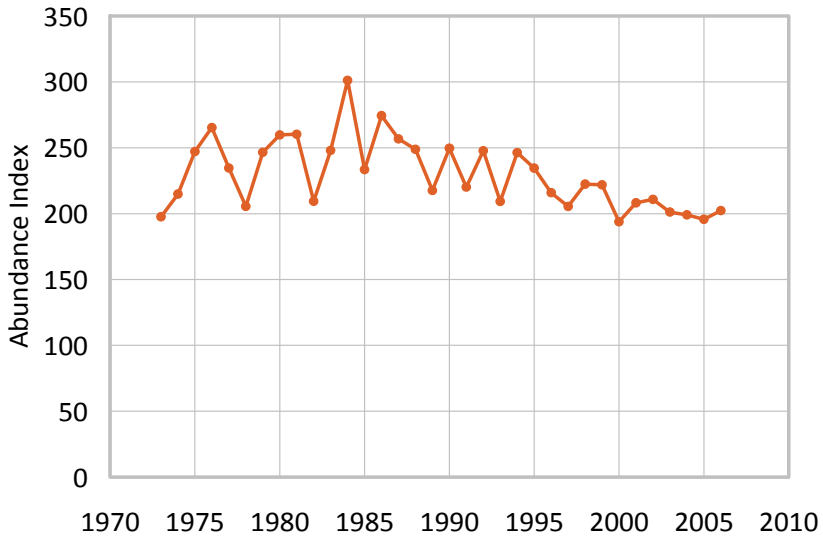



*Figure 32. Annual indices of population change in birds of forest habitat for the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 40. Trends in abundance of selected species of forest birds that are characteristic of the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Olive-sided Flycatcher | -4.50% | * | 5.2 | 2.8 | 1.9 | 1.2 | -76% |
| Red-eyed Vireo | -4.30% | * | 9.7 | 7.3 | 4.8 | 3.0 | -69% |
| Pine Siskin | -3.82% | * | 28.1 | 30.3 | 22.8 | 9.9 | -65% |
| Townsend's Solitaire | -3.44% | * | 1.3 | 1.1 | 0.5 | 0.4 | -66% |
| Townsend's Warbler | -1.78% | | 2.8 | 4.0 | 2.2 | 1.9 | -32% |
| American Redstart | -1.19% | | 9.8 | 7.2 | 7.2 | 6.8 | -31% |
| Dark-eyed Junco | -1.00% | n | 23.0 | 28.7 | 22.5 | 18.8 | -18% |
| Swainson's Thrush | -0.60% | | 38.9 | 37.3 | 35.2 | 33.0 | -15% |
| Northern Flicker | -0.30% | | 5.8 | 4.8 | 5.3 | 4.6 | -20% |
| Rufous Hummingbird | -0.30% | | 1.0 | 1.2 | 1.3 | 0.8 | -24% |
| Red-naped Sapsucker | -0.20% | | 2.0 | 2.0 | 2.2 | 1.5 | -27% |
| Yellow-rumped Warbler | -0.20% | | 14.1 | 22.8 | 19.2 | 14.1 | 0% |
| Hairy Woodpecker | 0.00% | | 0.9 | 0.7 | 0.7 | 0.8 | -13% |
| Western Tanager | 0.30% | | 5.4 | 6.8 | 6.6 | 5.6 | 4% |
| Dusky Flycatcher | 0.50% | | 6.1 | 10.0 | 7.5 | 6.2 | 1% |
| Ruffed Grouse | 0.60% | | 1.3 | 0.8 | 1.3 | 1.3 | -3% |
| Golden-crowned Kinglet | 0.90% | | 3.7 | 5.2 | 5.2 | 4.2 | 14% |
| Ruby-crowned Kinglet | 1.51% | | 10.3 | 12.4 | 13.1 | 16.2 | 56% |
| Varied Thrush | 1.71% | | 3.3 | 8.3 | 7.2 | 5.4 | 66% |
| Hammond's Flycatcher | 2.12% | | 5.5 | 4.1 | 7.2 | 6.4 | 16% |
| Red-breasted Nuthatch | 2.22% | * | 4.2 | 6.1 | 7.8 | 7.2 | 71% |
| Warbling Vireo | 2.74% | * | 10.0 | 13.7 | 18.1 | 20.5 | 106% |
| Cassin's Vireo | 4.19% | * | 1.5 | 2.7 | 4.3 | 4.0 | 174% |
| Pileated Woodpecker | 4.50% | n | 0.3 | 0.9 | 0.7 | 1.0 | 196% |
| Red-breasted Sapsucker | 8.33% | | 0.2 | 0.7 | 1.5 | 0.9 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

The highest abundance of Olive-sided Flycatcher, assessed as Threatened in 2007 (COSEWIC, 2007d) is found in western North America. Declines in this species have been detected in all Canadian ecozones[+] for which there are trends but have been most severe in the west, where the species has lost an estimated three-quarters of its population over the last 30 years in both the Montane Cordillera and the Pacific Maritime. The species is also declining significantly in the Western Interior Basin.

## *Shrub/early successional bird assemblage*

The overall trend for birds in shrub/early successional habitat is stable but tending positive (Figure 33). Yellow Warbler, a riparian species, shows declines (Table 41) consistent with the other western ecozones[+] (Western Interior Basin and Pacific Maritime), although its population has been stable or increasing in the rest of the country.

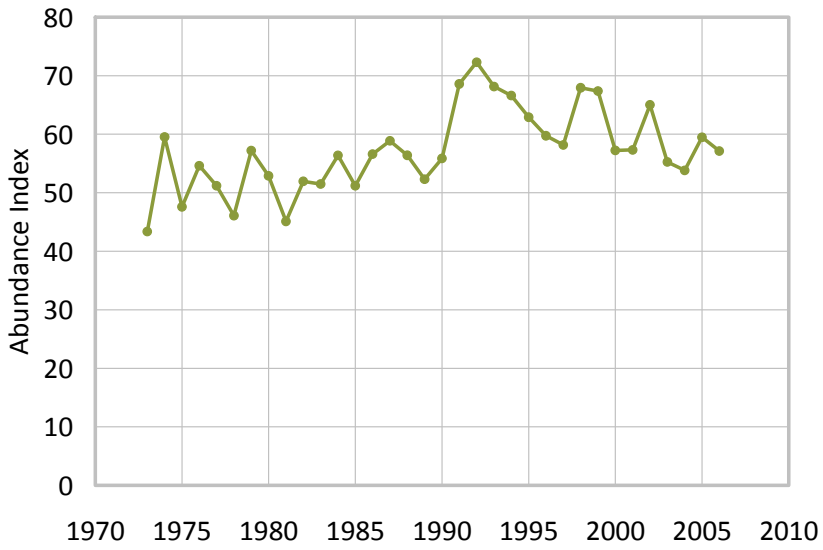



*Figure 33. Annual indices of population change in birds of shrub/early-successional habitat for the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 41. Trends in abundance of selected species of shrub/early successional birds that are characteristic of the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Wilson's Warbler | -3.25% | | 6.0 | 4.6 | 3.4 | 2.2 | -63% |
| Yellow Warbler | -2.27% | * | 10.2 | 7.0 | 5.4 | 5.2 | -49% |
| Willow Flycatcher | -1.19% | | 3.5 | 3.6 | 2.5 | 2.5 | -28% |
| Song Sparrow | -0.50% | | 7.2 | 5.8 | 5.5 | 6.3 | -12% |
| Orange-crowned Warbler | 1.01% | | 6.7 | 8.5 | 10.4 | 8.0 | 20% |
| Common Yellowthroat | 1.92% | * | 2.7 | 2.6 | 3.9 | 4.0 | 47% |
| MacGillivray's Warbler | 2.22% | n | 4.8 | 9.2 | 10.6 | 9.4 | 94% |
| Lazuli Bunting | 3.25% | | 0.6 | 1.1 | 1.7 | 1.1 | 89% |
| Alder Flycatcher | 4.19% | * | 1.7 | 1.9 | 4.7 | 4.2 | 143% |
| Lincoln's Sparrow | 9.75% | * | 0.8 | 2.5 | 7.5 | 5.5 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Other open habitat bird assemblage*

Birds of other open landscapes are declining as a group (Figure 34), a pattern repeated in all other ecozones[+] except the Prairies. Trends vary among individual species though there have been more declines than increases for the representative species listed (Table 42). This assemblage contains many of the aerial-foraging insectivores (swallows and nighthawks) that are declining as a group across Canada. The Violet-green Swallow stands out as the only swallow with a non-negative trend here and in Canada as a whole. The highest abundance of Common Nighthawk is found in the west where, in the Montane Cordillera, they have experienced a loss of two-thirds of their populations since the 1970s. The Common Nighthawk is declining across Canada, and was assessed as Threatened by COSEWIC (2007c).

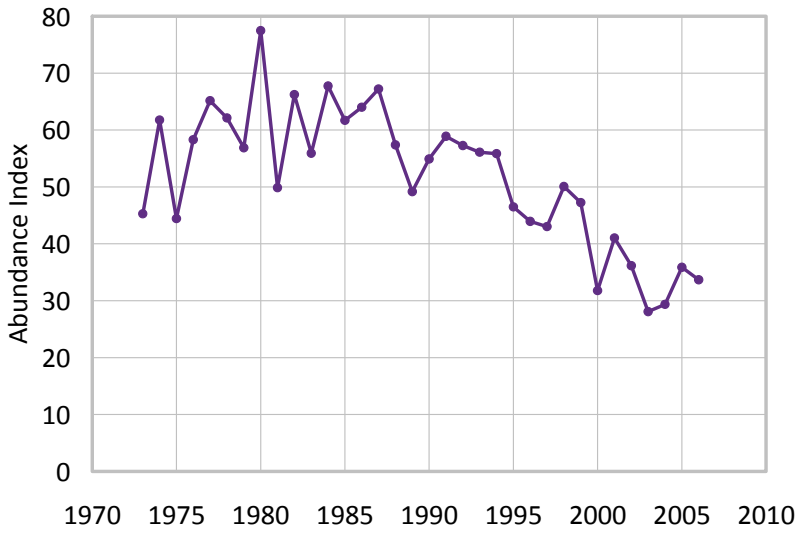



*Figure 34. Annual indices of population change in birds of other open habitats for the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 42. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Montane Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Barn Swallow | -4.69% | * | 7.3 | 10.4 | 6.3 | 2.2 | -70% |
| American Kestrel | -4.50% | * | 1.1 | 1.4 | 0.8 | 0.3 | -70% |
| Common Nighthawk | -3.92% | n | 1.0 | 1.1 | 0.8 | 0.3 | -66% |
| Brewer's Blackbird | -2.27% | | 6.5 | 8.9 | 5.5 | 4.0 | -38% |
| Tree Swallow | -1.98% | | 9.8 | 11.4 | 9.6 | 5.7 | -42% |
| Northern Rough-winged Swallow | -1.59% | | 4.3 | 4.8 | 3.8 | 2.6 | -38% |
| Mountain Bluebird | -0.10% | | 1.6 | 0.9 | 1.1 | 1.4 | -13% |
| Violet-green Swallow | 0.20% | | 3.8 | 5.0 | 5.9 | 3.5 | -8% |
| Red-tailed Hawk | 3.36% | * | 0.3 | 0.3 | 0.5 | 0.5 | 83% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Western Interior Basin Ecozone[+] (~ BCR 9)

## Contributor: Wendy Easton

Trend results presented here from the BBS are based on the years 1973 to 2006 because few BBS routes were run in the first five years of the survey. There are relatively few BBS routes in this region compared to others (13 to 20 BBS routes run per year in past decade) because this is a relatively small region. The routes are well distributed in the region, but under-represent areas of high elevation.

Four of the five bird habitat assemblages have undergone statistically significant long-term declines (Table 43). Only the birds of shrub/early successional assemblage have maintained a

stable to positive population trend. Bird populations have been affected by the cumulative impacts of conversion of land to agricultural (including eradication of sagebrush), overgrazing by livestock, urban development, altered fire regimes, and invasion of non-native plants (Ritter, 2000; Partners in Flight British Columbia and Yukon, 2003). The region is home to several nationally and provincially listed species (Partners in Flight British Columbia and Yukon, 2003).

*Table 43. Trends in abundance of landbirds for the Western Interior Basin Ecozone[+], based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Forest Birds | -0.7% | * | 215.4 | 223.0 | 206.8 | 176.1 | -18% |
| Shrub/Successional | 0.5% | | 50.6 | 58.3 | 61.0 | 58.4 | 15% |
| Grassland | -1.9% | * | 48.6 | 41.8 | 36.0 | 27.9 | -43% |
| Other Open | -1.8% | * | 118.6 | 98.0 | 89.6 | 67.8 | -43% |
| Urban/Suburban | -1.2% | * | 151.5 | 138.1 | 124.5 | 107.7 | -29% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Forest bird assemblage*

The forest bird assemblage in the Western Interior Basin shows an overall slight decline, especially since the mid-1990s (Figure 35). Individual species within the assemblage show a mix of increasing, decreasing, and stable population trends (Table 44). Declines of more than 50% of their populations are seen in several western-distributed species such as Dusky Flycatcher, Townsend's Warbler, and Rufous Hummingbird. Mountain Chickadee, another western species, has experienced a long-term significant population decline. Western North America is an area of relatively high abundance for Pine Siskin yet declines of more than 50% have occurred in all three western ecozones[+]. Warbling Vireo populations are doing well here as in most other regions of Canada, with the exception of the Boreal Plains Ecozone[+]. Clark's Nutcracker is increasing in the Western Interior Basin and overall in Canada. In addition to species listed above that are relatively well monitored, there are other species considered a priority in the Western Interior Basin, including several owls and woodpeckers, which are provincial and/or nationally listed species at risk (for example, Flammulated Owl, Western Screech-Owl, Spotted Owl, Lewis's Woodpecker, White-headed Woodpecker, and Williamson's Sapsucker) (Partners in Flight British Columbia and Yukon, 2003).

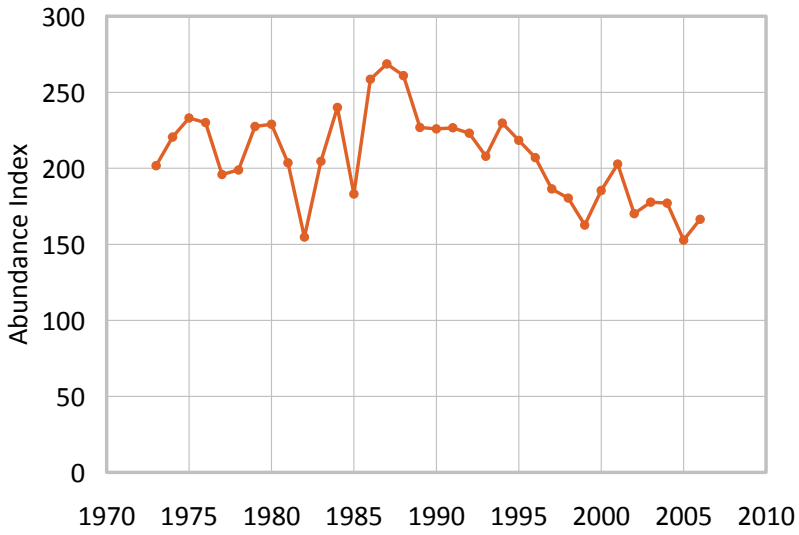



*Figure 35. Annual indices of population change in birds of forest habitat for the Western Interior Basin Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 44. Trends in abundance of selected species of forest birds that are characteristic of the Western Interior Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Dusky Flycatcher | -2.37% | * | 13.1 | 10.4 | 8.5 | 5.6 | -57% |
| Pine Siskin | -2.37% | * | 25.5 | 33.1 | 25.9 | 16.2 | -36% |
| Townsend's Warbler | -2.37% | | 4.9 | 4.9 | 4.0 | 2.4 | -51% |
| Rufous Hummingbird | -2.08% | | 3.5 | 1.2 | 1.1 | 1.2 | -67% |
| Veery | -2.08% | | 9.1 | 7.0 | 5.6 | 5.2 | -43% |
| Hammond's Flycatcher | -1.78% | | 10.9 | 8.4 | 7.3 | 6.9 | -37% |
| Red Crossbill | -1.59% | | 8.5 | 14.0 | 8.6 | 5.2 | -38% |
| Townsend's Solitaire | -1.29% | | 2.2 | 3.7 | 2.4 | 1.7 | -24% |
| Mountain Chickadee | -1.19% | * | 9.5 | 9.6 | 7.9 | 7.4 | -23% |
| Cassin's Finch | -1.09% | | 2.8 | 3.9 | 4.7 | 1.5 | -47% |
| Dark-eyed Junco | -1.09% | | 16.8 | 22.3 | 17.4 | 12.6 | -25% |
| Yellow-rumped Warbler | -0.70% | | 20.7 | 17.8 | 17.5 | 16.3 | -21% |
| Swainson's Thrush | -0.50% | | 21.6 | 18.1 | 17.5 | 18.0 | -16% |
| Cassin's Vireo | -0.40% | | 5.1 | 4.1 | 4.7 | 4.5 | -10% |
| Hairy Woodpecker | -0.20% | | 0.8 | 1.2 | 1.1 | 0.7 | -13% |
| Western Wood-pewee | 0.10% | | 7.5 | 7.0 | 6.3 | 7.9 | 6% |
| Red-naped Sapsucker | 0.30% | | 4.2 | 4.4 | 5.1 | 3.6 | -14% |
| Western Tanager | 1.11% | | 12.0 | 9.3 | 12.3 | 13.9 | 16% |
| Red-breasted Nuthatch | 3.05% | * | 3.3 | 6.3 | 7.6 | 8.3 | 149% |
| Warbling Vireo | 3.05% | * | 7.3 | 11.0 | 14.1 | 15.7 | 116% |
| Clark's Nutcracker | 5.23% | * | 0.7 | 1.2 | 2.5 | 2.2 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Shrub/early successional bird assemblage*

There has been little change in the overall trend for shrub/early successional birds (Figure 36). The overall pattern is similar to that seen in the Montane Cordillera, which shares some species. Results for most individual species (Table 45) are not statistically significant but show a mix of declines and increases. The western population of Nashville Warbler shows a strong increase in the Western Interior Basin and is increasing in the Montane Cordillera; the population trend in eastern Canada is generally steady or positive. Willow Flycatcher and Yellow Warbler are declining in western ecozones[+], more strongly in the Montane Cordillera and Pacific Maritime. McGillivray's Warbler is tending negative here, declining in the Pacific Maritime but increasing in the Montane Cordillera region. Orange-crowned Warbler populations have been relatively stable here, though tending negative, but have increased in the Montane Cordillera and significantly declined in the Pacific Maritime. Lazuli Buntings have increased throughout their range in western Canada (in both Montane Cordillera and Western Interior Basin).

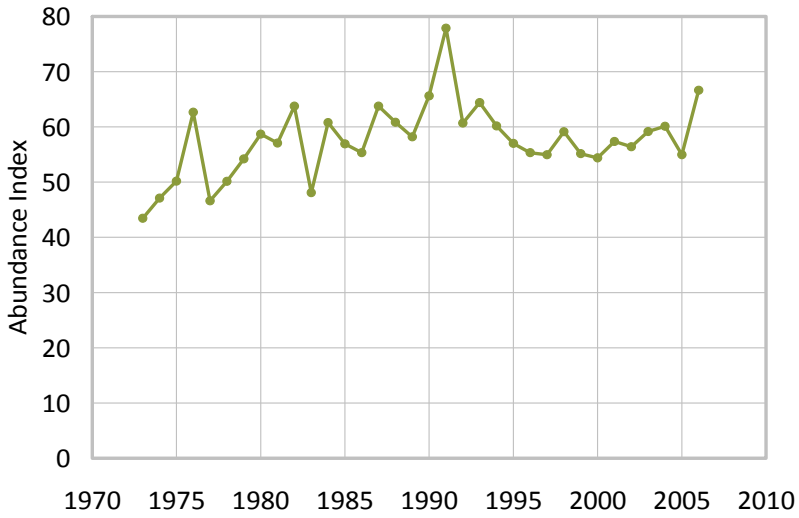



*Figure 36. Annual indices of population change in birds of shrub/early successional habitat for the Western Interior Basin Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 45. Trends in abundance of selected species of shrub/early successional birds that are characteristic of the Western Interior Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Willow Flycatcher | -1.59% | | 6.0 | 7.8 | 5.1 | 4.5 | -26% |
| Yellow Warbler | -1.19% | | 8.0 | 9.6 | 7.1 | 6.7 | -15% |
| MacGillivray's Warbler | -0.80% | | 5.0 | 6.9 | 5.3 | 4.3 | -13% |
| Orange-crowned Warbler | -0.20% | | 3.5 | 4.7 | 4.9 | 3.3 | -5% |
| Song Sparrow | 0.10% | | 8.0 | 8.4 | 7.8 | 8.5 | 6% |
| House Wren | 1.31% | | 1.5 | 2.6 | 3.4 | 1.7 | 18% |
| Spotted Towhee | 2.02% | | 3.4 | 5.3 | 7.4 | 5.3 | 55% |
| Lazuli Bunting | 2.43% | | 2.6 | 3.9 | 5.3 | 4.6 | 77% |
| Nashville Warbler | 5.44% | * | 1.0 | 2.5 | 4.8 | 4.4 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

Despite a lack of significant declines in these relatively well monitored species, there is concern about the status of several less common birds found in shrub habitats here, including Yellow-breasted Chat and Sage Thrasher, two nationally listed species at risk, and provincial blue-listed species such as Brewer's and Lark Sparrow (Partners in Flight British Columbia and Yukon, 2003). Greater Sage-grouse is now extirpated from this region.

## *Grassland bird assemblage*

While there are few grassland birds common enough to be monitored by BBS in this region, trends have been negative in this assemblage as a whole (Figure 37) and in individual species (Table 46). Although the data (Figure 37) show an apparent upswing in population in the last few years, it is unclear whether this reflects a true change in the population trend or simply a short-term fluctuation. These declines are part of a national and continental picture of declines among grassland birds over the past few decades. Declines in grassland and shrub/successional birds in this region reflect loss and degradation of habitat to urbanization and cropland (Partners in Flight British Columbia and Yukon, 2003). In addition to the relatively widespread species in Table 46, there are several less common grassland birds that are considered a priority for conservation attention (for example, Grasshopper Sparrow and Bobolink), including some listed as national species at risk (Barn Owl, Burrowing Owl, Short-eared Owl, and Ferruginous Hawk) (Partners in Flight British Columbia and Yukon, 2003).

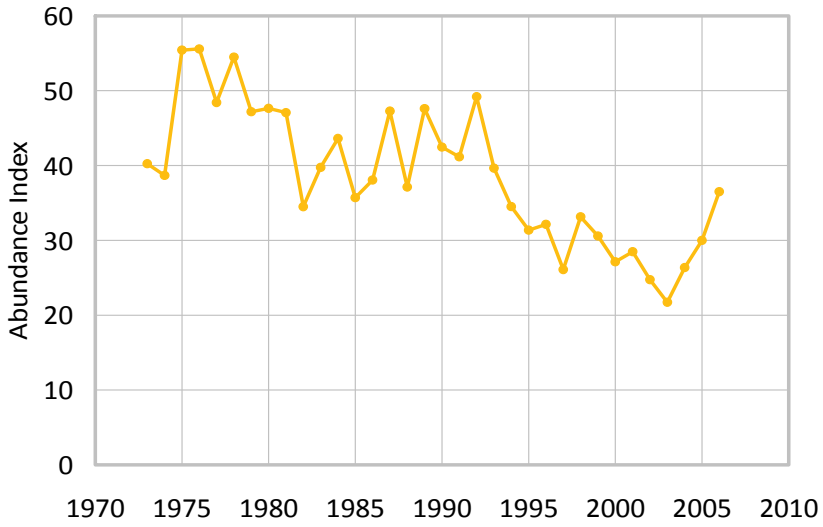



*Figure 37. Annual indices of population change in birds of grassland habitat for the Western Interior Basin Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 46. Trends in abundance of selected species of grassland birds that are characteristic of the Western Interior Ecozone[+], based on data from the Breeding Bird Survey.*

| Grassland Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Western Meadowlark | -3.05% | * | 26.3 | 24.7 | 16.7 | 12.1 | -54% |
| Vesper Sparrow | -1.19% | | 13.7 | 11.2 | 11.7 | 8.6 | -37% |
| Savannah Sparrow | -0.70% | | 4.0 | 3.9 | 4.9 | 2.7 | -34% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Other open habitat bird assemblage*

Other birds of open habitats have exhibited declines similar in magnitude to the grassland assemblage (Table 43, Figure 38). Individual species trends are mixed though more are negative than positive (Table 47). This assemblage contains several aerial-foraging insectivores that are declining as a group across Canada (swallows, nighthawks, and flycatchers). The trend for Violet-green Swallows is positive, though not statistically significant. This species is the only swallow in Canada showing an overall positive national trend. In contrast, Barn Swallow and Northern Rough-winged Swallow have lost more than 80% of their populations over the last three decades in the Western Interior Basin (Table 47). Bank and Cliff swallows are also showing signs of decline. The Brown-headed Cowbird has declined here and elsewhere in Canada.

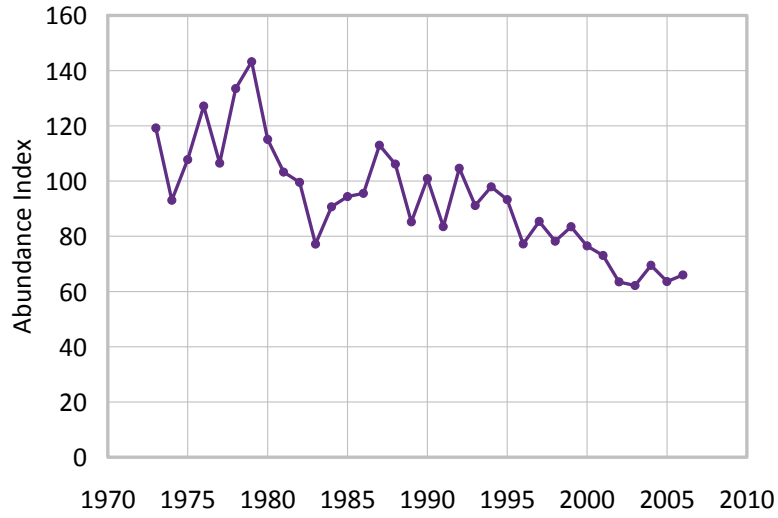



*Figure 38. Annual indices of population change in birds of other open habitats for the Western Interior Basin Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 47. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Western Interior Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Barn Swallow | -6.85% | * | 12.5 | 10.7 | 4.7 | 1.9 | -85% |
| Northern Rough-winged Swallow | -6.29% | * | 7.7 | 5.9 | 4.0 | 1.4 | -82% |
| Common Nighthawk | -3.82% | n | 1.4 | 2.3 | 1.2 | 0.5 | -62% |
| Western Kingbird | -3.44% | | 5.4 | 3.9 | 2.8 | 1.9 | -65% |
| Brewer's Blackbird | -2.76% | | 38.1 | 26.5 | 21.7 | 16.8 | -56% |
| American Kestrel | -2.27% | | 1.8 | 2.1 | 1.6 | 1.1 | -41% |
| Brown-headed Cowbird | -2.18% | * | 11.5 | 11.0 | 12.0 | 5.9 | -49% |
| Eastern Kingbird | -1.78% | | 2.7 | 2.3 | 2.1 | 1.6 | -40% |
| Tree Swallow | -0.20% | | 10.5 | 7.6 | 9.8 | 8.3 | -21% |
| Bullock's Oriole | -0.20% | | 2.7 | 4.0 | 3.4 | 2.4 | -9% |
| Mountain Bluebird | 1.01% | | 1.6 | 1.6 | 1.8 | 2.0 | 25% |
| Violet-green Swallow | 1.51% | | 6.3 | 7.8 | 12.0 | 7.6 | 21% |
| Red-tailed Hawk | 3.05% | | 0.5 | 1.4 | 1.1 | 1.1 | 106% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Urban and suburban bird assemblage*

Declines in the urban/suburban bird assemblage in the Western Interior Basin (Figure 39) are similar to other regions in Canada. Declines in the introduced European Starling (Table 48) are consistent across Canada; the species is also declining in Europe. House Finch populations are doing well throughout their Canadian range. Mourning Dove populations show a negative,

though non-significant, trend here but are increasing in Canada overall, especially in the east and in the Prairies.

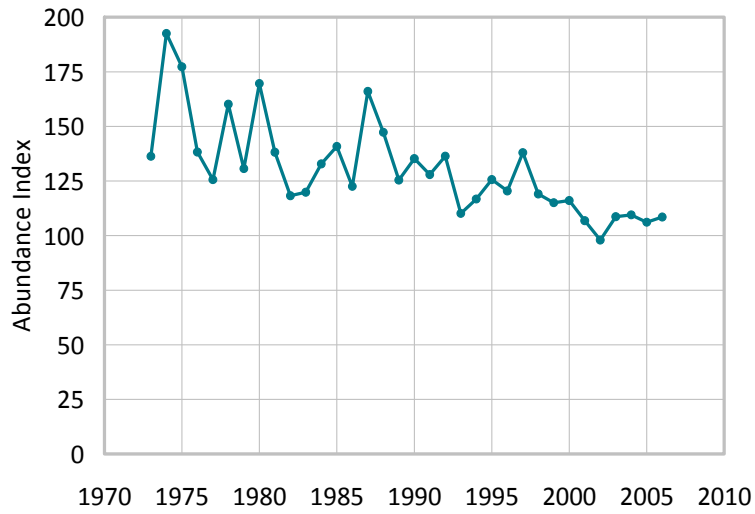



*Figure 39. Annual indices of population change in birds of urban/suburban habitat for the Western Interior Basin Ecozone⁺, based on data from the Breeding Bird Survey.*

*Table 48. Trends in abundance of selected species of urban/suburban birds that are characteristic of the Western Interior Basin Ecozone⁺, based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| European Starling (I) | -3.92% | * | 68.7 | 60.2 | 36.7 | 22.5 | -67% |
| Mourning Dove | -3.25% | | 8.1 | 4.4 | 3.4 | 3.0 | -63% |
| American Robin | 0.20% | | 47.3 | 45.8 | 49.6 | 47.6 | 0% |
| House Finch | 6.82% | * | 1.4 | 4.3 | 6.4 | 7.7 | >200% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
(I) indicates an introduced species
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Pacific Maritime Ecozone⁺ (BCR 5)

## Contributor: Wendy Easton

BBS routes are concentrated in the southern portion of the Pacific Maritime Ecozone⁺ and sample neither high elevation habitats nor forests that are inaccessible by road. Thus, trends tend to represent that part of the landscape most influenced by human settlement, more so than in other southern Canadian ecozones⁺. Analyses are based on the years 1973 to 2006, because there were too few BBS routes run in earlier years of the survey.

The Pacific Maritime is the only ecozone⁺ in Canada in which there were statistically significant declines in all assemblages (Table 49). Birds of other open habitats showed the strongest

declines with an overall loss of 61% of the population index. There are few grassland birds that have adequate trend data in this ecozone+ so results for this group are not shown; however grassland bird populations are among those known to be at risk from habitat loss and degradation in Garry Oak ecosystems in southwestern British Columbia (for example, *strigata* subspecies of Horned Lark, *affinis* subspecies of Vesper Sparrow, and Western Meadowlarks) (Garry Oak Ecosystems Recovery Team, 2002). It is likely that many declines in other habitats are also related to habitat loss and degradation in a region with increasing human population pressure and industrial development.

*Table 49. Trends in abundance of landbirds for the Pacific Maritime Ecozone+, based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend | | BBS Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | (%/yr) | P | 1970s | 1980s | 1990s | 2000s | Change |
| Forest Birds | -1.3% | * | 276.6 | 246.6 | 219.4 | 197.8 | -29% |
| Shrub/Successional | -1.5% | * | 117.0 | 95.5 | 87.5 | 75.5 | -35% |
| Other Open | -3.4% | * | 61.1 | 48.1 | 32.4 | 24.0 | -61% |
| Urban/Suburban | -1.9% | * | 178.7 | 197.4 | 136.3 | 111.2 | -38% |

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Forest bird assemblage*

The forest bird assemblage has experienced a relatively steady decline over the last 33 years (Figure 40), with a loss of 29% in the overall population index (Table 49). Individual species have shown a mix of declining and nearly stable trends, with few species showing noteworthy increasing trends (Table 50). The Olive-sided Flycatcher, assessed as Threatened by COSEWIC (2007d), is declining here as it is elsewhere in Canada. The species is most abundant in western Canada but is also undergoing its strongest declines in the west, especially in the Pacific Maritime and the Montane Cordillera ecozones+.

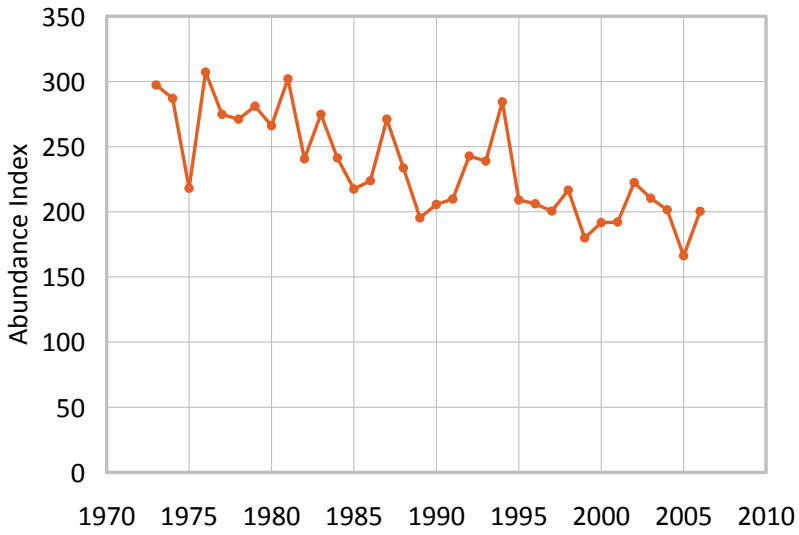



*Figure 40. Annual indices of population change in birds of forest habitat for the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 50. Trends in abundance of selected species of forest birds that are characteristic of the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Olive-sided Flycatcher | -5.5% | * | 3.32 | 1.84 | 0.91 | 0.79 | -76% |
| Dark-eyed Junco | -4.0% | * | 22.33 | 17.05 | 11.58 | 7.22 | -68% |
| Rufous Hummingbird | -3.5% | * | 8.68 | 4.03 | 3.24 | 2.87 | -67% |
| Red-breasted Sapsucker | -1.6% | | 11.37 | 4.74 | 3.73 | 4.19 | -63% |
| Golden-crowned Kinglet | -1.3% | | 8.22 | 4.95 | 6.09 | 4.57 | -44% |
| Swainson's Thrush | -1.2% | n | 54.78 | 44.89 | 42.54 | 38.78 | -29% |
| Yellow-rumped Warbler | -1.2% | | 10.60 | 7.42 | 7.56 | 7.35 | -31% |
| Steller's Jay | -0.4% | | 4.71 | 6.49 | 5.30 | 4.53 | -4% |
| Sooty Grouse | -0.4% | | 3.40 | 4.96 | 4.26 | 3.32 | -2% |
| Varied Thrush | 0.1% | | 16.87 | 23.82 | 17.93 | 20.22 | 20% |
| Winter Wren | 0.2% | | 17.96 | 19.11 | 20.28 | 18.31 | 2% |
| Warbling Vireo | 0.3% | | 11.38 | 11.85 | 11.87 | 11.39 | 0% |
| Chestnut-backed Chickadee | 0.7% | | 10.33 | 11.43 | 14.49 | 11.53 | 12% |
| Townsend's Warbler | 0.9% | | 11.36 | 10.95 | 10.63 | 14.83 | 31% |

Species are listed in order from those showing most severe declines to those showing the most positive increases

P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant

"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Shrub/early successional bird assemblage*

Shrub/early successional birds have experienced a long-term decline in population similar to the forest birds (Figure 41), and several of these species could be considered birds of forest habitats as well. More species have declined than increased (Table 51). The Canadian population of Bewick's Wren, now concentrated in the Pacific Maritime, shows a loss of 86% of its population since the 1970s, and has the largest population decline in this assemblage, although this species has not shown a consistent change in population at the North American

level in the past 40 years (Sauer et al., 2008). The decline in the eastern and central population, where it is now largely extirpated, mainly occurred before the end of 1970s and is thus not well reflected in BBS results. The eastern decline is thought to be related to interspecific competition from expanding House Wren populations (Kennedy and White, 1997).

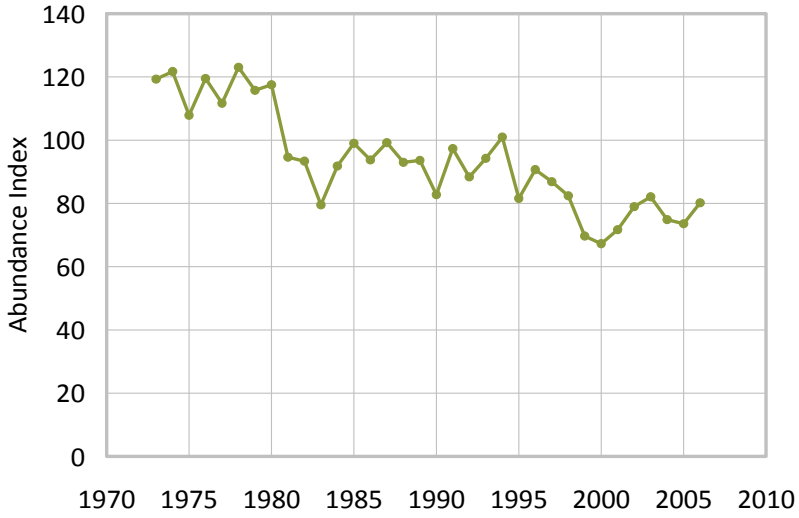



*Figure 41. Annual indices of population change in birds of shrub/early successional habitat for the Pacific Maritime Ecozone⁺, based on data from the Breeding Bird Survey.*

*Table 51. Trends in abundance of selected species of shrub/early successional birds that are characteristic of the Pacific Maritime Ecozone⁺, based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Bewick's Wren | -7.6% | * | 3.44 | 3.09 | 1.09 | 0.48 | -86% |
| Willow Flycatcher | -3.8% | * | 8.66 | 6.10 | 4.13 | 2.93 | -66% |
| Orange-crowned Warbler | -3.8% | * | 19.98 | 10.98 | 9.26 | 6.21 | -69% |
| MacGillivray's Warbler | -3.1% | * | 17.57 | 16.00 | 11.88 | 7.54 | -57% |
| Black-throated Gray Warbler | -0.7% | | 1.68 | 1.98 | 2.81 | 1.18 | -30% |
| Song Sparrow | -0.2% | | 16.29 | 16.05 | 16.25 | 15.30 | -6% |
| Spotted Towhee | 0.2% | | 11.62 | 10.71 | 12.50 | 11.51 | -1% |
| Bushtit | 0.7% | | 1.63 | 1.52 | 2.06 | 1.21 | -26% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Other open habitat bird assemblage*

Birds of other open landscapes are declining as a group (Figure 42), a pattern repeated in all other ecozones⁺ except the Prairies. The overall decline of more than 50% in the last three decades (Table 49) is reflected in declines of most species. Swallow species have shown declines at varying levels. Barn Swallow and Tree Swallow have experienced the largest, statistically significant declines (Table 52), whereas the Violet-green Swallow, whose distribution is restricted to western Canada (British Columbia, Alberta, and Yukon), shows a non-significant decline in population in the Pacific Maritime. It is the only swallow not showing a negative

trend at the national level, with stable trends in the Western Interior Basin and the Montane Cordillera ecozones[+]. Red-tailed Hawk, a common and widespread species, shows a positive trend here as well as at the national level and in most other ecozones[+].

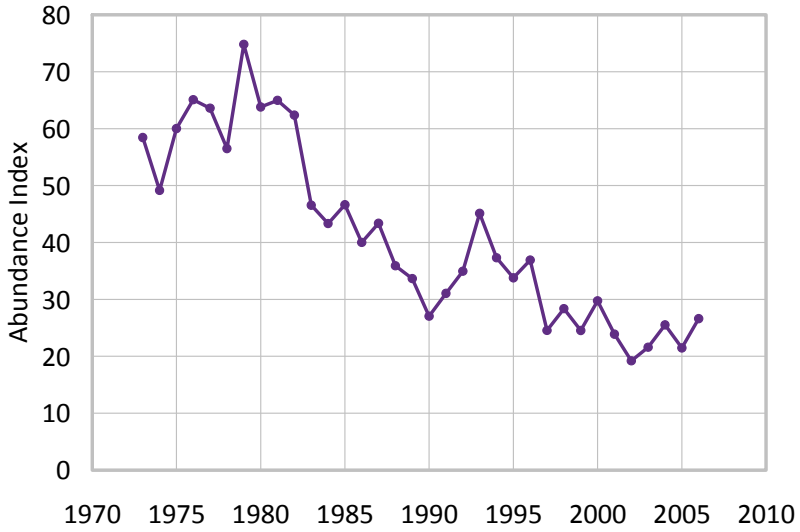



*Figure 42. Annual indices of population change in birds of other open habitats for the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 52. Trends in abundance of selected species of birds of other open habitats that are characteristic of the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Other Open Habitats | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| Barn Swallow | -5.4% | * | 27.01 | 21.98 | 11.88 | 7.09 | -74% |
| Brown-headed Cowbird | -5.2% | * | 7.87 | 5.81 | 3.01 | 1.99 | -75% |
| Tree Swallow | -5.1% | * | 7.46 | 5.87 | 3.20 | 1.94 | -74% |
| Brewer's Blackbird | -4.3% | n | 11.51 | 5.63 | 3.60 | 3.46 | -70% |
| Common Nighthawk | -4.0% | | 0.78 | 0.56 | 0.52 | 0.31 | -60% |
| Savannah Sparrow | -3.5% | | 4.39 | 2.37 | 1.93 | 1.38 | -69% |
| Violet-green Swallow | -1.5% | | 7.92 | 5.77 | 8.16 | 4.09 | -48% |
| Red-tailed Hawk | 1.1% | | 0.15 | 0.52 | 0.33 | 0.34 | 119% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

## *Urban and suburban bird assemblage*

The declining trend in urban/suburban birds in the Pacific Maritime (Figure 43) is consistent with the rest of Canada, and as elsewhere, it is driven by large declines in introduced Eurasian species, in this case by European Starling and Rock Pigeon. The Pacific Maritime is the only region in Canada where the House Sparrow has not declined according to BBS trend data (Table 53). In contrast, Rock Pigeon trend is negative in the Pacific Maritime but stable to positive across the rest of Canada. The large, statistically significant decline in European

Starling is consistent with similar declines elsewhere in Canada and in Europe (Pan-European Common Bird Monitoring Scheme, 2007).

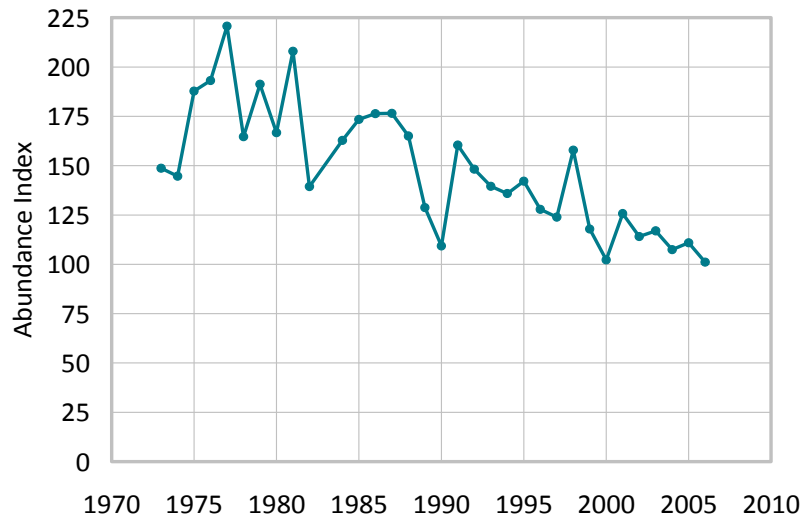



*Figure 43. Annual indices of population change in birds of urban/suburban habitat for the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 53. Trends in abundance of selected species of urban/suburban birds that are characteristic of the Pacific Maritime Ecozone[+], based on data from the Breeding Bird Survey.*

| Urban/Suburban Birds | Population Trend (%/yr) | P | BBS Abundance Index 1970s | 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|---|
| European Starling (I) | -6.0% | * | 82.74 | 119.53 | 37.44 | 16.88 | -80% |
| Rock Pigeon (I) | -3.6% | | 8.33 | 7.20 | 6.12 | 3.21 | -61% |
| American Robin | -0.8% | | 79.44 | 78.50 | 71.77 | 63.17 | -20% |
| House Sparrow (I) | 1.4% | | 8.12 | 5.26 | 8.06 | 9.24 | 14% |
| House Finch | 2.5% | | 4.12 | 7.22 | 10.07 | 8.31 | 102% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; n indicates 0.05<P<0.1; no value indicates not significant
(I) indicates an introduced species
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1970s) and the 2000s (2000-2006).

# Boreal Cordillera Ecozone[+] (southern portion of BCR 4)

## Contributor: Pam Sinclair

Much of the Boreal Cordillera area is remote wilderness, inaccessible by road. BBS coverage in the Boreal Cordillera is concentrated in the southwestern portion of the Yukon and along the northern border of British Columbia. The results presented are based on data from 1988 to 2006 because earlier years had too few BBS routes. Results have low precision and a short-time frame (19 years) relative to other ecozones[+].

The Boreal Cordillera is largely forested; therefore, landbird species selected as representative of this ecozone[+] belong mainly to the forest and shrub/early successional assemblages.

Urban/suburban, other open habitat, and grassland assemblages are not reported here because they are a very minor part of the avifauna, with few species and poor BBS trend precision.

*Table 54. Trends in abundance of landbirds for the Boreal Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Species Assemblage | Trend (%/yr) | P | BBS Abundance Index 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|
| Forest Birds | 1.6% | | 162.3 | 161.8 | 175.0 | 8% |
| Shrub/Successional | 0.6% | | 35.1 | 29.6 | 31.7 | -10% |

P is the statistical significance: no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1980s) and the 2000s (2000-2006).

The overall trend in forest landbirds as a group has been slightly positive, while the shrub/successional assemblage has been relatively stable over the last two decades (Table 54). There is considerable year-to-year variation in these assemblages because bird populations fluctuate in response to a variety of factors including climatic variation and food availability. One factor that likely influences landbird trends in the Pacific northwest is the Pacific Decadal Oscillation (Hare and Mantua, 2000) which is a pattern of surface temperature variability in the Pacific Ocean that results in alternating "warm" and "cool" climatic phases in the northeastern Pacific which last for two to three decades although there can be temperature variation within the phases.

## *Forest bird assemblage*

The overall trend for the forest bird assemblage is slightly positive (Table 54 and Figure 44) though not statistically distinguishable from a stable trend. Trends for most of the individual species presented have also been stable or positive (Table 55). The trend for Western Wood-pewee has been relatively stable in the Boreal Cordillera and stable, tending positive overall in Canada. However, it has declined in some other ecozones[+], particularly in the Pacific Maritime, and has shown a significant decline in North America as a whole (Sauer et al., 2008). The Common Raven, a widespread species that is tolerant of and often benefits from human-influenced landscapes, is increasing in the Boreal Cordillera and across its range in Canada. Raven populations decreased during the early part of the 20th century in the east and Prairies, but have since increased and are spreading back into their previous range. Suggested causes for the early decrease in these regions include control measures, land use changes, and competition from increases in American Crow (Boarman and Heinrich, 1999). Boreal Chickadees have a positive population trend here and in the Boreal Plains, in contrast to statistically significant declines in the Boreal Shield, Montane Cordillera, Atlantic Maritime, and at the national level.

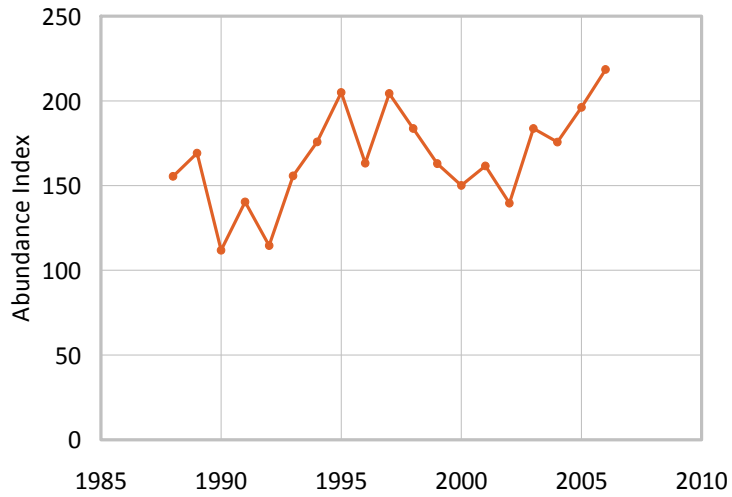



*Figure 44. Annual indices of population change in birds of forest habitat for the Boreal Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 55. Trends in abundance of forest birds for the Boreal Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Forest Birds | Population Trend (%/yr) | P | BBS Abundance Index 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|
| Western Wood-pewee | -0.10% | | 2.1 | 2.9 | 2.4 | 14% |
| Northern Flicker | 0.00% | | 1.5 | 2.9 | 2.3 | 50% |
| Dark-eyed Junco | 0.50% | | 44.1 | 40.0 | 43.8 | -1% |
| Swainson's Thrush | 1.92% | | 40.6 | 43.0 | 47.2 | 16% |
| Common Raven | 2.02% | | 2.1 | 3.7 | 3.4 | 66% |
| Gray Jay | 2.43% | | 7.8 | 9.3 | 10.5 | 34% |
| Yellow-rumped Warbler | 3.36% | n | 20.3 | 31.2 | 34.2 | 68% |
| Boreal Chickadee | 3.87% | | 1.7 | 1.8 | 2.0 | 21% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: n indicates 0.05<P<0.1; no value indicates not significant
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1980s) and the 2000s (2000-2006).

## *Shrub/early successional bird assemblage*

The shrub/early successional assemblage has been relatively stable overall with a mix of increases and decreases in individual species (Figure 45 and Table 56). Widespread species such as Lincoln's Sparrow and Yellow Warbler have shown increasing and stable trends respectively, consistent with their national trends. Lincoln's Sparrow trends have been stable or increasing in all ecozones[+]; however, maintenance of wide road verges in the north may benefit this species locally and they may be over-represented in BBS counts (C. Machtans, Environment Canada, pers. comm., 2010). Trends for Yellow Warbler vary across Canada but have been more negative in the western ecozones[+]. Common Yellowthroat has increased in the Boreal Cordillera but has declined in Canada overall, particularly in the Boreal Shield and Boreal Plains, and in North American overall (Sauer et al., 2008).

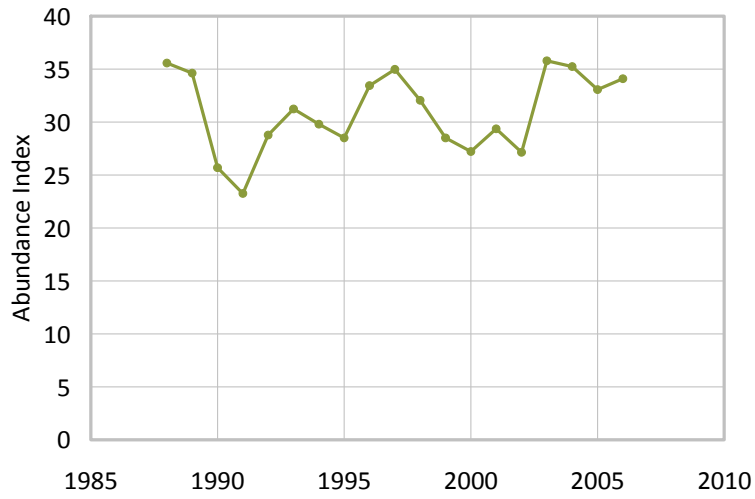



*Figure 45. Annual indices of population change in birds of shrub/early successional habitat for the Boreal Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

*Table 56. Trends in abundance of shrub/early successional birds for the Boreal Cordillera Ecozone[+], based on data from the Breeding Bird Survey.*

| Birds of Shrub/Succession | Population Trend (%/yr) | P | BBS Abundance Index 1980s | 1990s | 2000s | Change |
|---|---|---|---|---|---|---|
| White-crowned Sparrow | -2.86% | | 9.9 | 7.0 | 5.1 | -48% |
| Wilson's Warbler | -1.49% | | 4.9 | 4.5 | 3.4 | -30% |
| Alder Flycatcher | -1.29% | | 7.4 | 4.8 | 5.4 | -26% |
| Yellow Warbler | 0.00% | | 2.9 | 3.8 | 3.5 | 22% |
| Lincoln's Sparrow | 4.60% | | 1.2 | 2.4 | 2.4 | 103% |
| Common Yellowthroat | 4.71% | * | 1.9 | 2.1 | 2.6 | 37% |

Species are listed in order from those showing most severe declines to those showing the most positive increases
P is the statistical significance: * indicates P<0.05; no value indicates not significant (P>0.1)
"Change" is the percent change in the average index of abundance between the first decade for which there are results (1980s) and the 2000s (2000-2006)

# Taiga Ecozones[+] (Taiga Shield, Taiga Plains, and Taiga Cordillera)

There are very few data on landbird population trends in the three taiga ecozones[+]. Because of the remote character of these regions, the lack of roads and low population base, there are only a few scattered BBS routes and few other sources of population data. Some birds that breed in these remote northern landscapes spend their winters in the United States and more southerly parts of Canada, where their populations can be monitored by the Christmas Bird Count (CBC) (Audubon Society, 2010).

Species discussed in this section are those whose breeding range includes portions of the three taiga ecozones[+]. The CBC results presented below are preliminary findings based on CBC data from Canada and the United States combined (cf. Butcher and Niven, 2007). Canada has a high stewardship responsibility for all of these species because a large proportion of their breeding

population is in Canada. The Rusty Blackbird, a COSEWIC species of Special Concern (COSEWIC, 2006b) is listed, along with Smith's Longspur, as one of 100 species on the Partners in Flight North American Watch List (Rich et al., 2004).

CBC results for North America show a mix of declining and stable population trends (Table 57). Three of the six species show consistent, statistically significant long-term declines in population.

*Table 57. Trends in annual abundance of selected landbirds from the three taiga ecozones[+], 1966 to 2005, based on Christmas Bird Count results for North America.*

| Species | Main Breeding Range | Population Trend (%/yr) | P | CBC Abundance Index | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | 1970s | 1980s | 1990s | 2000s | Change |
| Rusty Blackbird | Hudson Bay Lowlands, taiga and boreal | -5.46% | * | 1.5 | 0.7 | 0.4 | 0.3 | -78% |
| Boreal Chickadee | Taiga and boreal | -1.73% | * | 1.6 | 1.3 | 1.2 | 1.2 | -29% |
| Northern Shrike | Taiga | -0.79% | * | 1.1 | 1.0 | 1.0 | 0.8 | -29% |
| Pine Grosbeak | Taiga and boreal | -0.78% | | 5.1 | 3.4 | 2.8 | 2.5 | -52% |
| Smith's Longspur | Taiga | -0.32% | | 0.05 | 0.06 | 0.07 | 0.08 | 57% |
| Lincoln's Sparrow | Taiga and boreal | -0.08% | | 1.5 | 1.5 | 1.7 | 1.6 | 8% |

Data table shows the annual rate of change and the average CBC abundance index by decade.
Asterisks (*) indicate statistically significant trends (P<0.05).
"Change" is the percent change in the average index abundance between the first decade (usually 1970s) for which there are results and the 2000s decade (2000-2006).
*Source: based on data from the Christmas Bird Count by Butcher and Niven (2007)*

The Rusty Blackbird, a temperate migrant that winters in the United States, shows a dramatic 78% loss of population between the 1970s and the 2000s (Figure 46). This decline is supported by BBS results from other parts of its range which show an even steeper rate of decline for Canada overall (-9.9% per year), with the decline being consistent across ecozones[+]. However, this species is not monitored adequately by the BBS because its wetland forest habitat is poorly sampled by BBS routes. There is circumstantial evidence that the declines have not been as dramatic in the North, recently supported by observations made by (Machtans et al., 2007). The declines in Boreal Chickadee and Pine Grosbeak are supported by BBS declines at the southern edge of their breeding ranges (-3.2 and -6.2% per year, respectively, for Canada).

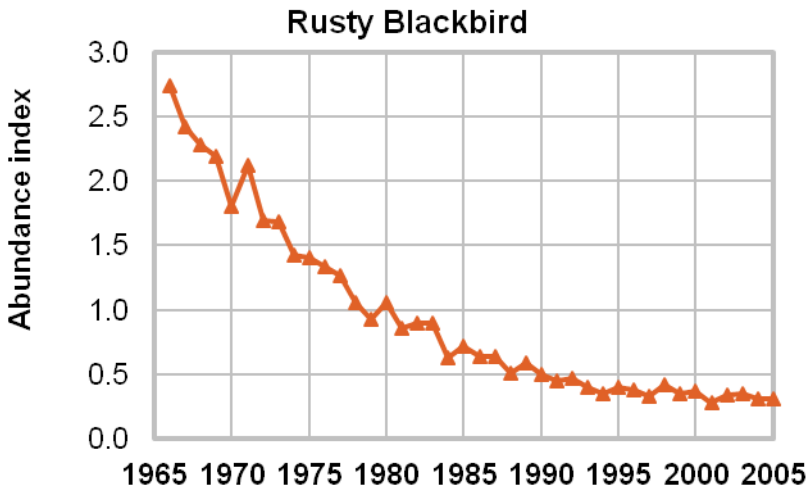



*Figure 46. Trend in annual abundance index for the Rusty Blackbird, 1996 to 2005, based on Christmas Bird Count results for North America.*
*Source: Christmas Bird Count (courtesy D. Niven, Audubon)*

Two species, Lincoln's Sparrow (Figure 47) and Smith's Longspur, show no strong change in overall population trend over the past 40 years, though the latter is difficult to monitor and change might not be detectable. The stable trend for Lincoln's Sparrow contrasts somewhat with the more positive trends from the BBS (3.0% per year for Canada). The BBS is run along roadsides and maintenance of wide road verges in the North may benefit this species locally. They may consequently be over-represented in BBS counts (C. Machtans, Environment Canada, pers. comm., 2010).

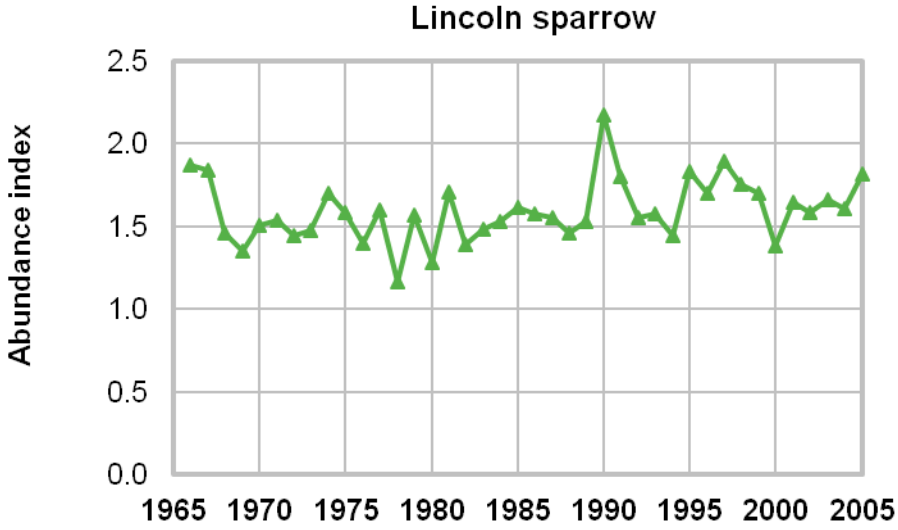



*Figure 47. Trend in annual abundance index for Lincoln's Sparrow, 1996 to 2005, based on Christmas Bird Count results for North America.*
*Source: Christmas Bird Count (courtesy D. Niven, Audubon)*

# Arctic Ecozone$^{+}$

The Arctic Ecozone$^{+}$ is relatively isolated and pristine and there are few immediate threats to landbirds from human activity, although species are affected by climate change, contaminants, and other wide-ranging factors. All birds listed here overwinter in more populated areas of Canada and the United States; development pressures are more intense both in their wintering ranges and along their migration routes. Canada has a high stewardship responsibility for these species because large portions of their western hemisphere breeding populations are concentrated in the Arctic Ecozone$^{+}$.

There are relatively few landbird species in the Arctic Ecozone$^{+}$ and few data on their population trends. Addressing the lack of information on population status and trends has been highlighted as the most pressing conservation need in relation to landbirds for this region (Rich et al., 2004). Because of remoteness and lack of roads, the BBS has not been carried and there are few other surveys of breeding birds. However, since many birds that breed in the Arctic spend their winters in the United States and more southerly parts of Canada, CBC data are available for some species. Results presented below are preliminary findings based on CBC data from Canada and the United States combined (Butcher and Niven, 2007).

CBC trends (Table 58 and Figure 48) indicate that several species, such as Harris's Sparrow and Snowy Owl, have been undergoing long-term, statistically significant declines since the 1960s. Other species, such as Rough-legged Hawk and Lapland Longspur, have shown relatively stable overall population trends.

*Table 58. Trends in annual abundance of selected Arctic Ecozone$^{+}$ landbirds, 1966 to 2006, based on Christmas Bird Count results for North America.*

| Species | Population Trend (%/yr) | P | CBC Abundance Index | | | | |
|---|---|---|---|---|---|---|---|
| | | | 1970s | 1980s | 1990s | 2000s | Change |
| Hoary Redpoll | -4.97% | * | 0.29 | 0.18 | 0.14 | 0.09 | -68% |
| American Tree Sparrow | -2.16% | * | 62.8 | 56.3 | 42.4 | 34.4 | -45% |
| Harris's Sparrow | -2.13% | * | 9.6 | 7.5 | 6.2 | 5.3 | -45% |
| Snowy Owl | -2.12% | * | 0.24 | 0.17 | 0.14 | 0.11 | -53% |
| American Pipit | -0.97% | * | 5.9 | 4.8 | 4.4 | 4.7 | -19% |
| Snow Bunting | -0.93% | | 15.8 | 14.4 | 11.6 | 9.3 | -41% |
| Rough-legged Hawk | -0.06% | | 1.8 | 1.6 | 1.6 | 1.7 | -7% |
| Lapland Longspur | 0.40% | | 0.9 | 0.9 | 0.9 | 1.0 | 12% |
| Common Redpoll | 0.60% | | 19.0 | 17.8 | 18.1 | 17.9 | -6% |

Table shows the annual rate of change and the average CBC abundance index by decade
Asterisks (*) indicate significant trends (P<0.05)
"Change" is the percent change in the average index abundance between the first decade for which there are results (1970s) and the 2000s decade (2000-2006).
*Source: based on data from the Christmas Bird Count by Butcher and Niven (2007)*

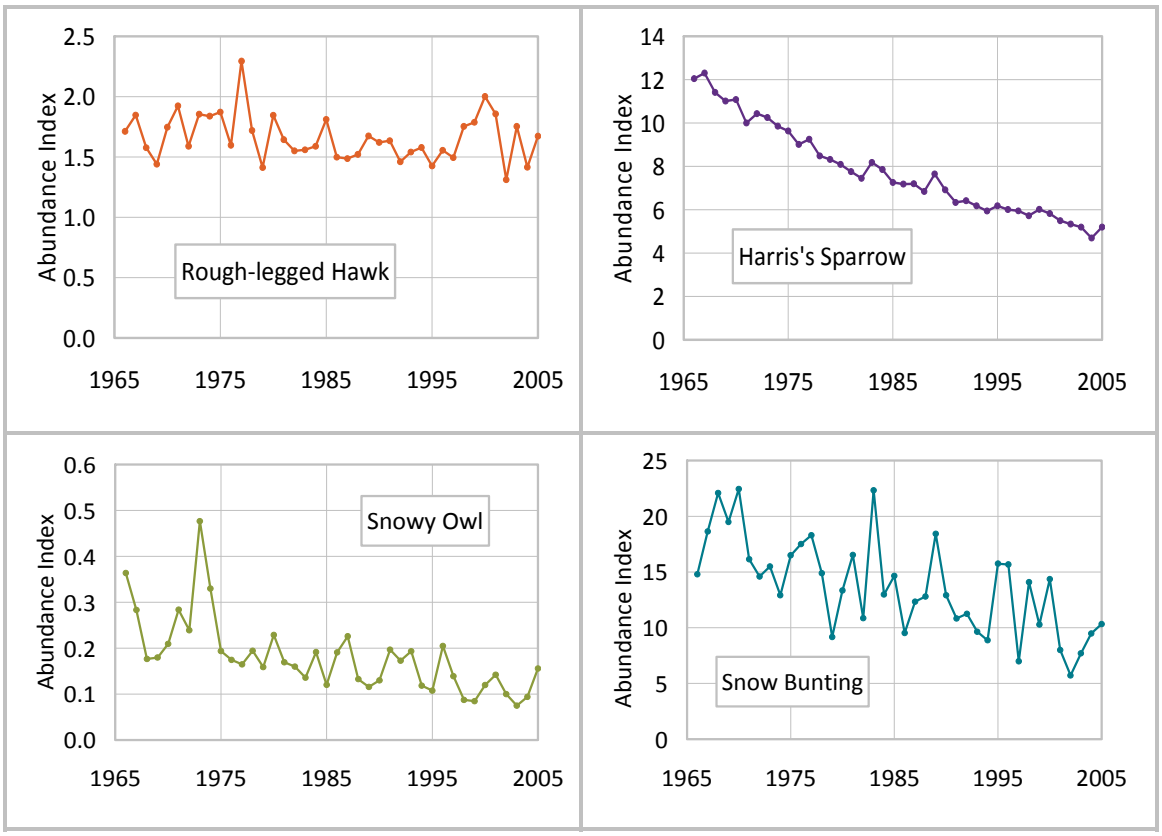



*Figure 48. Annual indices of population change for the Rough-legged Hawk, Snowy Owl, Harris's Sparrow, and Snow Bunting, 1966 to 2005, based on Christmas Bird Count results for North America. The Rough-legged Hawk and Snow Bunting show no significant trends, though the latter may be in decline; the Snowy Owl and Harris's Sparrow have declined significantly (P<0.05)*
*Source: based on data from the Christmas Bird Count, 1966-2005 (courtesy D. Niven, Audubon).*

Harris's Sparrow, a species with its entire breeding range in Canada, is classified by Partners in Flight as a Continental Watch List species (Rich et al., 2004). The species has apparently experienced a long-term decline over the last 40 years (Figure 48). Because of its isolated breeding range, direct influence of human activity on the breeding range is unlikely to be a factor in its decline. Harris's Sparrows, however, are susceptible to predation, especially by Merlins, whose populations are increasing. The influence of factors such as climate change is unknown (Niven et al., 2004; Norment and Shackleton, 2008).

Population indices for Snow Bunting vary annually but this species has apparently experienced a large decline in its population over the long term (Figure 48). The Arctic has a very high stewardship responsibility for Snow Buntings (Rich et al., 2004), which breed throughout the Arctic Cordillera and Northern Arctic and the northern portions of the Southern Arctic. Reduction in Snow Bunting populations may be related to earlier thawing of the tundra and conversion of open sites, its preferred nesting habitat, to more shrub-dominated communities. In addition, climate warming allows more avian and mammalian predators to survive and prey on Snow Bunting nests (Audubon Society, 2007).

# References


Alley, W.M. 1984. The Palmer Drought Severity Index - limitations and assumptions. Journal of Climate and Applied Meteorology 23:1100-1109.

Anderson, H.G. and Bailey, A.W. 1980. Effects of annual burning on grassland in the aspen parkland of east-central Alberta. Canadian Journal of Botany 58:985-996.

Arnett, E.B., Inkely, D.B., Johnson, D.H., Larkin, R.P., Manes, S., Manville, A.M., Mason, R., Morrison, M., Strickland, M.D. and Thresher, R. 2007. Impacts of wind energy facilities on wildlife and wildlife habitat. The Wildlife Society. Bethesda, MD.

Askins, R.A., Zuckerberg, B. and Novak, L. 2007. Do the size and landscape context of forest openings influence the abundance and breeding success of shrubland songbirds in southern New England? Forest Ecology and Management 250:137-147.

Audubon Society. 2007. State of the birds: common species in decline [online]. Christmas Bird Count (CBC) data for 1996-2006. http://stateofthebirds.audubon.org/cbid/profile.php?id=3 (accessed 14 February, 2008).

Audubon Society. 2010. Christmas Bird Count [online]. National Audubon Society Inc. http://www.audubon.org/bird/cbc/index.html (accessed 20 November, 2009).

Baillie, S.R., Marchant, J.H., Crick, H.Q.P., Noble, D.G., Balmer, D.E., Barimore, C., Coombes, R.H., Downie, I.S., Freeman, S.N., Joys, A.C., Leech, D.I., Raven, M.J., Robinson, R.A. and Thewlis, R.M. 2007. Breeding birds in the wider countryside: their conservation status 2007. Research Report No. 487. British Trust for Ornithology. Thetford, UK. http://www.bto.org/birdtrends.

Baltz, M.E. and Latta, S.C. 1998. Cape may warbler (*Dendroica tigrina*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/332.

BC Ministry of Forests and Range. 2006. British Columbia's mountain pine beetle action plan 2006-2011. Government of British Columbia. 24 p. www.gov.bc.ca/pinebeetle (accessed 15 December, 2010).

Bird Studies Canada. 2008. Atlas of breeding birds of the Maritime Provinces [online]. http://www.mba-aom.ca/english/index.html (accessed 23 October, 2009).

Blancher, P. 2002. Canada's landbird exports: the importance of Canada to migratory landbirds. Edition 20. Birdwatch Canada, Summer 2002. pp. 4-6.

Blancher, P. 2003. Importance of Canada's boreal forest to landbirds. Canadian Boreal Initiative and Boreal Songbird Initiative. Ottawa, ON and Seattle, WA. 43 p.

Blancher, P., Cadman, M.D., Pond, B.A., Couturier, A.R., Dunn, E.H., Francis, C.M. and Rempel, R.S. 2007. Changes in bird distributions between atlases. *In* Atlas of the breeding birds of Ontario, 2001-2005. Edited by Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D. and

Couturier, A.R. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. Toronto, ON. pp. 32-48.

Blancher, P.J., Phoenix, R.D., Badzinski, D.S., Cadman, M.D., Crewe, T.L., Downes, C.M., Fillman, D., Francis, C.M., Hughes, J., Hussell, D.J.T., Lepage, D., McCracken, J.D., McNicol, D.K., Pond, B.A., Ross, R.K., Russells, R., Venier, L.A. and Weeber, R.C. 2009. Population trend status of Ontario's forest birds. Forestry Chronicle 85:184-201.

Boarman, W.I. and Heinrich, B. 1999. Common raven (*Corvus corax*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/476 (accessed 23 October, 2009).

Bollinger, E.K., Bollinger, P.B. and Gavin, T.A. 1990. Effects of hay-cropping on eastern populations of the bobolink. Wildlife Society Bulletin 18:142-150.

Busby, D., Austin-Smith, S., Curley, R., Diamond, A., Duffy, T., Elderkin, M., Makepeace, S., Diamond, D., Melanson, R., Staicer, C. and Whittam, B. 2006. Partners in Flight Canada: Maritime Canada Landbird Conservation Plan. Technical Report Series No. 449. Environment Canada, Canadian Wildlife Service, Atlantic Region. Sackville, NS. 43 p.

Butcher, G.S. and Niven, D.K. 2007. Combining data from the Christmas Bird Count and the Breeding Bird Survey to determine the continental status and trends of North America birds. National Audubon Society. Ivyland, PA. 34 p.

Cadman, M.D., Dewar, H.J. and Welsh, D.A. 1998. The Ontario Forest Bird Monitoring Program (1987-1997): goals, methods and species trends observed. Technical Report Series No. 325. Environment Canada, Canadian Wildlife Service. 26 p.

Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D. and Couturier, A.R.(eds.). 2007. Atlas of the breeding birds of Ontario, 2001-2005. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. Toronto, ON. 728 p.

Campbell, G., Whittam, B. and Robertson, G. 2008. High elevation landbird program 6-year report. Bird Studies Canada. Port Rowan, ON. 18 p.

Canadian Intermountain Joint Venture. 2006. Biological foundation and prospectus. Canadian Intermountain Joint Venture. 72 p. http://www.pifbcyukon.org/3b.html.

Canadian Wildlife Service. 2007. Breeding Bird Survey in Canada [online]. Environment Canada. http://www.cws-scf.ec.gc.ca/nwrc-cnrf/Default.asp?lang=En&n=416B57CA (accessed 20 October, 2009).

Canadian Wildlife Service, Environment Canada. 2007. Ontario Forest Bird Monitoring Program, 1989-2006. Unpublished data.

CanWEA. 2010. The wind energy industry: the business of wind [online]. Canadian Wind Energy Association. http://www.canwea.ca/images/uploads/File/NRCan_-_Fact_Sheets/9_industry.pdf (accessed 22 March, 2010).

Cavitt, J.F. and Haas, C.A. 2000. Brown thrasher (*Toxostoma rufum*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/557 (accessed 23 October, 2009).

Collins, B.T. and Downes, C.M. 2009. Canadian bird trends web site version 2.3. [online]. Canadian Wildlife Service, Environment Canada. http://www.cws-scf.ec.gc.ca/mgbc/trends/index.cfm?lang=e&go=home.page (accessed 15 December, 2009).

COSEWIC. 2003. COSEWIC assessment and update status report on the cerulean warbler *Dendroica cerulea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 25 p.

COSEWIC. 2004. COSEWIC assessment and update status report on the loggerhead shrike *excubitorides* subspecies *Lanius ludovicianus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. 24 p.

COSEWIC. 2006a. COSEWIC assessment and status report on the golden-winged warbler *Vermivora chrysoptera* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 30 p.

COSEWIC. 2006b. COSEWIC assessment and status report on the rusty blackbird *Euphagus carolinus* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 26 p.

COSEWIC. 2007a. Canadian species at risk. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. 84 p.

COSEWIC. 2007b. COSEWIC assessment and status report on the chimney swift *Chaetura pelagica* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 49 p.

COSEWIC. 2007c. COSEWIC assessment and status report on the common nighthawk *Chordeiles minor* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 25 p.

COSEWIC. 2007d. COSEWIC assessment and status report on the olive-sided flycatcher Contopus cooperi in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 25 p.

COSEWIC. 2008. COSEWIC assessment and status report on the Canada warbler *Wilsonia canadensis* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vi + 35 p.

COSEWIC. 2009. COSEWIC assessment and status report on the Bicknell's thrush *Catharus bicknelli* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, ON. vii + 44 p.

COSEWIC. 2010. Species profile: Bicknell's thrush [online]. Committee on the Status of Endangered Wildlife in Canada.

http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=584 (accessed 15 December, 2009).

Crins, W.J., Pond, B.A., Cadman, M.D. and Gray, P.A. 2007. The biogeography of Ontario, with special reference to birds. *In* Atlas of the breeding birds of Ontario, 2001-2005. Edited by Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D. and Couturier, A.R. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. Toronto, ON. pp. 11-22.

Dale, B.C., Norton, M., Downes, C. and Collins, B. 2005. Monitoring as a means to focus research and conservation - the grassland bird monitoring example. *In* Bird conservation implementation and integration in the Americas: proceedings of the third international Partners in Flight conference 2002. Edited by Ralph, C.J. and Rich, T.D. U.S. Department of Agriculture, Forest Service General Technical Report PSW-GTR-191. pp. 485-495.

Davis, S.K. 2004. Area sensitivity in grassland passerines: effects of patch size, patch shape, and vegetation structure on bird abundance and occurrence in southern Saskatchewan. Auk 121:1130-1145.

Dettmers, R. 2004. Blueprint for the design and delivery of bird conservation in the Atlantic northern forest [online]. U.S. Fish and Wildlife Service. http://www.acjv.org/resources.htm (accessed 15 December, 2009).

Dhondt, A.A., Tessaglia, D.L. and Slothower, R.L. 1998. Epidemic mycoplasmal conjunctivitis in house finches from eastern North America. Journal of Wildlife Diseases 34:265-280.

Dolbeer, R.A., Mott, D.F. and Belant, J.L. 1995. Blackbirds and starlings killed at winter roosts from PA-14 applications, 1974-1992: implications for regional population management. *In* Eastern Wildlife Damage Control Conferences. Seventh Eastern Wildlife Damage Management Conference. University of Nebraska. Lincoln, NE.

Environment Canada. 2006. WILDSPACE 2008 [online]. Canadian Wildlife Service, Environment Canada. http://wildspace.ec.gc.ca/intro-e.html (accessed 23 October, 2009).

Environment Canada. 2009. Unpublished data.

Environment Canada. 2009. Invasive alien species in Canada [online]. http://www.ec.gc.ca/eee-ias/ (accessed 15 December, 2009).

Erskine, A.J. and McManus, R.Jr. 2005. Bird status changes - and changes in the environment - in the Chignecto Isthmus region of Atlantic Canada. Technical Report Series No. 430. Canadian Wildlife Service, Atlantic Region. 167 p.

Frawley, B.J. 1989. The dynamics of nongame bird ecology in Iowa alfalfa fields. Thesis (M.Sc.). Iowa State University. Ames, IA.

Garry Oak Ecosystems Recovery Team. 2002. Recovery strategy for Garry oak and associated ecosystems and their associated species at risk in Canada 2001-2006. x + 191 p. Draft, 20 February, 2002. http://www.goert.ca.

Hamilton, L. 2010. Effects of natural gas development on three grassland bird species in CFB Suffield, Alberta, Canada. Thesis (M.Sc.). University of Alberta. 137 p.

Hare, S.R. and Mantua, N.J. 2000. Empirical evidence for north Pacific regime shifts in 1977 and 1989. Progress in Oceanography 47:103-145.

Johnson, M. and Ruttan, R.A. 1993. Traditional Dene environmental knowledge: a pilot project conducted in Fort Good Hope and Colville Lake, NT 1989-1993. Dene Cultural Institute. Hay River, NT. 308 p.

Kennedy, E.D. and White, E.W. 1997. Bewick's wren (*Thryomanes bewickii*). *In* The birds of North America, No. 315. Edited by Poole, A. and Gill, F. Academy of Natural Sciences, Philadephia, PA, and American Ornithologists' Union, Washington, DC.

King, D., Lambert, J., Buonaccorsi, J. and Prout, L. 2008. Avian population trends in the vulnerable montane forests of the Northern Appalachians, USA. Biodiversity and Conservation 17:2691-2700. doi:10.1007/s10531-007-9244-9.

Machtans, C.S., Van Wilgenburg, S.L., Armer, L.A. and Hobson, K.A. 2007. Retrospective comparison of the occurrence and abundance of rusty blackbird in the Mackenzie Valley, Northwest Territories. Avian Conservation and Ecology/Écologie et conservation des oiseaux 2:3. doi:10.1007/s10531-007-9244-9. http://www.ace-eco.org/vol2/iss1/art3/.

McCracken, M.L. 1994. Factors affecting bird counts and their influence on density estimates. Thesis (Ph.D.). Oregon State University. Corvallis, OR.

McFarland, K.P., Rimmer, C.C., Frey, S.J.K., Faccio, S.D. and Collins, B.B. 2008. Demography, ecology and conservation of Bicknell's thrush in Vermont, with a special focus on the northeastern highlands. Technical Report No. 08-03. Vermont Center for Ecostudies. Norwich, VT.

McLaren, M. 2007. Boreal chickadee. *In* Atlas of the breeding birds of Ontario, 2001-2005. Edited by Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D. and Couturier, A.R. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. Toronto, ON. pp. 402-403.

McMaster, D.G. and Davis, S.K. 2001. An evaluation of Canada's permanent cover program: habitat for grassland birds? Journal of Field Ornithology 72:195-210.

Nebel, S., Mills, A.M., McCracken, J.D. and Taylor, P.D. 2010. Declines of aerial insectivores in North America follow a geographic gradient. Avian Conservation and Ecology/Écologie et conservation des oiseaux 5:1. http://www.ace-eco.org/vol5/iss2/art1/.

Niven, D.K., Sauer, J.R., Butcher, G.S. and Link, W.A. 2004. Population change in boreal birds from the Christmas Bird Count. American Birds 58:10-20.

Nocera, J.J., Parsons, G.J., Milton, G.R. and Fredeen, A.H. 2005. Compatibility of delayed cutting regime with bird breeding and hay nutritional quality. Agriculture, Ecosystems and Environment 107:245-253.

Norment, C.J. and Shackleton, S.A. 2008. Harris's sparrow (*Zonotrichia querula*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/064.

North American Bird Conservation Initiative, U.S. Committee (NABCI-US). 2009. The state of the birds, United States of America, 2009. US Department of Interior. Washington, DC. 36 p.

Palmer, W.C. 1965. Meteorological drought. Weather Bureau Resources Paper No. 45. U.S. Department of Commerce. Washington, DC. 58 p.

Pan-European Common Bird Monitoring Scheme. 2007. State of Europe's common birds, 2007. Czech Society for Ornithology, Royal Society for Protection of Birds. Prague, Czech Republic.

Partners in Flight British Columbia and Yukon. 2003. Canada's Great Basin Landbird Conservation Plan. Version 1.0. Partners in Flight British Columbia and Yukon. Delta, BC. 100 p.

Peltzer, D.A. and Wilson, S.D. 2006. Hailstorm damage promotes aspen invasion into grassland. Canadian Journal of Botany 84:1142-1147.

Perlut, N.G., Strong, A.M., Donovan, T.M. and Buckley, N.J. 2006. Grassland songbirds in a dynamic management landscape: behavioral responses and management strategies. Ecological Applications 16:2235-2247.

Peterjohn, B.G. and Sauer, J.R. 1993. North American Breeding Bird Survey annual summary, 1990-1991. Bird Populations 1:52-67.

Poole, A.F., Bierregaard, R.O. and Martell, M.S. 2002. Osprey (*Pandion haliaetus*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/683.

Rich, T.D., Beardmore, C.J., Berlanga, H., Blancher, P.J., Bradstreet, M.S.W., Butcher, G.S., Demarest, D.W., Dunn, E.H., Hunter, W.C., Iñigo-Elias, E.E., Kennedy, J.A., Martell, A.M., Panjabe, A.O., Pashley, D.N., Rosenberg, K.V., Rustay, C.M., Wendt, J.S. and Will, T.C. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology. Ithaca, NY. 84 p.

Rimmer, C.C. and McFarland, K.P. 1998. Tennessee warbler (*Vermivora peregrina*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/350.

Rimmer, C.C., McFarland, K.P., Ellison, W.G. and Goetz, J.E. 2001. Bicknell's thrush (*Catharus bicknelli*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/592.

Ritter, S. 2000. Idaho Bird Conservation Plan. Version 1.0. Idaho Partners in Flight. Hamilton, MT. 167 p.

Rivard, A., Shaffer, F. and Falardeau, G. 2006. Le bruant de Nelson (*Ammodramus nelsoni*) : état des populations au Québec. Technical Report Series No. 444. Environment Canada, Canadian Wildlife Service, Quebec Region. Sainte-Foy, QC. 71 p.

Robbins, C.S., Droege, S. and Sauer, J.R. 1989. Monitoring bird populations with Breeding Bird Survey and atlas data. Annales Zoologici Fennici 26:297-304.

Rosenberg, K.V. and Hodgman, T.P. 2000. Partners in Flight Landbird Conservation Plan: physiographic area 28: eastern spruce-hardwood forest. Cornell University. Ithaca, NY.

Sauer, J.R., Hines, J.E. and Fallon, J. 2008. The North American breeding bird survey, results and analysis 1966-2007 [online]. U.S. Geological Survey Patuxent Wildlife Research Center. http://www.mbr-pwrc.usgs.gov/bbs/ (accessed 20 October, 2009).

Sauer, J.R., Hines, J.E., Thomas, I., Fallon, J. and Gough, G. 2000. The North American Breeding Bird Survey, results and analysis 1966-1999. Version 98.1. US Geological Survey Patuxent Wildlife Research Center. Laurel, MD.

Sleep, D.J.H., Drever, M.C. and Szuba, K.J. 2009. Potential role of spruce budworm in range-wide decline of Canada warbler. Journal of Wildlife Management 73:546-555.

Statistics Canada. 1993. 1991 census of agriculture. Government of Canada. Ottawa, ON.

Sutter, G.C. and Brigham, R.M. 1998. Avifaunal and habitat changes resulting from conversion of native prairie to crested wheat grass: patterns at songbird community and species levels. Canadian Journal of Zoology 76:869-875.

Sutter, G.C., Davis, S.K. and Duncan, D.C. 2000. Grassland songbird abundance along roads and trails in southern Saskatchewan. Journal of Field Ornithology 71:110-116.

Terborgh, J. 1989. Where have all the birds gone? Essay on the biology and conservation of birds that migrate to the American tropics. Princeton University Press. Princeton, NJ. 224 p.

U.S. Geological Survey, Patuxent Wildlife Research Centre. 2010. The North American Breeding Bird Survey [online]. U.S. Department of the Interior. http://www.pwrc.usgs.gov/BBS/

Vallender, R. 2007. Golden-winged warbler. *In* Atlas of the breeding birds of Ontario, 2001-2005. Edited by Cadman, M.D., Sutherland, D.A., Beck, G.G., Lepage, D. and Couturier, A.R. Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, Ontario Ministry of Natural Resources, and Ontario Nature. Toronto, ON. pp. 462-463.

Waite, T.A. and Strickland, D. 2006. Climate change and the demographic demise of a hoarding bird living on the edge. Proceedings of the Royal Society B-Biological Sciences 273:2809-2813.

Warkentin, I.G., Sodhi, N.S., Espie, R.H.M., Poole, A.F., Oliphant, L.W. and James, P.C. 2005. Merlin (*Falco columbarius*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/044.

Watmough, M.D. and Schmoll, M.J. 2007. Environment Canada's Prairie & Northern Region Habitat Monitoring Program phase II: recent habitat trends in the Prairie Habitat Joint Venture. Technical Report Series No. 493. Environment Canada, Canadian Wildlife Service. Edmonton, AB. 135 p.

Williams, J.M. 1996. Bay-breasted warbler (*Dendroica castanea*). *In* The birds of North America online. Edited by Poole, A. Cornell Lab of Ornithology. Ithaca, NY. http://bna.birds.cornell.edu/bna/species/350.

# Appendix 1. Assemblage designations for species

Species included in BBS analyses, showing their assignments to assemblages for habitat, migration strategy, feeding type, and feeding substrate.

| | | | Assemblage Assignments | | | |
|---|---|---|---|---|---|---|
| **English Name** | **French Name** | **Latin Name** | **Habitat** | **Migration** | **Feeding** | **Substrate** |
| Chukar (I) | *Perdrix choukar* | *Alectoris chukar* | Other Open | Resident | Herbivore | Ground |
| Gray Partridge (I) | *Perdrix grise* | *Perdix perdix* | Other Open | Resident | Omnivore | Ground |
| Ring-necked Pheasant (I) | *Faisan de Colchide* | *Phasianus colchicus* | Grassland | Resident | Omnivore | Ground |
| Ruffed Grouse | *Gélinotte huppée* | *Bonasa umbellus* | Forest | Resident | Omnivore | Ground |
| Greater Sage-grouse | *Tétras des armoises* | *Centrocercus urophasianus* | Shrub/Successional | Resident | Herbivore | Ground |
| Spruce Grouse | *Tétras du Canada* | *Falcipennis canadensis* | Forest | Resident | Omnivore | Ground |
| Willow Ptarmigan | *Lagopède des saules* | *Lagopus lagopus* | | Resident | Herbivore | Ground |
| Rock Ptarmigan | *Lagopède alpin* | *Lagopus muta* | | Resident | Herbivore | Ground |
| Blue Grouse | *Tétras sombre* | *Dendragapus obscurus* | Forest | Resident | Omnivore | Ground |
| Sharp-tailed Grouse | *Tétras à queue fine* | *Tympanuchus phasianellus* | Grassland | Resident | Omnivore | Ground |
| Wild Turkey | *Dindon sauvage* | *Meleagris gallopavo* | Forest | Resident | Omnivore | Ground |
| California Quail (I) | *Colin de Californie* | *Callipepla californica* | Shrub/Successional | Resident | Herbivore | Ground |
| Northern Bobwhite | *Colin de Virginie* | *Colinus virginianus* | Shrub/Successional | Resident | Omnivore | Ground |
| Turkey Vulture | *Urubu à tête rouge* | *Cathartes aura* | | Short-distance | Carnivore | Ground |
| Osprey | *Balbuzard pêcheur* | *Pandion haliaetus* | Wetland | Short-distance | Carnivore | Water |
| Bald Eagle | *Pygargue à tête blanche* | *Haliaeetus leucocephalus* | Wetland | Short-distance | Carnivore | Water |
| Northern Harrier | *Busard Saint-Martin* | *Circus cyaneus* | Grassland | Short-distance | Carnivore | Ground |
| Sharp-shinned Hawk | *Épervier brun* | *Accipiter striatus* | Forest | Short-distance | Carnivore | Air |
| Cooper's Hawk | *Épervier de Cooper* | *Accipiter cooperii* | Forest | Short-distance | Carnivore | Air |
| Northern Goshawk | *Autour des palombes* | *Accipiter gentilis* | Forest | Resident | Carnivore | Air |

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|---|---|---|---|---|---|---|
| Red-shouldered Hawk | *Buse à épaulettes* | *Buteo lineatus* | Forest | Short-distance | Carnivore | Ground |
| Broad-winged Hawk | *Petite Buse* | *Buteo platypterus* | Forest | Neotropical | Carnivore | Ground |
| Swainson's Hawk | *Buse de Swainson* | *Buteo swainsoni* | Other Open | Neotropical | Carnivore | Ground |
| Red-tailed Hawk | *Buse à queue rousse* | *Buteo jamaicensis* | Other Open | Short-distance | Carnivore | Ground |
| Ferruginous Hawk | *Buse rouilleuse* | *Buteo regalis* | Grassland | Short-distance | Carnivore | Ground |
| Rough-legged Hawk | *Buse pattue* | *Buteo lagopus* | | Short-distance | Carnivore | Ground |
| Golden Eagle | *Aigle royal* | *Aquila chrysaetos* | | Short-distance | Carnivore | Ground |
| American Kestrel | *Crécerelle d'Amérique* | *Falco sparverius* | Other Open | Short-distance | Insectivore | Air |
| Merlin | *Faucon émerillon* | *Falco columbarius* | Forest | Neotropical | Carnivore | Air |
| Gyrfalcon | *Faucon gerfaut* | *Falco rusticolus* | | Resident | Carnivore | Air |
| Peregrine Falcon | *Faucon pèlerin* | *Falco peregrinus* | | Neotropical | Carnivore | Air |
| Prairie Falcon | *Faucon des prairies* | *Falco mexicanus* | Other Open | Short-distance | Carnivore | Air |
| Rock Pigeon (I) | *Pigeon biset* | *Columba livia* | Urban/Suburban | Resident | Omnivore | Ground |
| Band-tailed Pigeon | *Pigeon à queue barrée* | *Patagioenas fasciata* | Forest | Neotropical | Herbivore | Vegetation |
| Mourning Dove | *Tourterelle triste* | *Zenaida macroura* | Urban/Suburban | Short-distance | Herbivore | Ground |
| Yellow-billed Cuckoo | *Coulicou à bec jaune* | *Coccyzus americanus* | Forest | Neotropical | Insectivore | Vegetation |
| Black-billed Cuckoo | *Coulicou à bec noir* | *Coccyzus erythropthalmus* | Forest | Neotropical | Insectivore | Vegetation |
| Barn Owl | *Effraie des clochers* | *Tyto alba* | Grassland | Short-distance | Carnivore | Ground |
| Western Screech-owl | *Petit-duc des montagnes* | *Megascops kennicottii* | Forest | Resident | Insectivore | Ground |
| Eastern Screech-owl | *Petit-duc maculé* | *Megascops asio* | Forest | Resident | Insectivore | Ground |
| Great Horned Owl | *Grand-duc d'Amérique* | *Bubo virginianus* | | Resident | Carnivore | Ground |
| Northern Hawk Owl | *Chouette épervière* | *Surnia ulula* | Forest | Resident | Carnivore | Ground |
| Northern Pygmy-owl | *Chevêchette naine* | *Glaucidium gnoma* | Forest | Resident | Insectivore | Ground |
| Burrowing Owl | *Chevêche des terriers* | *Athene cunicularia* | Grassland | Neotropical | Carnivore | Ground |
| Barred Owl | *Chouette rayée* | *Strix varia* | Forest | Resident | Carnivore | Ground |
| Great Gray Owl | *Chouette lapone* | *Strix nebulosa* | | Resident | Carnivore | Ground |
| Long-eared Owl | *Hibou moyen-duc* | *Asio otus* | Forest | Short-distance | Carnivore | Ground |
| Short-eared Owl | *Hibou des marais* | *Asio flammeus* | Grassland | Short-distance | Carnivore | Ground |
| Boreal Owl | *Nyctale de Tengmalm* | *Aegolius funereus* | Forest | Resident | Carnivore | Ground |
| Northern Saw-whet Owl | *Petite Nyctale* | *Aegolius acadicus* | Forest | Short-distance | Carnivore | Ground |

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|---|---|---|---|---|---|---|
| Common Nighthawk | *Engoulevent d'Amérique* | *Chordeiles minor* | Other Open | Neotropical | Insectivore | Air |
| Common Poorwill | *Engoulevent de Nuttall* | *Phalaenoptilus nuttallii* | Shrub/Successional | Short-distance | Insectivore | Air |
| Whip-poor-will | *Engoulevent bois-pourri* | *Caprimulgus vociferus* | Forest | Neotropical | Insectivore | Air |
| Black Swift | *Martinet sombre* | *Cypseloides niger* | | Neotropical | Insectivore | Air |
| Chimney Swift | *Martinet ramoneur* | *Chaetura pelagica* | Urban/Suburban | Neotropical | Insectivore | Air |
| Vaux's Swift | *Martinet de Vaux* | *Chaetura vauxi* | Forest | Neotropical | Insectivore | Air |
| White-throated Swift | *Martinet à gorge blanche* | *Aeronautes saxatalis* | | Neotropical | Insectivore | Air |
| Ruby-throated Hummingbird | *Colibri à gorge rubis* | *Archilochus colubris* | Forest | Neotropical | Omnivore | Vegetation |
| Black-chinned Hummingbird | *Colibri à gorge noire* | *Archilochus alexandri* | Forest | Neotropical | Omnivore | Vegetation |
| Anna's Hummingbird | *Colibri d'Anna* | *Calypte anna* | | Resident | Omnivore | Vegetation |
| Calliope Hummingbird | *Colibri calliope* | *Stellula calliope* | Forest | Neotropical | Omnivore | Vegetation |
| Rufous Hummingbird | *Colibri roux* | *Selasphorus rufus* | Forest | Neotropical | Omnivore | Vegetation |
| Belted Kingfisher | *Martin-pêcheur d'Amérique* | *Megaceryle alcyon* | Wetland | Short-distance | Carnivore | Water |
| Lewis's Woodpecker | *Pic de Lewis* | *Melanerpes lewis* | | Short-distance | Insectivore | Air |
| Red-headed Woodpecker | *Pic à tête rouge* | *Melanerpes erythrocephalus* | | Short-distance | Insectivore | Air |
| Red-bellied Woodpecker | *Pic à ventre roux* | *Melanerpes carolinus* | Forest | Resident | Insectivore | Bark |
| Williamson's Sapsucker | *Pic de Williamson* | *Sphyrapicus thyroideus* | Forest | Short-distance | Omnivore | Bark |
| Yellow-bellied Sapsucker | *Pic maculé* | *Sphyrapicus varius* | Forest | Short-distance | Omnivore | Bark |
| Red-naped Sapsucker | *Pic à nuque rouge* | *Sphyrapicus nuchalis* | Forest | Short-distance | Omnivore | Bark |
| Red-breasted Sapsucker | *Pic à poitrine rouge* | *Sphyrapicus ruber* | Forest | Short-distance | Omnivore | Bark |
| Downy Woodpecker | *Pic mineur* | *Picoides pubescens* | Forest | Resident | Insectivore | Bark |
| Hairy Woodpecker | *Pic chevelu* | *Picoides villosus* | Forest | Resident | Insectivore | Bark |
| American Three-toed Woodpecker | *Pic à dos rayé* | *Picoides dorsalis* | Forest | Resident | Insectivore | Bark |
| Black-backed Woodpecker | *Pic à dos noir* | *Picoides arcticus* | Forest | Resident | Insectivore | Bark |
| Northern Flicker | *Pic flamboyant* | *Colaptes auratus* | | Short-distance | Insectivore | Ground |
| Pileated Woodpecker | *Grand Pic* | *Dryocopus pileatus* | Forest | Resident | Insectivore | Bark |
| Olive-sided Flycatcher | *Moucherolle à côtés olive* | *Contopus cooperi* | Forest | Neotropical | Insectivore | Air |

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|---|---|---|---|---|---|---|
| Western Wood-pewee | *Pioui de l'Ouest* | *Contopus sordidulus* | Forest | Neotropical | Insectivore | Air |
| Eastern Wood-pewee | *Pioui de l'Est* | *Contopus virens* | Forest | Neotropical | Insectivore | Air |
| Yellow-bellied Flycatcher | *Moucherolle à ventre jaune* | *Empidonax flaviventris* | Forest | Neotropical | Insectivore | Air |
| Acadian Flycatcher | *Moucherolle vert* | *Empidonax virescens* | Forest | Neotropical | Insectivore | Air |
| Alder Flycatcher | *Moucherolle des aulnes* | *Empidonax alnorum* | Shrub/Successional | Neotropical | Insectivore | Air |
| Willow Flycatcher | *Moucherolle des saules* | *Empidonax traillii* | Shrub/Successional | Neotropical | Insectivore | Air |
| Least Flycatcher | *Moucherolle tchébec* | *Empidonax minimus* | Forest | Neotropical | Insectivore | Air |
| Hammond's Flycatcher | *Moucherolle de Hammond* | *Empidonax hammondii* | Forest | Neotropical | Insectivore | Air |
| Gray Flycatcher | *Moucherolle gris* | *Empidonax wrightii* | Shrub/Successional | Neotropical | Insectivore | Air |
| Dusky Flycatcher | *Moucherolle sombre* | *Empidonax oberholseri* | Forest | Neotropical | Insectivore | Air |
| Pacific-slope Flycatcher | *Moucherolle côtier* | *Empidonax difficilis* | Forest | Neotropical | Insectivore | Air |
| Cordilleran Flycatcher < | *Moucherolle des ravins* | *Empidonax occidentalis* | Forest | Neotropical | Insectivore | Air |
| Eastern Phoebe | *Moucherolle phébi* | *Sayornis phoebe* | | Short-distance | Insectivore | Air |
| Say's Phoebe | *Moucherolle à ventre roux* | *Sayornis saya* | Other Open | Short-distance | Insectivore | Air |
| Great Crested Flycatcher | *Tyran huppé* | *Myiarchus crinitus* | Forest | Neotropical | Insectivore | Air |
| Western Kingbird | *Tyran de l'Ouest* | *Tyrannus verticalis* | Other Open | Neotropical | Insectivore | Air |
| Eastern Kingbird | *Tyran tritri* | *Tyrannus tyrannus* | Other Open | Neotropical | Insectivore | Air |
| Loggerhead Shrike | *Pie-grièche migratrice* | *Lanius ludovicianus* | Other Open | Short-distance | Carnivore | Ground |
| Northern Shrike < | *Pie-grièche grise* | *Lanius excubitor* | | Resident | Carnivore | Ground |
| White-eyed Vireo < | *Viréo aux yeux blancs* | *Vireo griseus* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Yellow-throated Vireo | *Viréo à gorge jaune* | *Vireo flavifrons* | Forest | Neotropical | Insectivore | Vegetation |
| Cassin's Vireo | *Viréo de Cassin* | *Vireo cassinii* | Forest | Neotropical | Insectivore | Vegetation |
| Blue-headed Vireo | *Viréo à tête bleue* | *Vireo solitarius* | Forest | Neotropical | Insectivore | Vegetation |
| Hutton's Vireo | *Viréo de Hutton* | *Vireo huttoni* | Forest | Resident | Insectivore | Vegetation |
| Warbling Vireo | *Viréo mélodieux* | *Vireo gilvus* | Forest | Neotropical | Insectivore | Vegetation |
| Philadelphia Vireo | *Viréo de Philadelphie* | *Vireo philadelphicus* | Forest | Neotropical | Insectivore | Vegetation |
| Red-eyed Vireo | *Viréo aux yeux rouges* | *Vireo olivaceus* | Forest | Neotropical | Insectivore | Vegetation |
| Gray Jay | *Mésangeai du Canada* | *Perisoreus canadensis* | Forest | Resident | Omnivore | Vegetation |

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|---|---|---|---|---|---|---|
| Steller's Jay | *Geai de Steller* | *Cyanocitta stelleri* | Forest | Resident | Omnivore | Ground |
| Blue Jay | *Geai bleu* | *Cyanocitta cristata* | Urban/Suburban | Short-distance | Omnivore | Ground |
| Clark's Nutcracker | *Cassenoix d'Amérique* | *Nucifraga columbiana* | Forest | Resident | Omnivore | Vegetation |
| Black-billed Magpie | *Pie d'Amérique* | *Pica hudsonia* | | Resident | Insectivore | Ground |
| American Crow | *Corneille d'Amérique* | *Corvus brachyrhynchos* | | Short-distance | Omnivore | Ground |
| Northwestern Crow | *Corneille d'Alaska* | *Corvus caurinus* | | Resident | Omnivore | Ground |
| Common Raven | *Grand Corbeau* | *Corvus corax* | | Resident | Omnivore | Ground |
| Sky Lark (I) < | *Alouette des champs* | *Alauda arvensis* | Other Open | Resident | Omnivore | Ground |
| Horned Lark | *Alouette hausse-col* | *Eremophila alpestris* | Grassland | Short-distance | Omnivore | Ground |
| Purple Martin | *Hirondelle noire* | *Progne subis* | Urban/Suburban | Neotropical | Insectivore | Air |
| Tree Swallow | *Hirondelle bicolore* | *Tachycineta bicolor* | Other Open | Short-distance | Insectivore | Air |
| Violet-green Swallow | *Hirondelle à face blanche* | *Tachycineta thalassina* | Other Open | Neotropical | Insectivore | Air |
| Northern Rough-winged Swallow | *Hirondelle à ailes hérissées* | *Stelgidopteryx serripennis* | Other Open | Neotropical | Insectivore | Air |
| Bank Swallow | *Hirondelle de rivage* | *Riparia riparia* | Other Open | Neotropical | Insectivore | Air |
| Cliff Swallow | *Hirondelle à front blanc* | *Petrochelidon pyrrhonota* | Other Open | Neotropical | Insectivore | Air |
| Barn Swallow | *Hirondelle rustique* | *Hirundo rustica* | Other Open | Neotropical | Insectivore | Air |
| Black-capped Chickadee | *Mésange à tête noire* | *Poecile atricapillus* | Forest | Resident | Insectivore | Vegetation |
| Mountain Chickadee | *Mésange de Gambel* | *Poecile gambeli* | Forest | Resident | Insectivore | Vegetation |
| Chestnut-backed Chickadee | *Mésange à dos marron* | *Poecile rufescens* | Forest | Resident | Insectivore | Vegetation |
| Boreal Chickadee | *Mésange à tête brune* | *Poecile hudsonica* | Forest | Resident | Insectivore | Vegetation |
| Tufted Titmouse < | *Mésange bicolore* | *Baeolophus bicolor* | Forest | Resident | Insectivore | Vegetation |
| Bushtit | *Mésange buissonnière* | *Psaltriparus minimus* | Shrub/Successional | Resident | Insectivore | Vegetation |
| Red-breasted Nuthatch | *Sittelle à poitrine rousse* | *Sitta canadensis* | Forest | Short-distance | Insectivore | Bark |
| White-breasted Nuthatch | *Sittelle à poitrine blanche* | *Sitta carolinensis* | Forest | Resident | Insectivore | Bark |
| Pygmy Nuthatch | *Sittelle pygmée* | *Sitta pygmaea* | Forest | Resident | Insectivore | Bark |
| Brown Creeper | *Grimpereau brun* | *Certhia americana* | Forest | Short-distance | Insectivore | Bark |
| Rock Wren | *Troglodyte des rochers* | *Salpinctes obsoletus* | | Short-distance | Insectivore | Ground |
| Canyon Wren < | *Troglodyte des canyons* | *Catherpes mexicanus* | | Resident | Insectivore | Ground |
| Carolina Wren < | *Troglodyte de Caroline* | *Thryothorus* | Shrub/Successional | Resident | Insectivore | Vegetation |

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|---|---|---|---|---|---|---|
| | | *ludovicianus* | | | | |
| Bewick's Wren | *Troglodyte de Bewick* | *Thryomanes bewickii* | Shrub/Successional | Short-distance | Insectivore | Ground |
| House Wren | *Troglodyte familier* | *Troglodytes aedon* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Winter Wren | *Troglodyte mignon* | *Troglodytes troglodytes* | Forest | Short-distance | Insectivore | Ground |
| Sedge Wren | *Troglodyte à bec court* | *Cistothorus platensis* | Grassland | Short-distance | Insectivore | Ground |
| Marsh Wren | *Troglodyte des marais* | *Cistothorus palustris* | Wetland | Short-distance | Insectivore | Vegetation |
| American Dipper | *Cincle d'Amérique* | *Cinclus mexicanus* | Wetland | Resident | Insectivore | Water |
| Golden-crowned Kinglet | *Roitelet à couronne dorée* | *Regulus satrapa* | Forest | Short-distance | Insectivore | Vegetation |
| Ruby-crowned Kinglet | *Roitelet à couronne rubis* | *Regulus calendula* | Forest | Short-distance | Insectivore | Vegetation |
| Blue-gray Gnatcatcher | *Gobemoucheron gris-bleu* | *Polioptila caerulea* | Forest | Neotropical | Insectivore | Vegetation |
| Eastern Bluebird | *Merlebleu de l'Est* | *Sialia sialis* | Other Open | Short-distance | Insectivore | Ground |
| Western Bluebird < | *Merlebleu de l'Ouest* | *Sialia mexicana* | Forest | Short-distance | Insectivore | Ground |
| Mountain Bluebird | *Merlebleu azuré* | *Sialia currucoides* | Other Open | Short-distance | Insectivore | Ground |
| Townsend's Solitaire | *Solitaire de Townsend* | *Myadestes townsendi* | Forest | Short-distance | Insectivore | Air |
| Veery | *Grive fauve* | *Catharus fuscescens* | Forest | Neotropical | Omnivore | Ground |
| Gray-cheeked Thrush | *Grive à joues grises* | *Catharus minimus* | Forest | Neotropical | Omnivore | Ground |
| Bicknell's Thrush | *Grive de Bicknell* | *Catharus bicknelli* | Forest | Neotropical | Omnivore | Ground |
| Swainson's Thrush | *Grive à dos olive* | *Catharus ustulatus* | Forest | Neotropical | Omnivore | Ground |
| Hermit Thrush | *Grive solitaire* | *Catharus guttatus* | Forest | Short-distance | Insectivore | Ground |
| Wood Thrush | *Grive des bois* | *Hylocichla mustelina* | Forest | Neotropical | Omnivore | Ground |
| American Robin | *Merle d'Amérique* | *Turdus migratorius* | Urban/Suburban | Short-distance | Omnivore | Vegetation |
| Varied Thrush | *Grive à collier* | *Ixoreus naevius* | Forest | Short-distance | Insectivore | Ground |
| Gray Catbird | *Moqueur chat* | *Dumetella carolinensis* | Shrub/Successional | Neotropical | Omnivore | Ground |
| Northern Mockingbird | *Moqueur polyglotte* | *Mimus polyglottos* | Urban/Suburban | Resident | Omnivore | Ground |
| Sage Thrasher < | *Moqueur des armoises* | *Oreoscoptes montanus* | Shrub/Successional | Short-distance | Insectivore | Ground |
| Brown Thrasher | *Moqueur roux* | *Toxostoma rufum* | Shrub/Successional | Short-distance | Omnivore | Ground |
| European Starling (I) | *Étourneau sansonnet* | *Sturnus vulgaris* | Urban/Suburban | Short-distance | Omnivore | Ground |
| American Pipit < | *Pipit d'Amérique* | *Anthus rubescens* | | Short-distance | Insectivore | Ground |
| Sprague's Pipit | *Pipit de Sprague* | *Anthus spragueii* | Grassland | Short-distance | Insectivore | Ground |
| Bohemian Waxwing | *Jaseur boréal* | *Bombycilla garrulus* | Forest | Short-distance | Herbivore | Vegetation |

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|---|---|---|---|---|---|---|
| Cedar Waxwing | *Jaseur d'Amérique* | *Bombycilla cedrorum* | | Short-distance | Insectivore | Air |
| Blue-winged Warbler | *Paruline à ailes bleues* | *Vermivora pinus* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Golden-winged Warbler | *Paruline à ailes dorées* | *Vermivora chrysoptera* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Tennessee Warbler | *Paruline obscure* | *Vermivora peregrina* | Forest | Neotropical | Insectivore | Vegetation |
| Orange-crowned Warbler | *Paruline verdâtre* | *Vermivora celata* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Nashville Warbler | *Paruline à joues grises* | *Vermivora ruficapilla* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Northern Parula | *Paruline à collier* | *Parula americana* | Forest | Neotropical | Insectivore | Vegetation |
| Yellow Warbler | *Paruline jaune* | *Dendroica petechia* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Chestnut-sided Warbler | *Paruline à flancs marron* | *Dendroica pensylvanica* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Magnolia Warbler | *Paruline à tête cendrée* | *Dendroica magnolia* | Forest | Neotropical | Insectivore | Vegetation |
| Cape May Warbler | *Paruline tigrée* | *Dendroica tigrina* | Forest | Neotropical | Insectivore | Vegetation |
| Black-throated Blue Warbler | *Paruline bleue* | *Dendroica caerulescens* | Forest | Neotropical | Insectivore | Vegetation |
| Yellow-rumped Warbler | *Paruline à croupion jaune* | *Dendroica coronata* | Forest | Short-distance | Insectivore | Vegetation |
| Black-throated Gray Warbler | *Paruline grise* | *Dendroica nigrescens* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Black-throated Green Warbler | *Paruline à gorge noire* | *Dendroica virens* | Forest | Neotropical | Insectivore | Vegetation |
| Townsend's Warbler | *Paruline de Townsend* | *Dendroica townsendi* | Forest | Neotropical | Insectivore | Vegetation |
| Blackburnian Warbler | *Paruline à gorge orangée* | *Dendroica fusca* | Forest | Neotropical | Insectivore | Vegetation |
| Pine Warbler | *Paruline des pins* | *Dendroica pinus* | Forest | Short-distance | Insectivore | Bark |
| Prairie Warbler < | *Paruline des prés* | *Dendroica discolor* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Palm Warbler | *Paruline à couronne rousse* | *Dendroica palmarum* | Shrub/Successional | Neotropical | Insectivore | Ground |
| Bay-breasted Warbler | *Paruline à poitrine baie* | *Dendroica castanea* | Forest | Neotropical | Insectivore | Vegetation |
| Blackpoll Warbler | *Paruline rayée* | *Dendroica striata* | Forest | Neotropical | Insectivore | Vegetation |
| Cerulean Warbler < | *Paruline azurée* | *Dendroica cerulea* | Forest | Neotropical | Insectivore | Vegetation |
| Black-and-white Warbler | *Paruline noir et blanc* | *Mniotilta varia* | Forest | Neotropical | Insectivore | Bark |
| American Redstart | *Paruline flamboyante* | *Setophaga ruticilla* | Forest | Neotropical | Insectivore | Vegetation |
| Ovenbird | *Paruline couronnée* | *Seiurus aurocapilla* | Forest | Neotropical | Insectivore | Ground |
| Northern Waterthrush | *Paruline des ruisseaux* | *Seiurus noveboracensis* | Forest | Neotropical | Insectivore | Water |
| Louisiana Waterthrush < | *Paruline hochequeue* | *Seiurus motacilla* | Forest | Neotropical | Insectivore | Water |

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|---|---|---|---|---|---|---|
| Kentucky Warbler < | *Paruline du Kentucky* | *Oporornis formosus* | Forest | Neotropical | Insectivore | Ground |
| Connecticut Warbler | *Paruline à gorge grise* | *Oporornis agilis* | Shrub/Successional | Neotropical | Insectivore | Ground |
| Mourning Warbler | *Paruline triste* | *Oporornis philadelphia* | Shrub/Successional | Neotropical | Insectivore | Ground |
| MacGillivray's Warbler | *Paruline des buissons* | *Oporornis tolmiei* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Common Yellowthroat | *Paruline masquée* | *Geothlypis trichas* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Hooded Warbler < | *Paruline à capuchon* | *Wilsonia citrina* | Forest | Neotropical | Insectivore | Vegetation |
| Wilson's Warbler | *Paruline à calotte noire* | *Wilsonia pusilla* | Shrub/Successional | Neotropical | Insectivore | Vegetation |
| Canada Warbler | *Paruline du Canada* | *Wilsonia canadensis* | Forest | Neotropical | Insectivore | Vegetation |
| Yellow-breasted Chat | *Paruline polyglotte* | *Icteria virens* | Shrub/Successional | Neotropical | Omnivore | Vegetation |
| Scarlet Tanager | *Tangara écarlate* | *Piranga olivacea* | Forest | Neotropical | Insectivore | Vegetation |
| Western Tanager | *Tangara à tête rouge* | *Piranga ludoviciana* | Forest | Neotropical | Omnivore | Vegetation |
| Spotted Towhee | *Tohi tacheté* | *Pipilo maculatus* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Eastern Towhee | *Tohi à flancs roux* | *Pipilo erythrophthalmus* | Shrub/Successional | Short-distance | Omnivore | Ground |
| American Tree Sparrow | *Bruant hudsonien* | *Spizella arborea* | | Short-distance | Omnivore | Ground |
| Chipping Sparrow | *Bruant familier* | *Spizella passerina* | Urban/Suburban | Neotropical | Omnivore | Ground |
| Clay-colored Sparrow | *Bruant des plaines* | *Spizella pallida* | Shrub/Successional | Neotropical | Omnivore | Ground |
| Brewer's Sparrow | *Bruant de Brewer* | *Spizella breweri* | Shrub/Successional | Neotropical | Insectivore | Ground |
| Field Sparrow | *Bruant des champs* | *Spizella pusilla* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Vesper Sparrow | *Bruant vespéral* | *Pooecetes gramineus* | Grassland | Short-distance | Omnivore | Ground |
| Lark Sparrow | *Bruant à joues marron* | *Chondestes grammacus* | Shrub/Successional | Neotropical | Omnivore | Ground |
| Lark Bunting | *Bruant noir et blanc* | *Calamospiza melanocorys* | Grassland | Neotropical | Omnivore | Ground |
| Savannah Sparrow | *Bruant des prés* | *Passerculus sandwichensis* | Grassland | Short-distance | Omnivore | Ground |
| Grasshopper Sparrow | *Bruant sauterelle* | *Ammodramus savannarum* | Grassland | Neotropical | Omnivore | Ground |
| Baird's Sparrow | *Bruant de Baird* | *Ammodramus bairdii* | Grassland | Neotropical | Insectivore | Ground |
| Henslow's Sparrow < | *Bruant de Henslow* | *Ammodramus henslowii* | Grassland | Short-distance | Omnivore | Ground |
| Le Conte's Sparrow | *Bruant de Le Conte* | *Ammodramus leconteii* | Grassland | Short-distance | Omnivore | Ground |

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| Nelson's Sparrow | *Bruant de Nelson* | *Ammodramus nelsoni* | Wetland | Short-distance | Omnivore | Ground |
| Fox Sparrow | *Bruant fauve* | *Passerella iliaca* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Song Sparrow | *Bruant chanteur* | *Melospiza melodia* | Shrub/Successional | Short-distance | Omnivore | Vegetation |
| Lincoln's Sparrow | *Bruant de Lincoln* | *Melospiza lincolnii* | Shrub/Successional | Neotropical | Omnivore | Ground |
| Swamp Sparrow | *Bruant des marais* | *Melospiza georgiana* | Wetland | Short-distance | Omnivore | Ground |
| White-throated Sparrow | *Bruant à gorge blanche* | *Zonotrichia albicollis* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Harris's Sparrow < | *Bruant à face noire* | *Zonotrichia querula* | | Short-distance | Omnivore | Ground |
| White-crowned Sparrow | *Bruant à couronne blanche* | *Zonotrichia leucophrys* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Golden-crowned Sparrow | *Bruant à couronne dorée* | *Zonotrichia atricapilla* | Shrub/Successional | Short-distance | Omnivore | Ground |
| Dark-eyed Junco | *Junco ardoisé* | *Junco hyemalis* | Forest | Short-distance | Omnivore | Ground |
| McCown's Longspur | *Bruant de McCown* | *Calcarius mccownii* | Grassland | Short-distance | Omnivore | Ground |
| Lapland Longspur < | *Bruant lapon* | *Calcarius lapponicus* | | Short-distance | Omnivore | Ground |
| Smith's Longspur < | *Bruant de Smith* | *Calcarius pictus* | | Short-distance | Omnivore | Ground |
| Chestnut-collared Longspur | *Bruant à ventre noir* | *Calcarius ornatus* | Grassland | Short-distance | Omnivore | Ground |
| Snow Bunting < | *Bruant des neiges* | *Plectrophenax nivalis* | | Short-distance | Omnivore | Ground |
| Northern Cardinal | *Cardinal rouge* | *Cardinalis cardinalis* | Shrub/Successional | Resident | Omnivore | Ground |
| Rose-breasted Grosbeak | *Cardinal à poitrine rose* | *Pheucticus ludovicianus* | Forest | Neotropical | Omnivore | Vegetation |
| Black-headed Grosbeak | *Cardinal à tête noire* | *Pheucticus melanocephalus* | Forest | Neotropical | Omnivore | Vegetation |
| Lazuli Bunting | *Passerin azuré* | *Passerina amoena* | Shrub/Successional | Neotropical | Omnivore | Vegetation |
| Indigo Bunting | *Passerin indigo* | *Passerina cyanea* | Shrub/Successional | Neotropical | Omnivore | Ground |
| Dickcissel < | *Dickcissel d'Amérique* | *Spiza americana* | Grassland | Neotropical | Omnivore | Ground |
| Bobolink | *Goglu des prés* | *Dolichonyx oryzivorus* | Grassland | Neotropical | Omnivore | Ground |
| Red-winged Blackbird | *Carouge à épaulettes* | *Agelaius phoeniceus* | Wetland | Short-distance | Omnivore | Ground |
| Eastern Meadowlark | *Sturnelle des prés* | *Sturnella magna* | Grassland | Short-distance | Insectivore | Ground |
| Western Meadowlark | *Sturnelle de l'Ouest* | *Sturnella neglecta* | Grassland | Short-distance | Insectivore | Ground |
| Yellow-headed Blackbird | *Carouge à tête jaune* | *Xanthocephalus xanthocephalus* | Wetland | Neotropical | Omnivore | Ground |
| Rusty Blackbird | *Quiscale rouilleux* | *Euphagus carolinus* | Wetland | Short-distance | Insectivore | Ground |
| Brewer's Blackbird | *Quiscale de Brewer* | *Euphagus cyanocephalus* | Other Open | Short-distance | Omnivore | Ground |

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|---|---|---|---|---|---|---|
| Common Grackle | *Quiscale bronzé* | *Quiscalus quiscula* | Urban/Suburban | Short-distance | Omnivore | Ground |
| Brown-headed Cowbird | *Vacher à tête brune* | *Molothrus ater* | Other Open | Short-distance | Omnivore | Ground |
| Orchard Oriole | *Oriole des vergers* | *Icterus spurius* | Other Open | Neotropical | Insectivore | Vegetation |
| Bullock's Oriole | *Oriole de Bullock* | *Icterus bullockii* | Other Open | Neotropical | Omnivore | Vegetation |
| Baltimore Oriole | *Oriole de Baltimore* | *Icterus galbula* | Other Open | Neotropical | Omnivore | Vegetation |
| Gray-crowned Rosy-finch < | *Roselin à tête grise* | *Leucosticte tephrocotis* | | Short-distance | Omnivore | Ground |
| Pine Grosbeak | *Durbec des sapins* | *Pinicola enucleator* | Forest | Short-distance | Omnivore | Vegetation |
| Purple Finch | *Roselin pourpré* | *Carpodacus purpureus* | Forest | Short-distance | Herbivore | Vegetation |
| Cassin's Finch | *Roselin de Cassin* | *Carpodacus cassinii* | Forest | Short-distance | Omnivore | Ground |
| House Finch | *Roselin familier* | *Carpodacus mexicanus* | Urban/Suburban | Short-distance | Herbivore | Ground |
| Red Crossbill | *Bec-croisé des sapins* | *Loxia curvirostra* | Forest | Short-distance | Omnivore | Vegetation |
| White-winged Crossbill | *Bec-croisé bifascié* | *Loxia leucoptera* | Forest | Short-distance | Omnivore | Vegetation |
| Common Redpoll | *Sizerin flammé* | *Carduelis flammea* | | Short-distance | Omnivore | Ground |
| Hoary Redpoll < | *Sizerin blanchâtre* | *Carduelis hornemanni* | | Short-distance | Omnivore | Ground |
| Pine Siskin | *Tarin des pins* | *Carduelis pinus* | Forest | Short-distance | Omnivore | Vegetation |
| American Goldfinch | *Chardonneret jaune* | *Carduelis tristis* | Shrub/Successional | Short-distance | Omnivore | Vegetation |
| Evening Grosbeak | *Gros-bec errant* | *Coccothraustes vespertinus* | Forest | Short-distance | Omnivore | Vegetation |
| House Sparrow (I) | *Moineau domestique* | *Passer domesticus* | Urban/Suburban | Resident | Herbivore | Ground |

(I) = Introduced species in Canada

< = few BBS data (no species trend but included in assemblage)

Blanks in habitat assemblages = not readily assigned to one of the habitat assemblage listed here