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BIRD TRENDS

A report on results of national ornithological surveys in Canada

After five years, *Bird Trends* returns to species reviewed in the very first issue. This gives us the opportunity to reflect on changes in our ability to monitor songbirds, as well as to look at species whose trends have changed in the interim. To identify the beginning of this second series, we've adopted a new look for the newsletter; we hope it better presents the results of the featured surveys. Our thanks are due to those of you who collect and analyse the data that fill these pages.

Landbirds: developing predictive capability

A.J. (Tony) Erskine, Scientist Emeritus, Canadian Wildlife Service, Sackville, NB

In 1997, CWS celebrated 50 years since the "Wildlife Service" name became official in Canada. Landbirds were part of the CWS mandate from the Migratory Birds Convention in 1916, but these birds seldom received more than passing attention for many years. Most landbirds are neither hunted nor exploited, and numbers of most species seemed little affected by advances of so-called civilization in Canada. CWS, and other management agencies, had more pressing work on species that were obviously adversely affected by human actions.

However, the responsibility to assure landbird conservation remained. Projects to monitor numbers of landbirds, alone or with other birds, came to Canada from the USA: Christmas Bird Counts (from 1900), roadside point-counts (for Bobwhite Quail from 1919, and other upland game birds later), territory-mapping on census plots (from 1937), and migration monitoring by banding ("Operation Recovery" of the 1950s). These efforts, or variants, continue to the present, but predictive capability was a long time coming.

Landbird population monitoring was accepted, at a token level, in the U.S. Fish and Wildlife Service soon after World War II, but it was 1968 when CWS first appointed a non-game bird biologist. As in the States, one person was to develop and coordinate volunteer efforts at counting birds across Canada. Baseline data on densities and productivity, as well as annually repeated counts, were required for population monitoring. To attempt all this could spread effort too thinly to obtain visible results, and going with known approaches, including the new Breeding Bird Survey (BBS), was enough to fully occupy one person's time.

Early Surveys

The BBS emerged in Maryland in 1965, adapted from roadside counts of game birds. By 1968 it was seen as the most promising approach yet devised for tracking trends in landbird numbers. Although BBS sampling reached the west coast in 1968, Canadian coverage was sparse, and most effort in the next five years went to encouraging volunteers to join the BBS team. Formal publication of results from the first ten years (Erskine 1978) indicated that BBS was making a difference: statistically acceptable population trends were no longer a dream!

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For years volunteers had measured breeding and wintering densities by repeated censuses of measured plots, but too few people undertook this labour-intensive approach for it to be useful in monitoring numbers (as was done successfully in the U.K.). Assembly of Canadian breeding-census data through 1970 showed effort concentrated in southern Ontario, with odd plots scattered coast-to-coast and north to the tundra. The absence of censuses in the boreal forest offered an opportunity where one person's efforts could make a useful contribution. After eight summers of censusing, *Birds in boreal Canada* (Erskine 1977) summarized breeding bird density data and related information for Canada's largest ecoregion.

Productivity of landbirds was another game. Nest-recording came from England in 1954 (Myres 1967) and spread across Canada. Mechanized storage/retrieval and analysis of Canadian nest data, using cumbersome mainframe computers in the 1970s, bogged down without usable results, but nesting information still exists and accumulates in card files.

Early Success

By 1975, the total Canadian population of starlings was no longer impossible to guess. Mapping censuses gave densities, BBS gave distributional indices, and nest records added some demographic data. Preliminary population figures for starling, Red-winged Blackbird, and White-throated Sparrow were presented at a conference that year, and published later (Erskine 1980). Such population modelling is neither precise nor statistically rigorous, but it provides perspective – which for conservation may be more valuable than precision.

The first non-game bird coordinator moved on to other work in 1977, but the data-collection schemes continued. After a decade, CWS assembled landbird expertise at regional as well as national levels to respond to continent-wide concerns over declines in "neotropical migrants" (Robbins et al. 1989; Terborgh 1989). Partners in Flight-Canada (the Canadian Landbird Conservation Program) now occupies the whole field considered by the original coordinator.

The kind of improvisation that produced species population estimates in 1975 seems unlikely to re-emerge. The accumulated knowledge of several decades, coupled with the power of personal computers makes possible rigorous predictive capability where only informed guesses were possible 20 years ago.

[Editor's note: Tony Erskine was the first non-game bird biologist for CWS].

"By 1975, the total Canadian population of starlings was no longer impossible to guess."

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Monitoring Canada's songbirds: status and results

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The very first issue of *Bird Trends* (in 1991) summarized the population status of Canadian songbirds. Subsequent issues covered other groups of species, but now it is time to return to songbirds for an update. A tremendous amount of progress has been accomplished on songbird monitoring in the intervening 6 years. Besides simply adding a few more years of data to our trends, we are in a much better position now to evaluate the quality of the data from alternate sources, and to interpret results.

What is a "songbird"? In this article, "songbird" includes non-passerines such as gallinaceous birds, doves, cuckoos, woodpeckers etc., as well as true songbirds. Waterbirds, seabirds, shorebirds and raptors have been covered in other editions of *Bird Trends*, and will be revisited in future issues.

Two recent publications have reviewed the status of bird monitoring in Canada. The Canadian Landbird Monitoring Strategy (Canadian Wildlife Service 1994) reviewed monitoring programs and identified those of greatest importance for generating trend data at regional and national scales. Dunn et al. (1997) summarized the strengths and weaknesses of those programs. The conclusions of these reviews for songbird species are summarized below.

Breeding Bird Survey

The Breeding Bird Survey (BBS) is the primary means of monitoring population trends of songbirds in Canada. This continent-wide survey uses standardized count methods on routes selected through stratified random sampling; analysis methods are statistically rigorous (Downes and Collins 1996). The survey samples over 75% of Canadian songbird species sufficiently well for trend calculation. Over 400 routes are run in Canada, by close to 300 volunteer expert birders. Each observer, starting at dawn, makes fifty 3-minute stops at 0.8 km intervals along a 39.4 km stretch of secondary road, recording all birds seen or heard within 0.4 km of each stop.

BBS coverage has increased steadily over the last several years (e.g. participation in 1996 was 43% higher than in 1990). Such increases in the number of routes covered both improves the reliability of our estimates of population trends and increases the number of species for which trends can be calculated. For the first time in BBS history we have sufficient coverage in southern Yukon/northern BC to calculate species trends for that region. With the help of Parks Canada in the Northwest Territories, efforts are being made towards similar increases in participation in southwestern NWT/ northern Alberta.

Despite the flagship status of BBS, it does have some limitations. Because routes are run by car, the survey is confined to areas where there is a good road network. Large areas of the boreal forest and arctic Canada lack roads entirely, so some northern-nesting species are not sampled at all and others are surveyed only in the southern portion of their breeding range. Certain other species are poorly sampled because they are very rare or secretive, or are specific to habitat types in which there are not many BBS routes. For example, prairie BBS routes tend to run through agricultural areas rather than native grassland, so certain grassland species are poorly sampled. However, a pilot project aimed toward improving coverage of grassland birds is currently underway (see article p. 18).

Migration Monitoring

Because Canada needs additional information sources for a significant number of species, this country has worked hard to evaluate other means of determining population status. Many northern-nesting species can be counted during their migration, and Canada is a world leader in developing a regular migration monitoring program (see article p. 11). Participating stations record all birds detected in a certain study area on a near-daily basis throughout spring and/or fall migration, using standardized count protocols. One limitation of migration monitoring is that it can only be used to generate regional trends. Once stations in all regions are up and running they should provide a national perspective on change in northern populations. Migration counts also are limited in the species they survey. They are very useful for sampling boreal-nesting species that are only partly covered by BBS, but for the most part they do not sample arctic-nesters.

Christmas Bird Count

Another source of data for some of the songbirds whose breeding range is not well-sampled by the BBS is the Christmas Bird Count (CBC). These semi-standardized counts are conducted on any single day within 2 weeks of Christmas, recording all birds detected within a circle 24.1 km in diameter. Although the same circles are

usually covered year after year, there are no rules governing their placement, the number or skills of observers,or time spent in the field. An obvious limitation is that CBC does not sample species wintering in the neotropics (including many of Canada's boreal species), although it does cover some of our arctic-nesting songbirds. Analysis has shown that trends from CBC and from BBS are correlated (Dunn and Sauer 1997), but CBC trends are considered the less reliable of the two sources. There are only a few Canadian songbirds for which data are available from CBC but not BBS. On the whole, then, CBC serves as a supplementary source of trend data on Canadian songbirds, rather than as a primary source.

Checklists

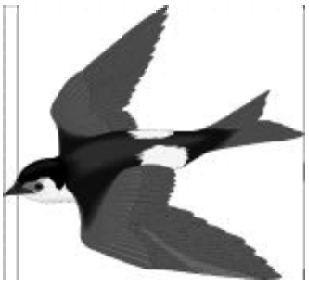
One additional broad-scale program that can generate population trends is the "checklist survey". Large numbers of birders record their daily sightings by locality, and results are compiled in a central database. Unlike most other volunteer surveys, data are collected in every season of the year. Although checklist programs, like CBCs, are not standardized as to location, observer skill, or time in the field, participants are asked to record such data in case it becomes possible to control for these known sources of bias retroactively. New guidelines by Dunn (1995) aim at improving standardization of checklist programs. Quebec has had a very active program for decades (now collecting 10,000 lists a year). Analysis of that data set showed that trends were correlated to those from BBS (Dunn et al. 1996), but further work is necessary to evaluate biases. Partly as a result of evaluation thus far, new Canadian checklist programs have been started in Alberta and the Northwest Territories, with interest shown by several other provinces and U.S. states. Expanded checklist programs have the potential to gather continent-wide data on distribution, and to generate further supplementary data on population trend.

Forest Bird Survey

The first focus of the Canadian Landbird Monitoring Strategy is on obtaining nation-wide population trends of landbirds. However, certain regional programs are covered. For example, Ontario's Forest Bird Monitoring Program (FBMP) is a source of standardized population data on birds breeding in mature forest (see article p. 21). While most species recorded by FBMP are also seen on BBS routes, the FBMP complements BBS trends by providing estimates of population change specific to mature forest habitat.

Demographics

Another topic covered by the Monitoring Strategy is the collection of demographic data, a critical link to investigating the causes of population trends and especially valuable for species whose populations are showing worrisome change. In Canada, wide-scale efforts to collect and analyse such data are generally lacking. Monitoring Avian Productivity and Survivorship (MAPS), Nest Record Schemes and Migration Monitoring (see articles pp. 11 and 16) all have potential to collect data on productivity and/or survivorship, although only MAPS is specifically designed to do so and has evaluated results. Only a handful of MAPS stations are currently run in Canada, so demographic monitoring here still has a long way to go.



Volunteers needed

All the programs in the Canadian Landbird Monitoring Strategy rely largely on the efforts of volunteer participants, without whom the collection of broad-scale monitoring data would be impossible. There are opportunities for volunteers to participate at all levels of skill and interest, and we invite you to consider taking part (see contact names at the end of the newsletter).

Results

With the foregoing perspective on the data sources available to us, we present the best available national-scale trend result over the past 30 years for each

Canadian songbird species (Table 1). We do not show results for the provinces or eco-regions, partly to simplify the table, but also because details of regional trends are now available from numerous public sources. Trends from Canadian BBS analyses (country-wide, provincial or by ecozone) can be obtained from the Canadian Bird Trends database on Environment Canada's GreenLane web page (http://www1.ec.gc.ca/~cws). Custom analyses (for any North American region or time period), a wide variety of maps, and graphic displays of results are on the U.S. BBS web site (http://www.mbr.nbs.gov/bbs/bbs.html). Displays of CBC results are available as well (http://www.mbr.nbs.gov/bbs/cbc.html). For those without Internet access, detailed Canadian BBS results have been published by Downes and Collins (1996) and are available from the same address as *Bird Trends*.

Canadian BBS trends are available on-line at: http://www1.ec.gc.ca/~cws

The trend data in Table 1 can be examined for clues as to causes of population change. If species typical of a particular habitat are declining as a group, for example, then loss of that habitat might be suspected as a common cause. (Such correlational evidence is not proof of a causal link, but can be used to formulate plans for more directed research.)

Analysis of the habitat groups for which there were sufficient sample sizes showed that grassland-nesters were more likely than other kinds of birds to be declining (Table 2), and the average trend for individual grassland species was significantly more negative than for other songbirds. Woodland species were especially likely to be increasing. A similar analysis which divided songbird species into migratory categories indicated no differences in population trends among those groups (Table 2). Similar results have been found for landbirds as a whole, including raptors and some inland aquatic species (Bradstreet and Dunn 1997, C. Downes unpubl. data).

Although grassland birds stand out as a group, there are declining species among all habitat types. We will often need further research on individual species in order to determine causes of decline, because causes and solutions will be different for each, and trend data cannot pinpoint causes. The main value of trend information is as an early warning system, highlighting species that we may want to help before population decline becomes critical.

A priority-setting exercise for Canada (see article p. 25) has provided some context in which we can assess the relative importance of equal declines in different species. Some of the results are shown here, in the last 2 columns of Table 1 (see notes to Table 1). Of Canada's distinctive songbirds (those with 50% or more of their breeding range in Canada) about half are declining and half increasing, just as one would expect if populations were changing randomly. On an avifauna-wide scale, therefore, Canada's songbirds are doing well. However, as we have shown in this article, our grassland birds are doing less well than we would like, and individual species in other habitats also deserve attention. Our hope is that, in the next songbird issue of *Bird Trends*, we'll be able to report real progress on using this kind of trend information to influence on-the-ground conservation efforts to improve the status of high priority species.

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Table 1. Long-term trends in Canadian landbird populations. See explanation of codes in notes to Table 1, page 10.

Species	Trend	Trend source	Preliminary Supervisory Responsibility	Canadian concern
Gray Partridge	0	BBS1	L	M
Chukar	--	BBS2	VL	H
Ring-necked Pheasant	0	BBS1	VL	M
Spruce Grouse	0?	BBS1	VH	M
Blue Grouse	--?	BBS1	H	H
Willow Ptarmigan	0??		L	M
Rock Ptarmigan	0?	BNA	H	M
White-tailed Ptarmigan	0?	BNA	H	M
Ruffed Grouse	-?	BBS1	H	M
Sage Grouse	0	BBS2	VL	M
Sharp-tailed Grouse	0?	BBS1	H	M
Wild Turkey	+	BBS2	VL	M
Northern Bobwhite	-	BBS2	VL	H
California Quail	0	BBS2	VL	M
Mountain Quail	0	BBS2	VL	M
Rock Dove	0	BBS1	L	L
Band-tailed Pigeon	--	BBS1	VL	H
Mourning Dove	+	BBS1	VL	L
Black-billed Cuckoo	0	BBS1	L	M
Yellow-billed Cuckoo	0	BBS1	VL	L
Common Nighthawk	0?	BBS1	VL	L
Common Poorwill	+	BBS2	VL	M
Chuck-will's-widow	-	BBS2	VL	H
Whip-poor-will	0	BBS1	L	M
Black Swift	-?	BBS1	H	H
Chimney Swift	--	BBS1	VL	H
Vaux's Swift	0?	BBS1	M	M
White-throated Swift	0	BBS2	VL	M
Ruby-throated Hummingbird	0	BBS1	VL	M
Black-chinned Hummingbird	0	BBS2	VL	M
Anna's Hummingbird	0	BBS2	VL	M
Calliope Hummingbird	0	BBS1	L	M
Rufous Hummingbird	0?	BBS1	H	M
Belted Kingfisher	0?	BBS1	M	L
Lewis's Woodpecker	-	BBS2	VL	H
Red-headed Woodpecker	0	BBS1	VL	M
Red-bellied Woodpecker	0	BBS2	VL	M
Yellow-bellied Sapsucker	0?	BBS1	VH	M
Red-naped Sapsucker	0?	BBS1	VL	M
Red-breasted Sapsucker	+?	BBS1	M	M
Williamson's Sapsucker	+	BBS2	VL	M
Downy Woodpecker	+?	BBS1	L	L
Hairy Woodpecker	+?	BBS1	M	L
White-headed Woodpecker	++	BBS2	VL	L
Three-toed Woodpecker	0?	BBS1	H	M
Black-backed Woodpecker	+?	BBS1	H	L
Northern Flicker	-?	BBS1	M	M
Pileated Woodpecker	++?	BBS1	L	L
Olive-sided Flycatcher	-?	BBS1	M	H
Western Wood-Pewee	0?	BBS1	L	M
Eastern Wood-Pewee	-	BBS1	VL	M
Yellow-bellied Flycatcher	0?	BBS1	VH	M
Acadian Flycatcher	0	BBS2	VL	M
Alder Flycatcher	0?	BBS1	H	M
Willow Flycatcher	0	BBS1	VL	M
Least Flycatcher	0?	BBS1	H	M
Hammond's Flycatcher	0?	BBS1	M	M
Dusky Flycatcher	0?	BBS1	L	M
Gray Flycatcher	++	BBS2	VL	L

Table 1 (continued).

Species	Trend	Trend source	Preliminary Supervisory Responsibility	Canadian concern
Western Flycatcher	++	BBS1	VL	L
Eastern Phoebe	0?	BBS1	M	M
Say's Phoebe	0?	BBS1	VL	M
Great Crested Flycatcher	0	BBS1	VL	M
Western Kingbird	+	BBS1	VL	M
Eastern Kingbird	0	BBS1	L	M
Eurasian Skylark	--?	Godfrey	VL	H
Horned Lark	0?	BBS1	VL	M
Purple Martin	0	BBS1	VL	M
Tree Swallow	0?	BBS1	H	M
Violet-green Swallow	++?	BBS1	L	L
Northern Rough-winged Swallow	+	BBS1	VL	L
Bank Swallow	0?	BBS1	M	M
Cliff Swallow	0?	BBS1	L	M
Barn Swallow	-?	BBS1	L	M
Gray Jay	0?	BBS1	VH	M
Steller's Jay	+	BBS1	VL	M
Blue Jay	0	BBS1	VL	M
Clark's Nutcracker	++	BBS1	VL	L
Black-billed Magpie	0	BBS1	L	M
American Crow	0?	BBS1	M	M
Northwestern Crow	0?	BBS1	H	M
Common Raven	++?	BBS1	H	VL
Black-capped Chickadee	+?	BBS1	M	L
Mountain Chickadee	++?	BBS1	L	L
Siberian Tit	??		VL	?
Boreal Chickadee	--?	BBS1	VH	H
Chestnut-backed Chickadee	-	BBS1	M	H
Tufted Titmouse	0	BBS2	VL	M
Bushtit	-	BBS2	VL	H
Red-breasted Nuthatch	++?	BBS1	H	L
White-breasted Nuthatch	0	BBS1	VL	M
Pygmy Nuthatch	0	BBS2	VL	M
Brown Creeper	0?	BBS1	M	M
Rock Wren	0	BBS1	VL	M
Canyon Wren	-	BBS2	VL	H
Carolina Wren	0	BBS2	VL	M
Bewick's Wren	0	BBS1	VL	M
House Wren	+	BBS1	L	L
Winter Wren	0?	BBS1	H	M
Sedge Wren	+	BBS1	L	M
Marsh Wren	++	BBS1	VL	L
American Dipper	--?	BBS1	L	H
Golden-crowned Kinglet	0?	BBS1	H	M
Ruby-crowned Kinglet	0?	BBS1	H	M
Blue-gray Gnatcatcher	+	BBS2	VL	L
Northern Wheatear	??		L	?
Eastern Bluebird	0	BBS1	VL	M
Western Bluebird	0	BBS2	VL	M
Mountain Bluebird	0	BBS1	L	M
Townsend's Solitaire	0?	BBS1	L	M
Veery	-	BBS1	M	M
Gray-cheeked Thrush	0??	BBS1	H	M
Bicknell's Thrush	??		H	?
Swainson's Thrush	0?	BBS1	H	M
Hermit Thrush	+?	BBS1	M	M
Wood Thrush	-	BBS1	VL	H
American Robin	0?	BBS1	M	L
Varied Thrush	0?	BBS1	L	M

Table 1 (continued).

Species	Trend	Trend source	Preliminary Supervisory Responsibility	Canadian concern
Gray Catbird	-	BBS1	VL	H
Northern Mockingbird	0	BBS1	VL	M
Sage Thrasher	0	BBS2	VL	M
Brown Thrasher	-	BBS1	VL	H
Yellow Wagtail	??		VL	?
American Pipit	-?	CBC	H	M
Sprague's Pipit	--	BBS1	H	VH
Bohemian Waxwing	0?	BBS1	H	M
Cedar Waxwing	+?	BBS1	M	L
Northern Shrike	0?	CBC	H	M
Loggerhead Shrike	--	BBS1	VL	H
European Starling	-	BBS1	M	M
Crested Myna	--	BNA	VL	H
White-eyed Vireo	0	BBS2	VL	M
Solitary Vireo	++?	BBS1	M	L
Yellow-throated Vireo	0	BBS1	VL	M
Hutton's Vireo	0	BBS2	VL	M
Warbling Vireo	+?	BBS1	M	M
Philadelphia Vireo	0	BBS1	VH	M
Red-eyed Vireo	+	BBS1	M	L
Blue-winged Warbler	0	BBS2	VL	M
Golden-winged Warbler	++	BBS1	VL	M
Tennessee Warbler	0?	BBS1	VH	M
Orange-crowned Warbler	0?	BBS1	H	M
Nashville Warbler	0	BBS1	M	M
Northern Parula	0	BBS1	VL	M
Yellow Warbler	+?	BBS1	M	L
Chestnut-sided Warbler	0	BBS1	M	M
Magnolia Warbler	0?	BBS1	VH	M
Cape May Warbler	+?	BBS1	VH	M
Black-throated Blue Warbler	0	BBS1	L	M
Yellow-rumped Warbler	+?	BBS1	H	L
Black-throated Gray Warbler	0?	BBS1	VL	M
Townsend's Warbler	0?	BBS1	L	M
Black-throated Green Warbler	0?	BBS1	H	M
Blackburnian Warbler	0	BBS1	M	M
Pine Warbler	0	BBS1	VL	M
Prairie Warbler	-	BBS2	VL	H
Palm Warbler	0?	BBS1	VH	M
Bay-breasted Warbler	0?	BBS1	VH	M
Blackpoll Warbler	--?	BBS1	VH	H
Cerulean Warbler	--	BBS2	VL	H
Black-and-white Warbler	0	BBS1	M	M
American Redstart	0?	BBS1	H	M
Prothonotary Warbler	-	BBS2	VL	H
Ovenbird	0?	BBS1	M	M
Northern Waterthrush	0?	BBS1	M	M
Louisiana Waterthrush	0	BBS2	VL	M
Connecticut Warbler	0?	BBS1	VH	M
Mourning Warbler	0?	BBS1	VH	M
MacGillivray's Warbler	0?	BBS1	M	M
Common Yellowthroat	0?	BBS1	L	M
Hooded Warbler	0	BBS2	VL	M
Wilson's Warbler	0?	BBS1	H	M
Canada Warbler	0?	BBS1	VH	M
Yellow-breasted Chat	0	BBS2	VL	M
Scarlet Tanager	0	BBS1	VL	M
Western Tanager	0?	BBS1	L	M
Northern Cardinal	0	BBS1	VL	M

Table 1 (concluded).

Species	Trend	Trend source	Preliminary Supervisory Responsibility	Canadian concern
Rose-breasted Grosbeak	0	BBS1	L	M
Black-headed Grosbeak	0	BBS1	VL	M
Lazuli Bunting	++	BBS1	VL	L
Indigo Bunting	0	BBS1	VL	M
Dickcissel	-	BBS2	VL	H
Rufous-sided Towhee	0	BBS1	VL	M
American Tree Sparrow	-?	CBC	H	M
Chipping Sparrow	0?	BBS1	M	M
Clay-colored Sparrow	-?	BBS1	VH	H
Brewer's Sparrow	+?	BBS1	L	M
Field Sparrow	0	BBS1	VL	M
Vesper Sparrow	0	BBS1	M	M
Lark Sparrow	0	BBS1	VL	M
Lark Bunting	-	BBS1	VL	H
Savannah Sparrow	0?	BBS1	H	M
Baird's Sparrow	0	BBS1	M	H
Grasshopper Sparrow	0	BBS1	VL	M
Henslow's Sparrow	--	BBS2	VL	VH
Le Conte's Sparrow	+?	BBS1	VH	M
Sharp-tailed Sparrow	0	BBS1	VH	M
Fox Sparrow	0?	BBS1	H	M
Song Sparrow	-?	BBS1	M	M
Lincoln's Sparrow	++?	BBS1	H	L
Swamp Sparrow	0?	BBS1	VH	M
White-throated Sparrow	-?	BBS1	VH	M
Golden-crowned Sparrow	0?	CBC	M	M
White-crowned Sparrow	-?	CBC	H	M
Harris's Sparrow	-?	CBC	VH	H
Dark-eyed Junco	0?	BBS1	M	M
McCown's Longspur	-	BBS1	M	H
Lapland Longspur	0?	CBC	VH	M
Smith's Longspur	0??	CBC	H	H
Chestnut-collared Longspur	0	BBS1	L	M
Snow Bunting	-??	CBC	H	M
Bobolink	-	BBS1	M	M
Red-winged Blackbird	0?	BBS1	L	M
Eastern Meadowlark	--	BBS1	VL	H
Western Meadowlark	-	BBS1	VL	M
Yellow-headed Blackbird	+	BBS1	L	L
Rusty Blackbird	--?	BBS1	VH	H
Brewer's Blackbird	0	BBS1	L	M
Common Grackle	-	BBS1	VL	M
Brown-headed Cowbird	-	BBS1	L	M
Orchard Oriole	0	BBS1	VL	M
Northern Oriole	0	BBS1	L	M
Rosy Finch	0?	CBC	L	M
Pine Grosbeak	0?	BBS1	H	M
Purple Finch	-?	BBS1	H	H
Cassin's Finch	0	BBS1	VL	M
House Finch	++	BBS1	VL	L
Red Crossbill	0?	BBS1	H	M
White-winged Crossbill	0??	BBS1	VH	M
Common Redpoll	0?	CBC	H	M
Hoary Redpoll	0?	CBC	H	M
Pine Siskin	0?	BBS1	H	M
American Goldfinch	0	BBS1	L	M
Evening Grosbeak	+	BBS1	H	L
House Sparrow	-	BBS1	L	M

Notes to Table 1. All data from Dunn (1997).

Trend:

blank	No data.
++	Statistically-significant increase of 3% per year; *or* (in absence of survey data) a well-documented very large increase
+	Statistically-significant increase of 1-3% per year; *or* non-significant increase of 3% per year; *or* well-documented modest increase without survey data; *or* poorly-documented major increase.
0	Non-significant trend (with adequate sampling) of -3 to 3% per year; *or* significant trend of -1% to 1% per year; *or* (in absence of data) other evidence of relatively stable populations.
-	Statistically-significant decrease of -1 to -3% per year; *or* non-significant decrease of -3% per year; *or* well-documented modest decrease without survey data; *or* poorly-documented major decrease.
--	Statistically-significant decrease of -3% per year; *or* well-documented very large decrease without survey data.
"?"	Indicates that 2% of Canadian breeding range is sampled by BBS, or the source was a survey less standardized than BBS. Other criteria are also important in assessing quality of BBS trend, and a question mark here is only a preliminary indicator that supplementary data would be valuable.
"??"	Indicates no data, or trend results with a high degree of uncertainty.

Trend Source:

BBS1	Breeding Bird Survey trend for Canada, 1966-1994, from Downes and Collins (1996) (default choice if data available).
BBS2	BBS trend for North America, 1966-1996, from U.S. BBS web page (see text).
BNA	*Birds of North America* (Poole and Gill 1992-1997; trends for various time periods; often on incomplete data or based on expert opinion).
CBC	Christmas Bird Count trends, 1958-1988, from CBC web page (see text).
Godfrey	Based on Godfrey (1986; trends for various time periods; often on incomplete data or based on expert opinion).

Supervisory Responsibility:

Scores based on proportion of North American breeding range in Canada (see numbers in parentheses below), adjusted downward for species with 25% of global range outside North America (see Dunn 1997 for details).

VH	Very High (>80% North American breeding range in Canada)
H	High (61-80% North American breeding range in Canada)
M	Medium (41-60% North American breeding range in Canada)
L	Low (20-40% North American breeding range in Canada)
VL	Very Low (<20% North American breeding range in Canada)
?	inadequate data

Preliminary Canadian Concern:

Scores are average of Trend and of *Vulnerability* (a composite score reflecting breadth of breeding and wintering range and global abundance. See Dunn 1997 for details.)

VH	Very High
H	High
M	Medium
L	Low
VL	Very Low

Table 2. Proportion of Canadian songbirds with declining trends, according to habitat and migration category[1].

Species	No. species increasing	No. species decreasing	Percent decreasing
Habitat category			
Woodland	62	38	38
Scrub	29	26	47
Grassland	5	16	76
Cosmopolitan	11	11	50
Migratory category			
Resident	26	15	37
Short-distance migrant	36	43	54
Long-distance migrant	54	45	4.5

[1] Chi square tests showed that the number of increasing species is not significantly different from the number of declining species in any single group (e.g. grassland birds or residents). However, there is significant variation among habitat groups when all are considered together (less than 5% probability of chance result).

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Migration monitoring in Canada

Erica H. Dunn, Canadian Wildlife Service; David Hussell, Ontario Ministry of Natural Resources; and Charles M. Francis, Bird Studies Canada

Migration counts for Ontario were reported in 1991 in *Bird Trends* number 1. At the time, we had little knowledge of the quality of such data, or the role that migration monitoring might play in a national monitoring strategy. Today the picture is entirely different, and Canada has become a world leader in the use of migration monitoring.

A "monitoring needs assessment" produced by Partners in Flight-U.S. noted that many northern-nesting species were poorly sampled by the Breeding Bird Survey (BBS) because, as a roadside survey, it does not sample remote areas of Canada. If daily counts of migrants could be shown to reflect population trend, an east-west string of monitoring stations across the northern limit of BBS coverage in Canada might be useful. Subsequently an international workshop was held to evaluate migration counting as a monitoring method (Blancher et al. 1994). Several subsequent publications demonstrated that standardized migration counts indeed reflect population change (reviewed in Dunn and Hussell 1995, Hussell 1997).

An important outcome of the workshop was the formation of a North American "Migration Monitoring Council", which has produced a set of recommended methods for monitoring with standardized migration counts (Hussell and Ralph 1996). Briefly, observers should record all birds present in a study area each day of the spring and/or fall migration season using capture (for banding), censuses, other count methods or a combination of these methods, at the same place during the same hours each day.

The past 5 years has also seen the informal establishment of a Canadian Migration Monitoring Network (CMMN; soon to become more formalized). This network consists of about 20 independent field stations spread across Canada that could potentially monitor landbird migrants. So far, there is at least one station in each province except Prince Edward Island and Newfoundland. Many are less than 5 years old (including some pilot projects), indicating increasing interest in migration monitoring in recent years. Other stations have passed the 5-year mark considered necessary for calculation of trends. Ontario's Long Point Bird Observatory has monitored migrants using standardized methods since 1960.

Bird Studies Canada (BSC) has taken the lead in developing CMMN. With financial help from CWS and others, BSC has built data-entry software for stations to facilitate submission of data for centralized analysis, has continued to evaluate the reliability of migration count trends and to improve analysis methods, and has compiled a list of species that are prime targets for migration monitoring (i.e. northern-nesting migratory landbirds with the majority of their breeding range beyond the BBS coverage area in Canada). This target list will help in setting priorities for selecting locations for new stations.

Preliminary trend analyses of 5 or 6 years of migration counts have been completed recently for sites at Last Mountain Lake, Saskatchewan, and Thunder Cape, Ontario. We expect trends based on 5 or more years of data to be available from many more stations before our next *Bird Trends* report. However, long-term trends are currently available only from the Long Point Bird Observatory in Ontario (Table 3).

Of the 58 species with results both from LPBO and Ontario BBS, there was only one (Lincoln's Sparrow) with significant trends in opposite directions; but over half the species had a significant trend in one data set but not the other. At least some of the discrepancies result from differences in analysis method (curvilinear vs. linear trends and different periods of years analysed). Migration counts also sample birds from outside the BBS coverage area within Ontario, where population trends may well be different. However,

Table 3. Trends in numbers of migratory birds at Long Point, Ontario, compared to BBS trends from Ontario[1].

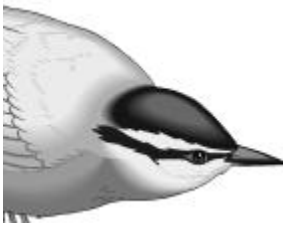
Species	Migration Trend[2]	BBS Trend[3]
Black-billed Cuckoo	-	0
Northern Flicker	0	-
Red-headed Woodpecker	-	0
Yellow-bellied Sapsucker	0	0
Great Crested Flycatcher	0	0
Eastern Wood-Pewee	+	0
Eastern Phoebe	++	0
Least Flycatcher	0	-
Yellow-bellied Flycatcher	0	0
Brown Creeper	++	0
House Wren	+	0
Winter Wren	++	0
Golden-crowned Kinglet	++	0
Ruby-crowned Kinglet	+	0
Blue-gray Gnatcatcher	++	
Wood Thrush	-	0
Veery	-	0
Swainson's Thrush	0	0
Gray-cheeked Thrush	0	
Hermit Thrush	+	++
American Robin	++	+
Gray Catbird	0	0
Brown Thrasher	0	--
Solitary Vireo	++	0
Red-eyed Vireo	+	0
Warbling Vireo	++	++
Philadelphia Vireo	0	
Tennessee Warbler	0	0
Nashville Warbler	0	0
Black-and-white Warbler	+	+
Black-throated Blue Warbler	++	0
Blackburnian Warbler	0	0
Chestnut-sided Warbler	+	0
Cape May Warbler	0	++
Magnolia Warbler	+	0
Yellow-rumped Warbler	++	0
Black-throated Green Warbler	+	0
Bay-breasted Warbler	0	0
Blackpoll Warbler	+	
Palm Warbler	0	0
Yellow Warbler	++	++
Mourning Warbler	0	0
Canada Warbler	0	0
Wilson's Warbler	0	0
Ovenbird	-	0
Northern Waterthrush	0	0
Common Yellowthroat	0	0
American Redstart	+	0
Rose-breasted Grosbeak	-	--
Indigo Bunting	++	0
Eastern Towhee	--	0
Vesper Sparrow	--	0
Savannah Sparrow	-	--
Song Sparrow	0	0
Field Sparrow	0	0
Chipping Sparrow	++	0
Dark-eyed Junco	0	--
White-throated Sparrow	-	0
White-crowned Sparrow	0	
Fox Sparrow	0	
Lincoln's Sparrow	-	++
Swamp Sparrow	-	0
Baltimore Oriole	0	0
Scarlet Tanager	0	0

Notes to Table 3.

[1] All trends expressed as annual percent change in population, with symbols as below:
++ Statistically-significant (p=0.05) increase of >2% per year;
+ Statistically-significant increase of 0 to 2% per year;
0 Non-significant trend;
- Statistically-significant decrease of 0 to -2% per year;
-- Statistically-significant decrease of >-2% per yr.

[2] LPBO trends for 1961-1996, based on spring and fall indices combined (except for spring only in Indigo Bunting and Wood Thrush). Derived from polynomial regression fit to annual indices derived from daily estimated totals (using multiple regression to reduce variance associated with weather and date effects). Significance tests from procedure developed by D. Hussell.

3 Ontario BBS trends for 1968-94, courtesy of C.M. Downes (Canadian Wildlife Service); based on route-regression analysis.



we still have a long way to go in understanding the reasons for specific differences in trend results from independent sources.

The groundwork has now been laid for many more migration stations to contribute standardized data, and within a few years we should be able to look at the status of northern-nesting migrants from a national perspective.

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Project FeederWatch: tracking winter population change

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Project FeederWatch (PFW) is an annual survey of North American birds that visit feeders in the winter. The project originated at Long Point Bird Observatory (LPBO) in 1976 as the Ontario Bird Feeder Survey (OBFS). In 1987, it was expanded across North America as a joint initiative of LPBO and the Cornell Laboratory of Ornithology. Since 1987, Project FeederWatch has grown to include almost 13,000 participants. Their role is to identify and count the birds that they see at their feeders for two days during each two-week period from November through April. At the end of the season, they send their data to Bird Studies Canada (BSC), or to the Cornell Laboratory of Ornithology (CLO) in the United States. Scientists at BSC and CLO use these data to analyse and track changes in the abundance and distribution of numerous bird species.

There are several main goals of Project FeederWatch:

- to gather long-term data on North American winter bird populations;
- to detect significant population declines or expansions;
- to track the dynamic movements of nomadic (wandering) and irruptive species during the winter months;
- to identify habitat features, including types of feeders and seeds, that attract or enhance bird populations ;
- to involve bird watchers across the continent in important ornithological research; and

- to share Project FeederWatch findings with participants, the general public, and other scientists.

Whether or not FeederWatch data actually reflect variations in bird populations is still under study. A comparison of 7 years of data (1976-77 to 1982-83) from the OBFS and Christmas Bird Counts (CBCs) found consistency in annual variations in the number of birds reported by the two surveys, though not for all species (Dunn 1986). Some discrepancies could be due to different survey methods: CBCs occur only once within a brief timeframe in early winter, while PFW records bird numbers throughout the winter season. PFW may be better able to detect population levels for erratic species, like finches, whose abundance can vary dramatically over the course of the winter. In a recent study, FeederWatch data from 1988-89 through 1994-95 were compared to Breeding Bird Survey data from the same time period, for nine resident species of the north-eastern United States (Wells et al., in press). For all nine species, the percentage of feeders visited per state was significantly correlated to state BBS indices. For eight of the nine species, PFW mean abundance was significantly correlated with state BBS indices. These results suggest that winter bird feeder counts, if interpreted with care, accurately reflect spatial, and in some cases temporal, variation in abundance of common resident birds. Bird Studies Canada is currently calculating winter bird trends using the 22 years of data available for Ontario, and updating the comparison with Christmas Bird Count data.

Ten years of North American data are presented on the Project FeederWatch website (http://birdsource.cornell.edu/pfwtrends). For each available species, the site presents a map and graph of the average number of birds per observation, as well as a graph of the percentage of feeders the species visited. Various patterns of abundance are depicted by the graphs for different species. Some resident species (such as Black-capped Chickadee) have remained stable in abundance throughout the years. Other species (like the House Finch), are increasing their range, and are seen by an increasing percentage of FeederWatchers each year. Another group of species, known as irruptive species, show erratic changes in numbers and percentage of feeders visited from year to year.

Common Redpoll (Figure 1) is one example of an irruptive species. Redpolls normally remain in Canada in winter and only cross the border during times of food shortages. This behaviour is illustrated by the way the percentage of feeders visited fluctuates in the northern regions from year to year. The regular biennial cycle of redpolls shown in past years predicts that 1997-98 will be another high redpoll year, and in fact, online FeederWatchers have already reported redpolls in high numbers. The flocking nature of redpolls can be seen by the mean group size variable, which varies from 2 to nearly 20. Other irruptive species include Pine Siskin, Evening Grosbeak, and Pine Grosbeak. The graphs for all these species show erratic changes in percentage of feeders visited or in the mean group size, but the patterns are different for each species, indicating different irruptive patterns. Although we can't yet say that the changes recorded through FeederWatch data reflect actual population trends, they do represent changes in distribution patterns over a ten-year time period. From the data gathered so far, however, it's evident that Project FeederWatch provides an interesting and important addition to our suite of monitoring programs.

"Winter bird feeder counts accurately reflect variation in abundance of common resident birds."

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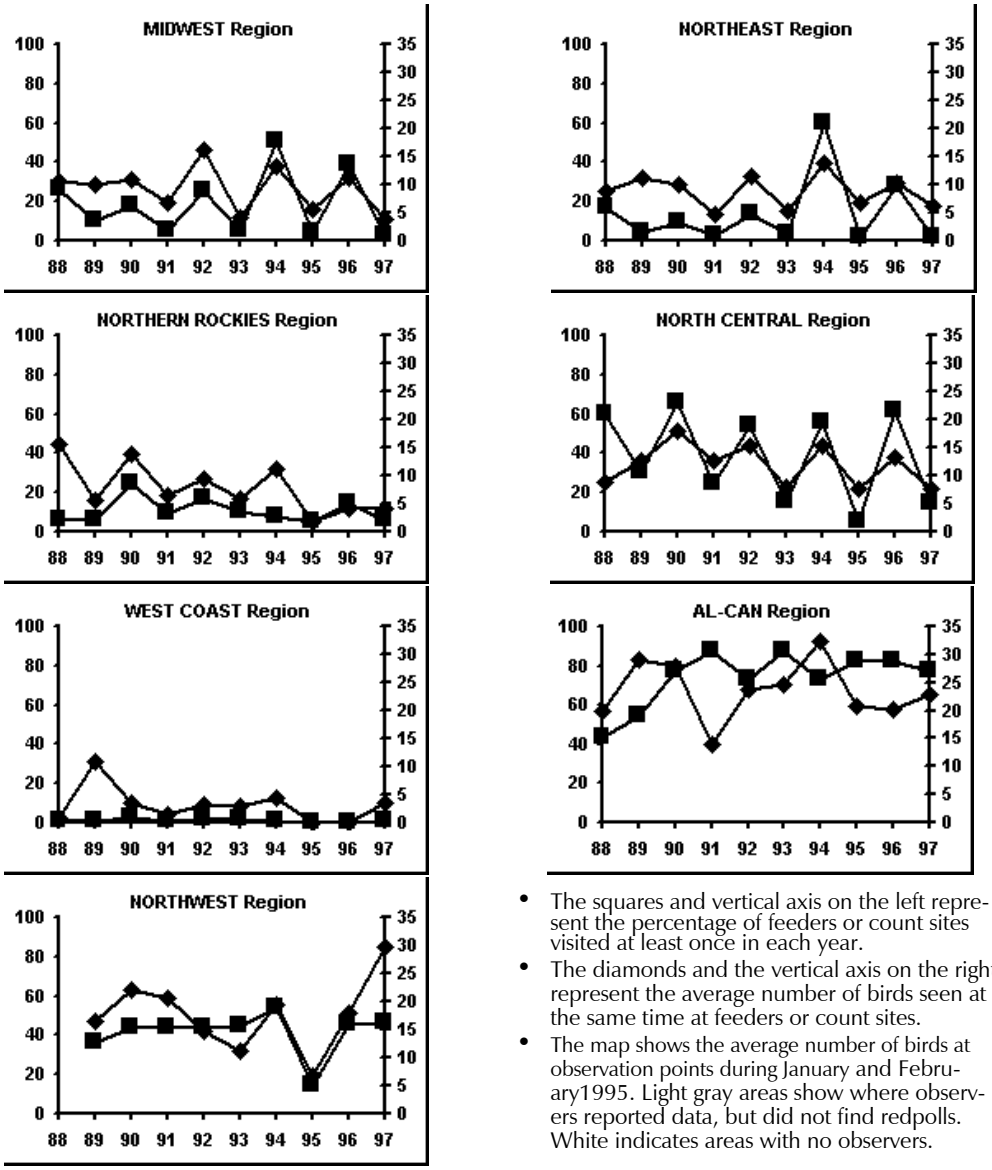

- The squares and vertical axis on the left represent the percentage of feeders or count sites visited at least once in each year.
- The diamonds and the vertical axis on the right represent the average number of birds seen at the same time at feeders or count sites.
- The map shows the average number of birds at observation points during January and February1995. Light gray areas show where observers reported data, but did not find redpolls. White indicates areas with no observers.

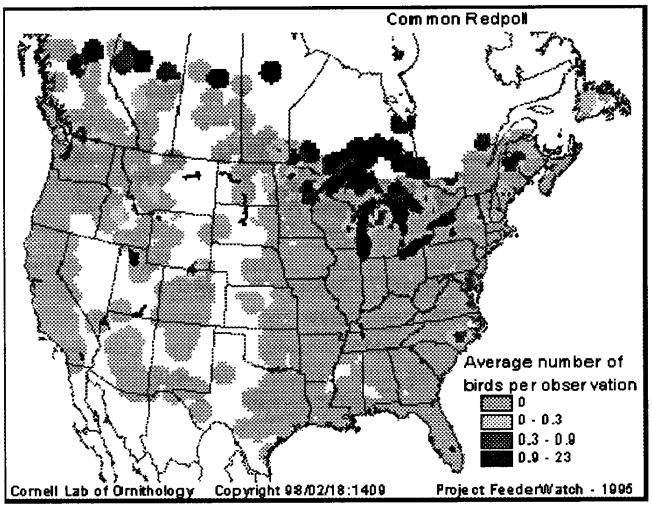

Figure 1. Distribution of Common Redpoll using 10-years of Project FeederWatch data (from Cornell Laboratory of Ornithology Project FeederWatch website, http://birdsource2.ornith.cornell.edu/pfwtrends/).

Monitoring Avian Productivity and Survivorship (MAPS)

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The MAPS program was established in 1989 by the Institute for Bird Populations (IBP) to provide both local and regional information on productivity and survivorship, the primary demographic parameters of North American landbirds. Monitoring primary demographic parameters (in addition to secondary population trends) can indicate the causes of population change, identify local management actions and larger-scale conservation strategies to reverse population declines, and, perhaps most importantly, evaluate the effectiveness of management actions and conservation strategies actually implemented (DeSante and Rosenberg in press). We need to monitor primary demographic parameters because environmental stressors and management actions affect these parameters directly. Monitoring only secondary population trends provides little or no information as to the stage(s) of the life cycle at which population change is being effected.

An effective landbird monitoring strategy integrates the monitoring of both primary and secondary parameters. This allows scientists to form hypotheses about the causes of population change and test them through research efforts. We can generate stronger and more interesting hypotheses if we can look at patterns over time and space at scales ranging from local to regional. MAPS aims to serve as one critical component of such an integrated North American monitoring strategy (DeSante 1992).

MAPS was patterned after the Constant Effort Sites Program that has been operated by the British Trust for Ornithology since 1981. MAPS utilises constant-effort mist-netting during the breeding season (DeSante and Burton 1997) at a continent-wide network of stations to provide, at both local and regional scales:
(1) indices of productivity (from the proportion of young in the catch); and,
(2) estimates of adult survival rates (from mark-recapture analyses).

MAPS has grown from 17 stations in 1989 to over 450 stations operated in 1997 across the continental United States and Canada (Table 4). Notable gaps in coverage occur in the Great Basin, Great Plains, southwest deserts, portions of the deep South, and most of Canada. Only 26 stations were operated in Canada in 1997; they comprise only 5.8% of the total stations and only 9.6% of the stations in the four regions that include Canada. Clearly, many more stations are needed in Canada to provide adequate coverage of the breeding ranges of North American landbirds.

In November, 1996 the MAPS Program was extensively evaluated, and then reviewed by a U.S. Geological Survey/Biological Resources Division-appointed Review Panel in January 1997. The conclusions of the review are summarised below:

1. MAPS is technically sound and is based on the best available biological and statistical methods;
2. The pilot has substantially exceeded expectations in rapidly expanding the number of sites supported by independent agencies and organisations;
3. MAPS complements other landbird monitoring programs such as the BBS by providing useful information on land bird demographics that is not available elsewhere;

Table 4: Distribution of MAPS stations in Canada in 1997.

	Total Number	Number in Canada	% of total
Northern Regions			
Alaska and Boreal Canada	27	5	18.5
Northwest	128	1	0.8
North-central	47	13	27.7
Northeast	68	7	10.3
Subtotal	270	26	9.6
Southern Regions			
Southwest	50	0	0.0
South-central	59	0	0.0
Southeast	73	0	0.0
Subtotal	182	0	0.0
Total	452	26	5.8

4. The quality, quantity, and usefulness of the data generated by MAPS indicates that some level of continued U.S. federal funding is appropriate.

The Review Panel also noted that MAPS represents a tremendous partnership among many federal and state agencies, NGOs, and private individuals, who contributed direct financial support and in-kind services during the pilot project. They concluded that MAPS is the most important project in the non-game bird monitoring arena in quite some time (probably since the creation of the BBS).

Several important results have emerged from this evaluation:

- year-to-year continuity of MAPS station operation was high, generally above 95%;
- the overall quality of data submitted was good;
- the remaining error rate (after data verification) in species and age determinations was estimated at less than 0.5% and 1.5% respectively.

MAPS data predicted short-term population trends for target species, at least at the local level.

Although productivity indices from MAPS are likely biased (DeSante, in press [a]), and some between-habitat biases exist, temporal (between-year), spatial (between-area), and inter-species comparisons of productivity indices may be relatively unbiased. In particular, trend indices calculated using MAPS data generally predicted short-term population trends for target species reasonably well, at least at the local level. We can adequately detect trends and estimate survival-rates for many species over large spatial scales but for only a few species at smaller scales (Rosenberg et al. in press). This will improve as we increase the number of years and number of stations. For species with large numbers of captures, the geographic variation in survival estimates and productivity indices seems to occur by physiographic region (DeSante et al. 1995). Using large-scale estimates and indices may mask temporal patterns and small-scale variation in survival rates and productivity (DeSante in press [b]). Finally, as with most monitoring schemes, because MAPS stations were not chosen through a probability-based sampling strategy, estimates and indices from the available stations may not truly represent the larger geographic area.

Recommended changes in MAPS field methods also came out of the MAPS Program review: (1) eliminate the final two 10-day data collection periods (August 9-28); (2) eliminate point counts; (3) submit daily breeding status lists; and (4) revise the procedures for collecting vegetation data at MAPS stations. These recommendations were implemented in the 1997 MAPS protocol.

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Pilot Grassland bird monitoring in Prairie Canada

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Grassland is the most affected biome in the world (Mondor 1976) and habitat loss continues (Gayton 1991). Grassland birds, as a guild, are declining more rapidly than any other group in Canada (Downes 1994 and see Table 5) or North America (Peterjohn and Sauer 1993). A number of these grassland species are covered too poorly by the Breeding Bird Survey (BBS) in Canada, and particularly in the prairies, for us to confidently track their trends (Some declines in Table 5 are large but not significant). Poor survey coverage can be a function of too few routes where the species is detected, too few birds per route, or large year to year variation in the number detected. The purpose of the Grassland Bird Monitoring Pilot Project (GBM) is to find a way to make prairie BBS coverage more effective for grassland birds or, failing that, develop a new volunteer survey to effectively track trends.

The pilot study was designed to proceed in stages. The first stage measures the improvement in coverage from running currently vacant BBS routes from the "Grassland" portion of Canada. Field work conducted in 1993 determined that finding volunteers to run vacant routes might improve coverage of some grassland species and is certainly a worthwhile goal (Dale 1994). However, it does not appear that running vacant routes would result in measurable improvement for Sprague's Pipit and many of the grassland sparrows. The reason for this is fairly clear: most vacant routes run through mainly agricultural land where grassland is already broken or intensively used. Since 80% or more of grasslands are broken, BBS reflects the landscape as a whole although it may under-sample large remaining tracts of grassland.

The next stage tests whether modification of BBS would improve coverage for grassland birds. It seems that problems encountered in tracking grassland bird trends originate more from the sampling strategy of BBS than the methodology. BBS routes are normally placed on the nearest secondary road to a randomly chosen point to

Table 5. Comparison of long-term Breeding Bird Survey routes to 1996 Grassland Bird Monitoring routes[1].

Species	Long-term BBS avg./route/year	1996 GBM avg./route	Long-term BBS # routes present	1996 GBM # routes present	BBS trend[2] (31 years) % per year
Swainson's Hawk	2.28	3.09	90	19	-2.1
Ferruginous Hawk	0.25	0.25	26	3	12.5
Sharp-tailed Grouse	0.63	1.09	56	2	-6.5
Upland Sandpiper	1.27	0.91	60	11	1.9
Long-billed Curlew	1.80	4.00	33	14	-1.4
Marbled Godwit	4.58	9.22	86	21	-0.2
Burrowing Owl	0.05	0.09	16	2	-9.7
Horned Lark	69.41	79.52	90	23	*-2.2
Sprague's Pipit	2.67	18.70	67	22	*-7.1
Loggerhead Shrike	0.58	0.78	63	9	*-10.1
Clay-colored Sparrow	27.39	19.83	92	23	*-1.2
Brewer's Sparrow	0.11	1.83	11	6	not avail.
Vesper Sparrow	23.69	40.48	92	23	-0.1
Lark Bunting	5.12	14.42	44	13	-5.2
Savannah Sparrow	26.90	38.57	93	23	-0.4
Baird's Sparrow	2.36	18.00	64	22	-0.7
Grasshopper Sparrow	0.45	3.04	46	13	-2.0
McCown's Longspur	3.53	8.26	22	10	-3.9
Chestnut-collared Longspur	13.73	28.09	46	20	-0.1
Bobolink	3.43	0.16	58	3	*-1.7
Western Meadowlark	50.61	72.09	93	23	*-2.0

[1] Averages based on a sample size of 23 routes run in 1996.

[2] Trends presented are long term (31 years) for Canada (Sauer et al. 1997). Significant trends are marked *.

ensure they are passable every year. But few secondary roads cross the remaining extensive grasslands, so Prairie BBS route locations may result in under-representation of remaining grassland blocks. For the second stage of the pilot project in 1996, we chose 35 routes in southeast Alberta and southwest Saskatchewan using the nearest passable road. Although inclement weather was a problem, observers conducted a total of 23 complete routes split fairly evenly between Alberta (13) and Saskatchewan (10) using BBS methods. In addition we recorded estimated proportions of various grassland classes at each stop so route averages of native and total grass cover could be calculated.

Grass cover of any type on completed routes varied from 23.1 to 93.7% (mean 59.0) and native grass ranged from 15.8 to 86.1% (mean 45.6). For a few species, coverage is poorer or equal to BBS averages/route (Bobolink, Upland Sandpiper and Clay-colored Sparrow, Ferruginous Hawk, and Brown-headed Cowbird) (Table 5). For remaining species, improvement in relative abundance per route is substantial with numbers on GBM being 1.4 to 17.43 times higher than BBS. Four critical species (Sprague's Pipit, Baird's Sparrow, Chestnut-collared and McCown's Longspur), identified as grassland endemics (restricted to the prairies) by Mengel (1970) are among those with the greatest improvement in coverage. Several of these species are among those with poor coverage even at the continental level (Peterjohn and Sauer 1993) and the small amount of data we have shows declines (Sauer et al. 1997).

The number of routes that can be included in analyses is also an important factor in how effective BBS is at detecting trends. The GBM routes increase route coverage by 3.6 to 54.5 % over BBS. Again the four critical species showed very marked improvement (32.8 to 45.5% increase). The most marked increase in coverage was for Brewer's Sparrow, a secondary grassland endemic (Mengel 1970), whose range is mainly in the United States where it has strong BBS coverage. GBM would give us the opportunity to effectively monitor numbers in Canada. Grasshopper Sparrow also showed a real improvement in coverage for the prairies (it currently enjoys good coverage in the U.S. and eastern Canada).

Initial results are very positive but conclusions are still several years away. We need at least 3 years of data to calculate trends; until we can, we won't be sure how much more effective GBM routes are than regular BBS. There are several other issues to be dealt with as well. Can GBM routes be included in BBS analyses? The answer is probably "no": we sample grasslands so heavily that our results might swamp what is happening to grassland birds in the agricultural land that forms the majority of the prairie landscape. We need to analyze GBM data alone, and combined with BBS data, to see how they best contribute. If GBM data can be added to BBS, we benefit from increased sample sizes for generating trends. If GBM is fundamentally different (i.e. trends in grasslands differ from those in fragmented agricultural land), the differences may provide important information. For example, if a species is steady or increasing on GBM routes but declining on BBS routes, the issue affecting that species is likely habitat-based (it needs unbroken prairie). If, on the other hand, a grassland species declines on both BBS and GBM routes it might indicate problems on the wintering grounds, widespread productivity problems, or other issues that require research. This kind of comparison is one of the strengths of the integrated monitoring program outlined in the Canadian Landbird Monitoring Strategy (Canadian Wildlife Service 1994). Population declines are easier to track in areas of high bird abundance (GBM routes) than where habitat loss has already reduced the abundance so much that incremental changes are hard to detect (BBS routes). Because the Grassland Bird Monitoring program collects information on habitat, we can examine the habitat needs of different species. With the exception of generalists like the Western Meadowlark, most grassland birds occur on only the sites that meet their habitat preferences. This kind of information could help us confirm habitats critical to the future of each species. We will collect data on these routes until we have sufficient years of coverage to calculate trends and determine the future role of Grassland Bird Monitoring.

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Forest Bird Monitoring in Saskatchewan

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A pilot program to monitor breeding forest birds in Saskatchewan began in 1990. Five sites, each with 20 point counts, were selected in forested areas in the southern part of the province. The sites were mostly located within Provincial Parks where they are removed from human-induced habitat disturbance. This makes it possible to detect the effects of habitat succession on the breeding grounds, or habitat loss on the wintering grounds, on birds at these sites. By 1992, the survey had grown to eight sites including 150 points.

An intensive, species-by-species analysis of these data has not yet been undertaken. Sample sizes may be too small and the time frame too short to reveal statistically significant population trends in any but the most common species. A preliminary analysis by guild, however, has provided some interesting information. For example, an analysis of the "excavators and probers" guild (woodpeckers, chickadees, nuthatches, and Black-and-white Warbler) showed a possible, but non-significant, decline in their numbers ($r=0.34$, $p=0.13$). If real, this decline is probably attributable to Dutch Elm Disease which, as it spreads up the Souris River, is decimating the American Elm. Elms constitute, depending on the area, from 50 – 90% of the trees in the valley. As that guild is particularly dependent on trees for foraging, roosting and nesting, the loss of an important tree species would have a significant effect on the population. A survey of Eastern Screech-Owls in the valley showed a similar trend with numbers falling from 15 birds in 1986 (Adam 1989) to four in 1997 (Smith unpublished). Plans to repeat the latter survey in 1998 are in the works.

A second project compares data from surveys made 20 years apart. Eight Breeding Bird Census (BBC) plots in the boreal forests of Saskatchewan and Manitoba were originally surveyed in 1972-73 (Erskine 1977), and then again in 1990-92 (Kirk et al. 1997). The BBC was designed to gather information on the absolute densities of birds in various habitats, but trend analyses of data from BBC plots have returned some interesting results. Comparison of data from these two time periods suggests dramatic changes in the numbers of neotropical migrants occurring on the plots in both provinces. In Manitoba, the density of more neotropical migrants increased (19) than decreased (11) but with no statistical difference between years, or any consistent pattern of change. Solitary Vireo showed the most notable decrease, while Canada Warbler, Ovenbird, Swainson's Thrush and Least Flycatcher all increased. All changes in Manitoba could be accounted for by vegetation succession or forest fragmentation in the surrounding landscape.

In Saskatchewan more species decreased (16) than increased (9), including decreases on all plots in Red-eyed Vireos, Tennessee Warblers, and Ovenbirds, and on most plots in Black-throated Green Warblers and Rose-breasted Grosbeaks. The cause of these trends is more difficult to interpret than those in Manitoba. Plots were located in a continuously forested

landscape where fragmentation was not a factor, and successional change accounts for only some of the population differences. The direction of most of these trends agrees with those calculated from the provincial BBS, which encompasses a much broader area. This is, perhaps, an indication that factors operating at a larger scale are in play. Although it is tempting to speculate that habitat loss on the wintering grounds is a cause of these declines, this study does not allow us to be conclusive. These data compare only two points in time; population fluctuations in the interim could lead to different conclusions. Continued monitoring and research in Saskatchewan will allow us to more clearly define changes in bird populations.

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Ontario's Forest Bird Monitoring Program

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The Forest Bird Monitoring Program (FBMP) provides trends in numbers of forest songbirds in selected mature, unmanaged forests in Ontario. As such, it provides a set of trend data complementary to that of the Breeding Bird Survey, which covers a broad array of habitats close to roadsides.

The FBMP is a volunteer-based program, run by the Ontario region of the Canadian Wildlife Service. It began in 1987, and now has 11 years of data. The program grew during its first five years, but since 1992 has been fairly consistent at about 100 volunteers per year, covering approximately 160 sites. Coverage is primarily in southern and central Ontario, with a few sites near northern communities.

Table 6 summarizes the trends of forest birds in Ontario from 1987 to 1997 according to the FBMP. The 74 species presented are those for which the FBMP has adequate coverage to determine a trend (birds reported on 14 or more sites). Asterisks indicate a statistically significant trend at the 95% level, and "n" indicates a nearly significant trend at the 90% level. The upper and lower confidence intervals indicate the range of values within which we are 95% sure the trend actually occurs.

Overall, 40 of the species show increasing or zero trend and 34 show a decline. Only 12 species show significant or near significant trends, eight of them increasing and four decreasing. The relatively small number of significant trends is perhaps not surprising given that FBMP sites are primarily stable and protected. Because of the relative stability of FBMP sites, a trend may reflect changes outside of the sites themselves – perhaps on the wintering ground, or in the surrounding landscape. However, there is very little fully mature forest in Ontario, and successional changes are still underway on most FBMP sites, so all these factors will have to be considered in explaining trend results.

Of the significant trends, neotropical migrants make up seven of the increases and only two decreases, suggesting that neotropical migrants are doing quite well on FBMP sites. Resident birds are generally more stable, as might be expected given the nature of the sites, with only chickadee showing significant decline, and Purple Finch showing a near-significant increase.

By comparing and integrating the results of the FBMP, BBS and Migration Monitoring Program in Ontario, we hope to soon have a better understanding of forest bird population dynamics in the province. We will soon be comparing trends among species and groups of species (Neotropical migrants, forest interior species, etc.) at the provincial level and by ecozone, to get a better understanding of how to interpret the results from each program and how to use them together.

A couple of initial comparisons provide an indication of the challenges involved. The large increase in Yellow Warblers according to FBMP has also been reported in Ontario

Table 6. Ontario forest bird trends, 1987-97.

Species	Annual Trend	Upper confidence interval	Lower confidence interval
Broad-winged Hawk	2.4	31.0	-19.9
Ruffed Grouse	-1.1	10.8	-11.8
Mourning Dove	3.6	15.7	-7.2
Black-billed Cuckoo	-8.8	11.1	-25.2
Yellow-billed Cuckoo	0	16.2	-13.9
Ruby-throated Hummingbird	19.3n	42.5	-0.1
Yellow-bellied Sapsucker	5.0*	9.5	0.7
Downy Woodpecker	-2.2	4.2	-8.3
Hairy Woodpecker	2.3	12.4	-6.8
Northern Flicker	-6	3.0	-14.3
Pileated Woodpecker	-4.3	2.7	-10.7
Eastern Wood-Pewee	-1.5	3.6	-6.3
Yellow-bellied Flycatcher	2	34.4	-22.6
Least Flycatcher	1	10.3	-7.5
Eastern Phoebe	-0.8	19.8	-17.8
Great Crested Flycatcher	2.7	8.4	-2.7
Tree Swallow	1	26.8	-19.6
Blue Jay	1.5	5.7	-2.5
American Crow	0.8	6.2	-4.3
Black-capped Chickadee	-4.7*	-0.8	-8.4
Common Raven	-0.8	11.7	-11.8
Red-breasted Nuthatch	1.8	12.3	-7.7
White-breasted Nuthatch	-0.4	8.8	-8.8
Brown Creeper	-1.8	7.1	-9.9
House Wren	-4.5	12.5	-19.0
Winter Wren	-1.9	5.5	-8.7
Golden-crowned Kinglet	-12.7*	-2.8	-21.7
Blue-gray Gnatcatcher	3.9	24.6	-13.4
Veery	2.9n	5.8	0.0
Swainson's Thrush	-2.6	7.6	-11.9
Hermit Thrush	1.2	11.1	-7.9
Wood Thrush	0.9	9.5	-7.0
American Robin	-2.6	1.8	-6.8
Gray Catbird	-5	8.2	-16.6
Cedar Waxwing	-9.9*	-3.2	-16.2
Solitary Vireo	4.7	17.3	-6.6
Yellow-throated Vireo	-0.8	21.7	-19.1
Warbling Vireo	-1.5	17.7	-17.5
Red-eyed Vireo	1.6	4.2	-1.0
Nashville Warbler	-1	5.8	-7.3
Yellow Warbler	18.8*	27.7	10.6
Chestnut-sided Warbler	3	14.7	-7.6
Magnolia Warbler	1.1	9.1	-6.3
Black-throated Blue Warbler	8.2*	15.8	1.1
Yellow-rumped Warbler	1.9	9.5	-5.1
Black-throated Green Warbler	0.6	6.0	-4.5
Blackburnian Warbler	-3.6	1.4	-8.3
Pine Warbler	9.4*	19.2	0.4
Bay-breasted Warbler	-10	12.4	-27.9
Cerulean Warbler	5.3	29.7	-14.5
Black-and-white Warbler	0.7	8.7	-6.6
American Redstart	9.0*	14.9	3.5
Ovenbird	-2.2n	6.5	-10.3
Northern Waterthrush	4.6	12.6	-2.9
Mourning Warbler	-4.6	9.7	-17.1
Common Yellowthroat	-1.4	8.3	-10.3
Canada Warbler	4.6	16.6	-6.1
Scarlet Tanager	-0.2	8.1	-7.9
Northern Cardinal	6.6	17.5	-3.4
Rose-breasted Grosbeak	-1.1	2.4	-4.4
Indigo Bunting	4.9	15.7	-4.9
Eastern Towhee	-5.5	8.4	-17.7
Chipping Sparrow	-1.7	8.0	-10.5
Song Sparrow	-6	2.3	-13.5
Swamp Sparrow	3.2	18.3	-9.9
White-throated Sparrow	-0.9	4.0	-5.5
Dark-eyed Junco	-7.7	13.9	-25.2
Red-winged Blackbird	1.4	11.0	-7.3
Common Grackle	4.7	15.2	-4.9
Brown-headed Cowbird	-1.9	12.1	-3.7
Northern Oriole	0.7	9.3	-7.2
Purple Finch	9.2n	18.6	0.6
American Goldfinch	0.6	7.5	-5.8
Evening Grosbeak	10.7	29.6	-5.5

by the Migration Monitoring Program. Although Yellow Warblers aren't commonly observed in most mature forest sites, their general population increase is being picked up by the FBMP. Conversely, the statistically significant increase in Black-throated Blue Warbler on FBMP sites is not being reflected in BBS results. One possible explanation is that the species is beginning to increase, but is first doing so in the larger, more mature sites sampled by FBMP.

As part of the FBMP, we have also collected information on the vegetation and landscape characteristics of each FBMP site, which will allow us to determine not only how these factors affect the composition of the bird community, but also how they influence trend. We will be able to test, for example, whether large sites have more stable populations of Ovenbirds, or whether the chickadee decline is occurring in a particular type of forest.

Poorly-located or unmonitored nest boxes allow competitors a foothold in the area, from which they can usurp even well-maintained boxes. Every effort should be made to remove nest boxes from bluebird trails that will no longer be monitored and maintained. Adequate predator protection ensures that bluebirds attracted to nest boxes have a reasonable chance of success.

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History and current status of the Eastern Bluebird

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The Eastern Bluebird (*Sialia sialis*) is a cherished sight for birdwatchers across its range in eastern North America. It held a special place in the folklore of our early settlers who welcomed it as a true harbinger of spring. Originally, bluebirds were limited to forest fire burns, clearings created by indigenous peoples, prairie openings and edge areas. The settlers did much to provide new nesting habitat for bluebirds by clearing the dense forests that covered eastern North America. The wooden posts and uprooted trees that fenced farm fields and enclosures provided a new source of nest cavities. These combined factors helped bluebirds become abundant across eastern North America, likely reaching population peaks in the mid- to late 1800s.

The introduction of species like the House Sparrow and European Starling in the mid- to late-19th century created problems for bluebirds nesting in settled areas. These more aggressive species out-compete bluebirds for nesting cavities resulting in low bluebird productivity. However, both these competitors show significant long-term population declines across most of their range according to BBS data (1966-94 Canada-wide trends: HOSP -2.0, $N=379$, $p<0.05$; EUST -1.7, $N=484$, $p<0.05$).

Despite this competition, bluebirds remained common to abundant well into the 20th century, and were still common in the 1940s. After that time, changing farm practices (including larger farms, fewer wooden posts, more T-bars and barbed wire) reduced the available nest cavities, as did the expansion of urban areas.

Cold weather, on both the wintering and breeding grounds, can also severely reduce bluebird numbers. Up until the 1940s, populations appeared to recover to former levels within a few years of weather-related declines. After about 1950, however, rebounds appear to fail, and declines continued until the drastic losses following the harsh winters of 1978-79 and 1979-80. This failure to recover may be partly linked to the expansion of starlings from urban to rural areas.

The North American Bluebird Society (NABS) was founded in 1978 to respond to the continued decline of the Eastern Bluebird by establishing nest box trails. Bluebird trails are believed to have played a major role in bringing bluebirds back to many areas, and provide a means to monitor populations. In Canada, the Ontario Eastern Bluebird Society (OEBS), through its Nest Box Survey, has asked volunteers to report on the occupancy, number of eggs and fledging success of bluebirds since 1987. Nest box trails in other parts of Canada also provide data useful for estimating Eastern Bluebird population levels.

Status

In 1984, concern over declining bluebirds resulted in *vulnerable* status from the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (Risley, 1984). At that time, the known Canadian population was only 383 pairs, although the actual population was thought to be closer to 1000 pairs. Since then, population estimates have been revised as new data were gathered. The *Ontario Breeding Bird Atlas* (Risley 1987) documented breeding evidence for Eastern Bluebirds in 702 of

1824 squares with between 2 and 10 pairs in most squares. The OEBS nest box summary (McNicholl et al., 1994) reported that , in 1987, 1222 pairs fledged approximately 4950 young thanks to milder winters and monitored, predator-proof nest boxes. The Ontario population is likely higher than given in the atlas.

Breeding was confirmed in 423 squares during the Atlas of Breeding Birds of Southern Quebec (Banville and Robert 1996). Because several pairs often breed in one 10km x 10km atlas square, this number likely underestimates the population. The ÉPOQ checklist program cites significant increases in bluebirds from 1970-1991, but this is at least partly due to birds moving from natural forest-edge cavities to nest box trails where they are more readily detected (Fragnier 1995).

The Maritimes Breeding Bird Atlas (Erskine 1992) estimates fewer than 300 pairs in New Brunswick, and approximately 30 pairs in Nova Scotia and 5 in Prince Edward Island. Forest clearcuts provide a new source of habitat, and numbers of birds are believed to be increasing. Interestingly, bluebirds in the Maritimes have been slow to accept nest box trails, and only a few have attracted birds (Erskine 1992).

The Eastern Bluebird also appears to be increasing in the western part of its range, although the available data are largely anecdotal. Approximately 400 pairs now nest in Manitoba (Read and Alvo 1996), but fluctuations in numbers follow cold winters and yearly variation in bluebird trail effort. Bird atlases report confirmed breeding in 21 squares, and unconfirmed breeding in 9 others in Saskatchewan (Smith 1996), and 1 confirmed breeding record in Alberta (Semenchuck 1992). Eastern Bluebirds are gradually replaced by Mountain Bluebirds at the western edge of their range.

Eastern Bluebird populations have increased over the last decade (Tables 7 and 8), earning a revised status of *not at risk*. An updated status report (Read and Alvo, 1996) recommends annual monitoring through nest box surveys. Currently, only Ontario has a standardized program, which may adequately monitor national status. Bluebirds will always be vulnerable to harsh winters, but continued effort to maintain both natural and man-made nesting cavities should ensure the continued presence of these lovely birds.

Table 7. Number of known pairs of Eastern Bluebirds in Canada, 1980 and 1996 (from Read and Alvo 1996).

Province	1980	1996
Nova Scotia	0	30
New Brunswick	1	300
Prince Edward Island	0	5
Quebec	56	273
Ontario	236	2060
Manitoba	50	400
Saskatchewan	40	15
Alberta	0	1
Canada	**383**	**3049**

Table 8. Canadian Breeding Bird Survey trends for Eastern Bluebird by ecoregion and nationally[1].

Ecoregion	1966-94	1966-79	1980-94
Boreal Shield	2.7*	7.6	3.6
Mixedwood Plains	1.2	10.7*	4.1*
Canada	2.0*	-1.2	4.5**

* = 0.05<p<0.15; ** = p<0.05

[1] from Downes and Collins 1996.

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Using trend data in setting priorities for Canada's landbirds

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The Canadian Wildlife Service (CWS) recently completed a priority-setting exercise for landbirds as a contribution to Partners in Flight-Canada (Dunn 1997). This article gives a brief overview of the system and the importance of good population trends in making it work well.

CWS could have used one of several existing schemes to rank species' importance, but the complexity of the more popular schemes makes it quite difficult to understand why a particular species ranks highly. The CWS system instead uses a simple, limited set of criteria; all the data (and sources) have been put into a database made available to users.

The main unique feature of the CWS system is that it calculates two separate sets of ranks. The first is a *Supervisory Responsibility* list, based on the proportion of a species' North American breeding range in Canada. Birds that breed almost wholly in Canada are especially important for us to look after, because no one else can. We therefore need to ensure that our land-use does not endanger species ranking highly on this scale.

The second set of ranks is based on *Concern*. This rank depends on two factors equally: *Population Trend* and *Vulnerability* (a composite score that reflects abundance, and breadth of breeding and of wintering range). High *Vulnerability* score indicates that a species could be severely impacted by fairly local events, while high *Trend* score is our best early warning of actual trouble for a species (whether it is widespread or not). It is important to note that *Concern* scores are preliminary, and need to be refined through consideration of additional criteria before they are used in setting priorities for on-the-ground conservation action for individual species.

Many people feel some responsibility for protecting species of high *Concern*, whether or not they rank highly in Canadian *Supervisory Responsibility*, but species ranking highly on both lists surely deserve extra attention. Table 9 lists the Canadian species that are of high concern because they are declining nationally. These are grouped according to level of Canadian *Supervisory Responsibility*. This table helps us put declines into a context which can guide our conservation priorities. For example, Henslow's Sparrow and Band-tailed Pigeon (about two-thirds of the way down Table 9) are both declining as severely as Rusty Blackbird and Blackpoll Warbler (at the top of Table 9), but the blackbird and warbler are distinctively Canadian, whereas the former are primarily U.S. species with only the northern fringe of their range in Canada. This distinction may affect our actions. Canadians should be particularly concerned with finding the causes of decline in the Rusty Blackbird and Blackpoll Warbler, while work on the other two species should be closely coordinated with work in the U.S. (since actions taken in Canada alone can have little effect on the species as a whole). Also shown in Table 9 is a preliminary indicator of trend uncertainty, which can guide our priorities for improving BBS coverage or finding alternate sources of data. Relatively few species have highly uncertain trends, but some of these are of high importance to Canada (e.g. Gray-cheeked Thrush). Certain other high *Responsibility* species with high trend uncertainty do not appear in Table 9 because the limited data we have do not indicate strong declines; these too should be considered high priority for better monitoring in case they are actually in more trouble than we realize. By contrast, certain other species with poor data, such as Yellow Wagtail and Siberian Tit (bottom of Table 9) are Old World species with only tiny populations in Canada, and may not deserve specialized monitoring effort.

Table 9. Canadian songbird species with long-term population declines of -1% per year or more.

Species	Canadian Supervisory Responsibility[1]	Trend[2]		Trend Uncertainty[3]
Rusty Blackbird	VH	-5.7	*	M
Blackpoll Warbler	VH	-4.9	*	M
Boreal Chickadee	VH	-4.6	*	M
Canada Warbler	VH	-2.3		M
Harris's Sparrow	VH	-2.2	*	M
Yellow-bellied Sapsucker	VH	-1.7		M
White-throated Sparrow	VH	-1.7	*	M
White-winged Crossbill	VH	-1.4		H
Clay-colored Sparrow	VH	-1.2	*	M
Sprague's Pipit	H	-6.9	*	L
Blue Grouse	H	-4.6	*	M
Black Swift	H	-3.3		L
Purple Finch	H	-2.7	*	M
Pine Grosbeak	H	-2.5		M
Rufous Hummingbird	H	-2.2		M
Ruffed Grouse	H	-2.1	*	M
American Pipit	H	-2.1	**	M
Snow Bunting	H	-2.1		M
American Tree Sparrow	H	-2.1	**	M
Pine Siskin	H	-1.8		M
Gray-cheeked Thrush	H	-1.6		H
White-crowned Sparrow	H	-1.5	**	M
Bohemian Waxwing	H	-1.5		M
Sharp-tailed Grouse	H	-1.4		M
Bicknell's Thrush	H			H
McCown's Longspur	M	-8.2		L
Chestnut-backed Chickadee	M	-3.3		L
Olive-sided Flycatcher	M	-2.3	*	M
Bobolink	M	-2.1	*	L
Bank Swallow	M	-1.8		M
European Starling	M	-1.7	*	L
Veery	M	-1.5	*	L
MacGillivray's Warbler	M	-1.3		M
Northern Flicker	M	-1.3	*	M
Song Sparrow	M	-1.3	*	M
Baird's Sparrow	M	-1.1		L
Rosy Finch	L	-3.2		M
American Dipper	L	-3.1	*	M
House Sparrow	L	-2	*	L
Chestnut-collared Longspur	L	-1.8		L
Rose-breasted Grosbeak	L	-1.6		L
Townsend's Warbler	L	-1.5		M
Brown-headed Cowbird	L	-1.5	*	L
Whip-poor-will	L	-1.4		L
Barn Swallow	L	-1.1	*	M
Black-billed Cuckoo	L	-1		L
Henslow's Sparrow	VL	-8.3	**	L
Chukar	VL	-6.6	*	L
Band-tailed Pigeon	VL	-6.3	*	L
Lark Bunting	VL	-5.1		L
Chimney Swift	VL	-4.9	*	L
Canyon Wren	VL	-4.6		L
Cerulean Warbler	VL	-4.3	**	L
Loggerhead Shrike	VL	-4.1	*	L
Crested Myna	VL	-4		L
Eurasian Skylark	VL	-4		M

Table 9 (concluded).

Species	Canadian Supervisory Responsibility[1]	Trend[2]		Trend Uncertainty[3]
Eastern Meadowlark	VL	-3.7	*	L
Wood Thrush	VL	-3.4		L
Lewis's Woodpecker	VL	-3.1		L
Lark Sparrow	VL	-2.8		L
Prairie Warbler	VL	-2.7	**	L
Northern Bobwhite	VL	-2.4	**	L
White-throated Swift	VL	-2.4		L
Eastern Wood-Pewee	VL	-2.2	*	L
Ring-necked Pheasant	VL	-2.1		L
Brown Thrasher	VL	-2.1	*	L
Common Grackle	VL	-2	*	M
Scarlet Tanager	VL	-1.9		L
Prothonotary Warbler	VL	-1.7	*	L
Bewick's Wren	VL	-1.7		L
Grasshopper Sparrow	VL	-1.6		L
Dickcissel	VL	-1.6	**	L
Chuck-will's-widow	VL	-1.4	**	L
Bushtit	VL	-1.3	*	L
Gray Catbird	VL	-1.3	*	L
Red-headed Woodpecker	VL	-1.1		L
Western Meadowlark	VL	-1.1	*	L
Yellow Wagtail	VL			H
Siberian Tit	VL			H

[1] *Supervisory Responsibility* scores based on proportion of North American breeding range in Canada (see numbers in parentheses below), adjusted downward for species with 25% of global range outside North America (details in Dunn 1997).
VH Very High (>80% North American breeding range in Canada);
H High (61-80%);
M Medium (41-60%);
L Low (20-40%);
VL Very Low (<20%).

[2] Trend (expressed in percent change in population size per year) is from data source indicated in Table 1, pp. 6-9 of this issue.
* indicates probability of a chance result is <5%;
** indicates probablilityof a chance result is <1%.

[3] Trend uncertainty:
"L" (low) indicates data from BBS, with more than half of Canadian breeding range sampled;
"M" (medium) indicates that 2% of Canadian breeding range is sampled by BBS, *or* the source was a survey less standardized than BBS;
"H" (high) indicates no data, or trend results with a high degree of uncertainty.

Many of our high *Supervisory Responsibility* species that have moderate trend uncertainty are northern-nesting birds with less than half their Canadian breeding range sampled by BBS. This does not necessarily mean that the BBS data which are available are inaccurate, only that it is particularly important to consult additional sources of trend data which sample the entire population (such as migration monitoring, or, for some species, Christmas Bird Counts). Finally, low trend uncertainty in Table 9 indicates that most of the species' range is covered by BBS. Nonetheless, sampling could still be inadequate (e.g. for rare or secretive species). Power analyses can help us assess sampling quality, and we may wish to consider the Supervisory Responsibility and Concern rankings in selecting a high priority group of species for such an analysis.

This brief article gives only a few examples of how data from the priority-setting system can be used to direct conservation efforts or to set goals for better monitoring, but much more is possible. People wishing to use the landbird database can request MS Access or dBASE IV versions from:

Judith Kennedy, Bird Conservation Bio-

logist, Canadian Wildlife Service
tel: (819) 953-4390; fax: (819) 994-4445;
email: Judith.Kennedy@ec.gc.ca

References:

Dunn, E.H. 1997. *Setting priorities for conservation, research and monitoring of Canada's landbirds.* Can. Wildl. Serv. Tech. Rept. No. 293, Ottawa.

Landbirds at Risk In Canada

Lisa Twolan, Canadian Wildlife Service, Hull, QC

***B**ird Trends* first summarized Canada's threatened and endangered birds in 1991. Since then, two landbird species* (excluding raptors) were delisted by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), two others were uplisted and 11 species were newly listed. Delisted species are considered no longer at risk in Canada, whereas uplisted species were moved to a higher category of risk.

The Eastern Bluebird was delisted by COSEWIC in 1996. The article on page 23 outlines the population changes leading to this decision. Population increases are largely attributed to increased breeding success through the use of nest boxes.

The other species delisted in 1996 is Baird's Sparrow, a grassland species that breeds in southeastern Alberta, southern Saskatchewan and southern Manitoba. It was first listed as threatened in 1989, when its numbers and range appeared to be declining in both Canada and the U.S.. Population estimates were unavailable, but BBS data indicated declining abundance along prairie routes since 1970. A national recovery team approved a 1992 recovery plan to direct research, population and distribution surveys, and evaluate nesting areas. In 1995, population counts from the southern prairies showed the bird was more common in some habitats than initially thought. The team commissioned an updated status report and COSEWIC delisted the species in 1996. Although Baird's Sparrow has been delisted, the decline in available grassland habitat remains a potential cause for concern for the species.

The number of Henslow's Sparrows has declined since the 1950's, likely due to loss of suitable breeding habitat. Its status was uplisted to endangered in 1993 because few breeding pairs remain, most colonies comprise only one pair, and little information is available on the amount of suitable habitat remaining in Canada. The national recovery team coordinates surveys of large areas of suitable habitat in Ontario, is restoring native grassland in the Prince Edward Point National Wildlife Area, and participated in experimental habitat management on a former nesting site. Currently, the sparrow remains at severe risk of disappearing from Canada.

The Prothonotary Warbler, another species that breeds only in southern Ontario, was uplisted to endangered in 1996 following continued population declines in the '80s and early '90s. The population is estimated at 13 pairs in two sites along Lake Erie and one possible site near Hamilton. The national recovery team hopes to reverse the declining population trend in southwestern Ontario, and maintain a stable or increasing population by the year 2001. A nest box program carried out in the summer of 1997 showed signs of success and will be expanded in 1998.

The Cerulean Warbler typically breeds in mature deciduous forest in the southern Great Lakes-St. Lawrence and Carolinian Forest Zones of southern Ontario and extreme south-western Quebec. In 1993, COSEWIC listed the Cerulean Warbler as vulnerable, partly due to its relatively small Canadian population (between 700 and 3000 breeding pairs) and its local and peripheral breeding range. Other reasons include: significant population declines in the U.S., high losses of breeding and wintering habitat, and few quantitative data on its biology or Canadian population trends.

An "Endangered" species is one that faces imminent extirpation or extinction, a "Threatened" species is likely to become endangered if limiting factors are not reversed, and a "Vulnerable" species is of special concern because of characteristics that make it particularly sensitive to human activities or natural events.

* Species - Any indigenous species, subspecies, variety or geographically defined population of wild fauna and flora.

The BC population of the Yellow-breasted Chat was listed as threatened in 1994. A distinct population of the prairie subspecies, almost all known territories are located along the Okanagan and Similkameen rivers. Its habitat is slowly being destroyed and only a few sites in the province sustain more than one chat territory. Conservation measures for this species, along with the Sage Thrasher and White-headed Woodpecker, form part of the South Okanagan Ecosystem Recovery Plan in preparation. Together, the BC and Ontario populations of the Yellow-breasted Chat amount to fewer than 50 breeding pairs annually. Chat numbers have also declined at Point Pelee National Park, one of Ontario's most important breeding sites. Now absent from Rondeau Provincial Park, the species appears to be stable on Pelee Island. The eastern population was designated vulnerable in 1994.

Two additional Carolinian bird species were newly listed in 1994, the endangered Acadian Flycatcher and the threatened Hooded Warbler. Population estimates for the two species were 38 individuals and 80-176 breeding pairs, respectively. Clearing and fragmentation of most of the large Carolinian forests have reduced the quality and quantity of their forest interior habitat. A combined recovery plan is underway for these species, starting with thorough surveys during the 1998 field season.

The Sage Thrasher received endangered status in 1992. Its historical breeding range includes the southern interior of BC, and casual records from southwestern Alberta and Saskatchewan. For the last two decades, the Sage Thrasher has bred only in the Okanagan and Similkameen Valleys with only 5-10 pairs present since 1980. This species depends on sagebrush habitat during the breeding season, but range management practices such as mowing, burning, and herbicide use have reduced its availability. Residential and agricultural development also contribute to habitat loss.

Four non-passerine landbirds have been newly listed by COSEWIC: two woodpeckers, and two upland game birds. The White-headed Woodpecker of the southern Okanagan relies on mature to old-growth stands of ponderosa pines for nesting and feeding. Its specific habitat needs, its shrinking habitat and its population size of less than 100 individuals earned it threatened status in 1992. The Red-headed Woodpecker occurs in the southern regions of Manitoba, Saskatchewan and Ontario, and south-western Quebec. Although it is believed to be secure on the global scale, it has declined throughout most of its range in North America, including all provinces in its Canadian breeding range. The Red-headed Woodpecker was designated vulnerable in 1996, largely due to loss of forest habitat, including the removal of dead trees and branches. This species is also affected by intensive agricultural practices, competition from starlings and increased road traffic.

The Northern Bobwhite reaches its northern limit in Ontario, the only province in which it is native, and has shown large fluctuations in numbers and range over time. By the mid 1800s it was considered common in southern Ontario. Factors including more intensive farming practices, severe winters, continued habitat destruction and herbicide use have all contributed to its decline to 185 individuals in 1989/90. Low population numbers, combined with threats to remaining habitat and the need for a management program, resulted in endangered status in 1994.

The largest of the Canadian grouse, the Sage Grouse is found in southeastern Alberta and southwestern Saskatchewan near the Montana border. It relies on hoary sagebrush for cover, nesting sites and food, but this habitat is threatened by increased development. Populations have declined over their entire range, and they have been eliminated from some parts of their former range. The BC population was listed as extirpated, and the prairie population as threatened, in 1997.

References:

Status reports for each of the species reviewed in this article are available from the COSEWIC Secretariat, c/o Canadian Wildlife Service, Environment Canada, Ottawa, ON, K1A 0H3, Tel: (819) 997-4991, Fax: (819) 953-6283, email:Sylvia.Normand@ec.gc.ca

Menu of volunteer-based ornithological programs in Canada

This list includes only projects that document species abundance and population trends. For a more complete listing of programs that monitor landbirds, you may obtain a copy of the *Canadian Landbird Monitoring Strategy* from: Connie Downes, Migratory Bird Populations Division, National Wildlife Research Centre, Environment Canada, Ottawa K1A 0H3; 819-953-1425 tel; 819-953-6612 fax; Connie.Downes@ec.gc.ca.

Distributional Studies

Bird banding.

Lucie Métras
Bird Banding Office,
National Wildlife Research Centre,
Canadian Wildlife Service,
Ottawa, ON K1A 0H3
tel (819) 997-4213, fax (819) 953-6612
email: Lucie.Metras@ec.gc.ca

Seasonal summaries of bird sightings.

Continent-wide summary published each season in *American Birds*. Participants supply sightings to regional coordinators.

National Audubon Society,
700 Broadway,
New York, NY 10003
tel (212) 979-3000

Studies of Abundance and Population Trends

Breeding Bird Survey (BBS).

Connie Downes,
Migratory Bird Populations Division,
Canadian Wildlife Service,
National Wildlife Research Centre,
Hull, PQ K1A 0H3
tel (819) 953-1425, fax (819) 953-6612
email: Connie.Downes@ec.gc.ca

Canadian Lakes Loon Survey (CLLS).

Russ Weeber
Bird Studies Canada
P.O. Box 160
Port Rowan, ON N0E 1M0
tel (519) 586-3531, fax (519) 586-3532
email: aqsurvey@bsc-eoc.org

Checklist programs

Alberta Bird Survey Checklist.
Trevor Wiens
Federation of Alberta Naturalists
Box 1472
Edmonton, AB T5J 2K5
tel (403) 453-8629

NWT Bird Survey Checklist
Vicki Johnston, CWS
P.O. Box 637
Yellowknife, NT X1A 3S8
tel (403) 920-6789, fax (403) 873-8185
email: Vicki.Johnston@ec.gc.ca

Étude des Populations d'Oiseaux du Québec (ÉPOQ).
Jacques Larivée
ÉPOQ
194 Ouellet
Rimouski, PQ G5L 4R5
tel (418) 723-1880

Christmas Bird Counts (CBC).

Contact your local naturalist club for the name of the CBC coordinator in your area, or write:

Geoff LeBaron
National Audubon Society
700 Broadway
New York, NY 10003
tel (212) 979-3000

Forest Bird Monitoring Program (FBMP).

Mike Cadman
Canadian Wildlife Service
Ontario Region
75 Farquhar Street
Guelph, ON N1H 3N4
tel (519) 826-2094, fax (519) 826-2113
email: Mike.Cadman@ec.gc.ca

Hawk counts.

North American Hawk Migration Association
Seth Kellogg (Membership)
377 Loomis Street
Southwick, MA 01077, *or*

William Barnard (Chair)
Norwich University Biology Department
Northfield, VT 05663

Hawkwatches.
(i) Ontario**:**

Bruce Peninsula
Mark Wiercinski
Box 9
Heathcote, ON N0H 1N0
tel (519) 599-3322

Greater Toronto Raptor Watch (Sept.1-Dec.)
(Cranberry Marsh / High Park)
John Barker
27 Horizon Crescent,
Scarborough, ON M1T 2G2
tel (416) 291-1598

Hawk Cliff (Sept.1 - Nov.30)
Su Ross
483 George Street
Port Stanley, ON N5L 1H1
tel (519) 782-4152

Holiday Beach (Sept.1 - Nov.30).
Bob Pettit, President
23393 Meadows Avenue
Flat Rock, MI 48134, USA
tel (313) 379-4558

or Hank Hunt, Canadian Vice-President
tel (519) 948-7015

Niagara Peninsula (March 1 - May 15).
Mike Street
73 Hatton Drive
Ancaster, ON L9G 2H5
tel (905) 648-3737 (evenings)

(ii) Alberta**:**

Calgary Hawkwatch
Wayne Smith
8220 Elbow Drive
Calgary, AB T2V 1K4
tel (403) 255-0052

Alberta Hawkwatch
Peter Sherrington
Eagle Monitoring
R.R. 2
Cochrane, AB T0L 0W0
tel (403) 932-5183

Manitoba Breeding Bird Atlas.

George Holland
Manitoba Naturalists' Society
401-63 Albert Street,
Winnipeg, MB R3B 1G4
tel (204) 489-6539, but prefer written enquiries.

Maritimes Shorebird Survey.

Peter Hicklin
Canadian Wildlife Service, Atlantic Region
P.O. Box 1590
Sackville, NB E0A 3C0
tel (506) 364-5029, fax (506) 364-5062,
email: Peter.Hicklin@ec.gc.ca

Marsh Monitoring Program.

Russ Weeber,
Long Point Bird Observatory
P.O. Box 160
Port Rowan, ON N0E 1M0
tel (519) 586-3531, fax (519) 586-3532
email: rweeber@bsc-eoc.org

Migration Monitoring Program (MMP)

Bird Studies Canada.
Jul Wojnowski
P.O. Box 160
Port Rowan, ON N0E 1M0
tel (519) 586-3531, fax (519) 586-3532
email: lpbo@bsc-eoc.org

Migration Monitoring/Banding Stations:

Rocky Point.
Michael Shepard
306-825 Cook St.,
Victoria, BC V8V 3Z1
tel (250) 380-9195 (H)
email: mgs@islandnet.com

Sea Island.
Tom Plath
330-9411 Glendower
Richmond, BC V7A 2Y6
tel 604-272-9206 (H)

Mackenzie Nature Observatory.
Vi Lambie or Alan Simcoe,
c/o MacKenzie Nature Observatory
P.O. Box 149
Mackenzie, BC V0J 2C0
tel Vi Lambie (250) 997-6876 (H)
email: lambiedav@cnc.bc.ca
or Alan Simcoe (250) 997-4875 (H)
(250) 997-2634 (W), fax (250) 997-2639

***Vaseux Lake*.**
Rhonda Millikin, CWS
R.R. 1 Delta, 5421 Robertson Rd.
Vancouver, BC V4K 3N2
tel (604) 940-4669, fax (604) 946-7022
email: Rhonda.Millikin@ec.gc.ca

Canal Flats.
Rhonda Millikin, CWS
R.R. 1 Delta, 5421 Robertson Rd.
Vancouver, BC V4K 3N2
tel (604) 940-4669, fax (604) 946-7022
email: Rhonda.Millikin@ec.gc.ca

Beaverhill Bird Observatory.
Jason Duxbury
Beaverhill Bird Observatory
P.O. Box 1418, Edmonton, AB T5J 2N5
tel (403) 430-1694 (H)
email: jduxbury@pop.srv.ualberta.ca

Lesser Slave Lake Bird Observatory.
Steve Lane or Frank Fraser
P.O. Box 1076
Slave Lake, AB T0G 2A0
F. Fraser:tel (403) 849-7100 (W)
email: gabfras@telusplanet.net *or*
S. Lane: tel (403) 849-5114 (H) (403) 849-5723 (W)
fax (403) 849-2633. email: lslbo@telusplanet.net

Inglewood Bird Sanctuary.
Doug Collister
3426 Lane Cr. SW
Calgary, AB T3E 5X2
tel (403) 240-1635 (H); (403) 246-2697 (W)
fax (403) 246-2697. email: collis@telusplanet.net

Last Mountain Bird Observatory.
Al Smith, Canadian Wildlife Service
Prairie & Northern Region
115 Perimeter Rd.
Saskatoon, SK S7N 0X4
tel (306) 975-4091 (W); fax (306) 975-4089
email: Alan.Smith@ec.gc.ca

Delta Marsh Bird Observatory.
Heidi den Haan
R.R. 1, Box 1Portage la Prairie, MB R1N 3A1
tel (204) 239-4287; fax (204) 239-5950
email: hdenhaan@umanitoba.ca

Thunder Cape Bird Observatory.
Nick Escott
133 South Hill St..
Thunder Bay, ON P7B 3T9
tel (807)345-7122 (H)
email: escott@loon.norlink.net

Whitefish Point Bird Observatory.
Russell Utych, WPBO
16914 N. Whitefish Point Rd.
Paradise, MI 49768
tel (906) 492-3596; fax (906) 492-3954

Long Point Bird Observatory.
Jul Wojnowski, LPBO
P.O. Box 160
Port Rowan, ON N0E 1M0
tel (519) 586-3531, fax (519) 586-3532
email: lpbo@bsc-eoc.org

Innis Point Bird Observatory.
Bill Petrie
P.O. Box 72137, Kanata North RPO
Kanata, ON K2K 2P4.
tel (613) 820-8434 (H); (613) 721-9686 (W)
fax (613) 721-9528. email: wfpetrie@magi.com

Prince Edward Point Bird Observatory.
Eric Machell
P.O. Box 2
Delhi, ON N4B 2W8
tel (519) 582-4738 (H)

Toronto Bird Observatory.
Lori Nichols,
Box 439, 253 College St.,
Toronto, ON M5T 1R5.
tel 416-604-8843 (H).
email: nkhsin@netrover.com.

Haldimand Bird Observatory.
John Miles
P.O. Box 449
Jarvis, Ontario N0A 1J0
tel (519) 587-5223 (H), email: miles@kwic.com

Tadoussac.
Jacques Ibarzabal,
1824 Sainte-Famille
Jonquiere, QC G7X 4Y3
tel (418) 542-2560 (H)
email: jhawk.ibarzabal@sympatico.ca

Grand Manan Bird Observatory.
Brian Dalzell
P.O. Box 145
Castalia, NB E0G 1L0
tel (506) 662-8650 (H)

Brier Island.
Lance Laviolette
R.R. 1
Glen Robertson, ON K0B 1H0
tel (613) 874-2449 (H)
(514) 340-8310 ext. 7642 (W)
email: lance.laviolette@lmco.com

Atlantic Bird Observatory (Bon Portage Island and Seal Island, NS).
Phil Taylor
Dept.of Biology, Acadia University
Wolfville, NS B0P 1X0
tel (902) 585-1287 (W); fax (902) 585-1059
email: philip.taylor@acadiau.ca

Point Lepreau.
Jim Wilson
Saint John Naturalists' Club
2 Neck Rd.
Quispamsis, NB E2G 1L3
tel (506) 847-4506 (H); fax 506)849-0234
email: jgw@nbnet.nb.ca

Monitoring Avian Productivity and Survivorship (MAPS).

Standardized constant-effort bird-banding to estimate population size and productivity. Banding permit required. Continent-wide, but limited coverage. Contact your local banding group, or:

Lucie Métras
Bird Banding Office
National Wildlife Research Centre
Canadian Wildlife Service
Ottawa, ON K1A 0H3
tel (819) 997-4213, fax (819) 953-6612
email: Lucie.Metras@ec.gc.ca

Project FeederWatch.

Vince Deschamps, Project FeederWatch
Bird Studies Canada
P.O. Box 160
Port Rowan, ON N0E 1M0
tel (519) 586-3531, fax (519) 586-3532
email: pfw@bsc-eoc.org

Nest Record Schemes

Compilation of records from individual nests (habitat, clutch size, success, etc.).

British Columbia.

Wayne Campbell
Ministry of Environment, Lands and Parks
4th floor, 2975 Jutland Rd.
Victoria, BC V8T 9M1
tel (250) 356-1376

Prairies.

Herb Copland
Manitoba Museum of Man and Nature
190 Rupert Avenue
Winnipeg, MB R3B 0N2
tel (204) 956-2830, fax (204) 942-3679

Ontario.

George Peck, Ornithology
Royal Ontario Museum
100 Queen's Park Crescent
Toronto, ON M5S 2C6
tel (416) 586-5522

Quebec.

Michel Gosselin
Ornithology
National Museums of Canada
Ottawa, ON K1A 0M8
tel (613) 954-4951

Maritimes:

A.J. (Tony) Erskine
CWS Atlantic Region
P.O. Box 1590
Sackville, NB E0A 3C0
tel (506) 364-5035
fax (506) 364-5062

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- feedback to volunteers of ornithological surveys;
- information on trends in Canadian bird populations;
- a menu of volunteer-based ornithological projects in Canada.

 Additional information may be obtained from: Migratory Birds Conservation Division,
Canadian Wildlife Service, Ottawa, Ontario K1A 0H3, tel (819) 953-4390, fax (819) 994-4445,
email: Judith.Kennedy@ec.gc.ca

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