The Canadian Migration Monitoring Network - Réseau canadien de surveillance des migrations:

Ten-Year Report on Monitoring Landbird Population Change

Photo: Brendan Donaghey

Technical Report #1

by

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Réseau canadien de surveillance des migrations

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Canadian Migration Monitoring Network

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Canadian Migration Monitoring Network – Réseau canadien de surveillance des migrations

Member Stations and Affiliates:

Albert Creek Bird Observatory, YK
Amherst Point Migration Monitoring Station, NS
Atlantic Bird Observatory, NS
Ausable Bird Observatory, ON
Beaverhill Bird Observatory, AB
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Bruce Peninsula Bird Observatory, ON
Columbia River-Revelstoke Station, BC
Delta Marsh Bird Observatory, MB
Haldimand Bird Observatory, ON
Inglewood Bird Sanctuary, AB
Innis Point Bird Observatory, ON
Last Mountain Bird Observatory, SK
Lesser Slave Lake Bird Observatory, AB
Long Point Bird Observatory, ON
Mackenzie Nature Observatory, BC
McGill Bird Observatory, QC
Observatoire d'oiseaux de Tadoussac, QC
Pelee Island Bird Observatory, ON
Prince Edward Point Bird Observatory, ON
Rocky Point Bird Observatory, BC
St. Andrews Bird Banding Station, NB
Tatlayoko Bird Observatory, BC
Teslin Lake Bird Observatory, YK
Thunder Cape Bird Observatory, ON
Tommy Thompson Park Bird Research Station, ON
Vaseux Lake Bird Observatory, BC
Whitefish Point Bird Observatory, MI

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Abstract

The Canadian Migration Monitoring Network - Réseau canadien de surveillance des migrations (CMMN-RCSM) was formed in 1998 as a cooperative venture among a dozen independent migration monitoring stations, Bird Studies Canada and the Canadian Wildlife Service. Since then, the network has expanded to over 20 stations across Canada that monitor the spring and/or fall migration of over 150 species of landbirds, about 80 of which breed in Canada's boreal and other northern forests and are not well monitored by established breeding bird surveys.

In addition to participating in special collaborative research projects on migration and stop-over ecology, CMMN stations conduct daily counts of migrants during spring and/or fall migration. Up until 2006, 10 years of migration count data had been collected at 14 stations during at least one migration season. Using migration count data, we estimated annual population indices using a generalized linear model which controls for effects of date. Population trajectories (trends) in annual indices were then modeled for each species and station using linear models for stations having less than 10 years of data, and polynomial models for stations having 10 or more years of data.

Broad regional similarities in population trends were supported by positive between-station correlations of annual indices at relatively short interstation distances. However, correlations were zero or even negative beyond about 2000 km. Furthermore, trends within a region were more similar than trends among regions, with more positive trends in Ontario (spring and fall) and Western (fall) regions and more negative trends in Prairie (spring and fall) and Eastern (fall) regions.

Taken together across the country, population trends were not affected by migration strategy (temperate vs neotropical migrant) or by ecoregional association (boreal vs non-boreal). Hence, at the national level, roughly equal proportions of neotropical migrants and temperate migrants were declining or increasing. However, we did see regional differences in these patterns. For example, more species in the Prairie region exhibited negative trends in spring and fall for both neotropical and temperate migrants (including species breeding in the boreal forest) than other regions of Canada.

Breeding Bird Survey (BBS) coverage in Canada is primarily restricted to the southern part of the country. For species that have ranges that are predominantly within areas of high BBS coverage, good correlations would be expected between BBS regional trend statistics and those developed from migration monitoring. However, correlations would be expected to be weak or non-existent for species that breed predominantly in northern areas outside the main area of BBS coverage. To investigate this, we compared long-term annual indices and trends (1968-2006) at Long Point Bird Observatory with BBS statistics from Ontario. Results indicated that migration monitoring is indeed measuring a similar population signal to BBS for species breeding primarily in the south, particularly in spring. However, this relationship breaks down for species breeding primarily north of BBS coverage. By inference, these results further support the notion that migration monitoring can be used to effectively monitor the status of boreal/northern breeding birds where BBS coverage is weak.

Further scientific advances in migration monitoring are underway with the development of new analytical approaches and a large collaborative isotope project that will help reveal the geographic origins of birds sampled at migration stop-over sites.

Résumé

C’est en 1998 que le Réseau canadien de surveillance des migrations (RCSM) a été mis sur pied, à titre d’initiative conjointe. Il rassemblait une douzaine de stations indépendantes de surveillance des migrations, Études d’Oiseaux Canada et le Service canadien de la faune. Le réseau est passé depuis à plus de 20 stations situées dans l’ensemble du Canada qui assurent la surveillance des migrations du printemps ou d’automne de plus de 150 espèces d’oiseaux terrestres, dont environ 80 se reproduisent dans la forêt boréale ou dans d’autres forêts du Nord et font l’objet d’une surveillance incomplète dans le cadre des relevés établis des oiseaux nicheurs.

En plus de contribuer à des projets spéciaux de recherche conjointe portant sur les migrations et l’écologie d’étape, le personnel des stations du RCSM dénombre quotidiennement les oiseaux migrateurs au printemps, à l’automne ou durant les deux périodes de migration. À la fin de 2006, des données de dénombrement sur 10 ans avaient été recueillies à 14 stations au cours d’une période de migration au moins. À partir des relevés migratoires, nous avons établi des indices annuels de population en procédant par estimation au moyen d’un modèle linéaire général qui tient compte des effets de la période de l’année. Les projections (tendances) démographiques obtenues à partir des indices annuels ont ensuite été modélisées par espèce et par station, à l’aide de modèles linéaires dans le cas des stations possédant des résultats pour moins de 10 ans et de modèles polynomiaux dans le cas des stations possédant des résultats s’étendant sur au moins 10 ans.

L’obtention de corrélations positives par comparaison entre eux des indices annuels de diverses stations assez rapprochées les unes des autres a permis de confirmer l’existence de grandes lignes de ressemblance entre les régions sur le plan des tendances démographiques. Toutefois, pour les stations situées à plus de 2000 km de distance les unes des autres, les corrélations prennent une valeur nulle ou même négative. De plus, les tendances observées au sein d’une même région sont plus étroitement apparentées qu’elles ne le sont entre les régions. Les tendances sont davantage positives dans les régions de l’Ontario (au printemps et à l’automne) et de l’Ouest (à l’automne), et elles sont davantage négatives dans les régions des Prairies (au printemps et à l’automne) et de l’Est (à l’automne).

À l’échelle du pays, la stratégie de migration (populations migratrices des régions tempérées par opposition aux populations néotropicales) et l’association écorégionale (populations boréales ou non boréales) n’influent pas sur les tendances démographiques. C’est donc dire que les migrateurs néotropicaux et les migrateurs des régions tempérées sont en déclin ou en hausse dans des proportions sensiblement égales dans tout le Canada,. Nous avons cependant observé des écarts régionaux quant à ces tendances. Par exemple, un plus grand nombre d’espèces migratoires des Prairies (tant des régions néotropicales que des régions tempérées, y compris les espèces nichant dans la forêt boréale) que des autres régions présente des tendances négatives au printemps et à l’automne.

Au Canada, la couverture du Relevé des oiseaux nicheurs se limite en bonne partie au sud du pays. Lorsqu’il s’agit d’espèces dont l’aire de répartition se trouve principalement dans les secteurs où la surveillance est étendue, on est en droit de s’attendre à de bonnes corrélations entre les tendances régionales associées à ces derniers et les tendances dérivées de la surveillance des mouvements migratoires. À l’inverse, les corrélations devraient être peu marquées, voire inexistantes dans le cas des espèces se reproduisant surtout hors des principaux secteurs de couverture. Pour vérifier cette hypothèse, nous avons comparé sur une longue échelle les indices annuels et les tendances (1968-2006) relevés à l’Observatoire d’oiseaux de Long Point et les statistiques du relevé de l’Ontario. D’après les résultats, la surveillance des mouvements migratoires permet effectivement de mesurer un signal démographique semblable à celui mesuré au moyen du relevé lorsqu’il s’agit d’espèces nichant dans le sud, particulièrement au printemps. Toutefois, ce rapport ne se vérifie plus dans le cas des espèces nichant principalement au nord des secteurs ciblés par le relevé. Par inférence, ces résultats tendent à renforcer la notion à l’effet que la surveillance des mouvements migratoires peut servir à suivre l’état des populations des oiseaux nicheurs des régions boréales ou septentrionales, là où la couverture du relevé est incomplète.

Grâce à la mise au point de nouvelles méthodes d’analyse et à un important projet conjoint faisant appel à des isotopes pour aider à déterminer l’origine géographique de migrateurs capturés dans leurs haltes migratoires, de nouvelles percées scientifiques dans la surveillance des mouvements migratoires sont à portée de main.

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Introduction

In North America, the northward flood of millions of brightly coloured neotropical landbirds from their wintering grounds in Central and South America to their breeding grounds in the northern forest regions is one of the wonders of spring. In spring, neotropical migrants are preceded by temperate species, such as American Robin, that winter in the United States and southern Canada. In fall, the pattern of migration is generally reversed, with neotropical migrants preceding the hardier temperate species. Although the spring landbird migration generally attracts more attention than the fall migration, the number of migrants is actually much higher in fall with the addition of the new cohort of young birds.

The many species of warblers, thrushes, flycatchers, vireos, sparrows and other species that make up these bi-annual waves of migrants more than just mark the arrival of spring and fall, they are also considered to be barometers of the health of the diverse ecosystems of the Western Hemisphere. Their numbers fluctuate depending on the abundance of food and availability of suitable nesting habitat in the dynamic northern and boreal forest ecosystems, while their over-winter survival depends on the quality of habitat on their wintering grounds, which could be Andean cloud forests in Peru, tropical lowland forests in Central America, evergreen forests in Mexico, or dry scrublands in the Caribbean. These small migrants are also affected by habitat quality at migration stopover locations, where they stop to refuel while en-route through the United States and southern Canada. Given the rate at which habitat and ecosystems are changing throughout the Americas, it is no wonder that many species of neotropical landbird migrants that nest in North America's northern forest biome (hereafter 'northern forest'; Figure 1) are of high conservation interest.

The tri-national North American Bird Conservation Initiative (NABCI) and Partners in Flight (PIF) both recognize the importance of monitoring the status of bird populations if species are to be conserved and managed effectively (e.g., Rich et al. 2004). The primary landbird monitoring program in North America is the Breeding Bird Survey (BBS), which is a roadside count of birds on their breeding grounds. However, in Canada, the breeding range of about 80 landbird species is largely north of the road network and inaccessible. These species include northern breeding neotropical migrants such as Gray-cheeked and Swainson's thrushes, Alder and Yellow-bellied flycatchers, and Blackpoll, Cape May, Connecticut, Wilson's, and Tennessee warblers. For these and other species that breed in the northern forests, alternative population monitoring methods are required. Because these northern breeding birds migrate through southern Canada and the United States in spring and fall, where people and birders are concentrated, surveying birds on migration is a logical focus for monitoring their populations. Moreover, migration monitoring is particularly important for neotropical species that are not monitored on their wintering grounds, unlike temperate species which are monitored by programs such as Christmas Bird Count and Project FeederWatch.

Over the past 50 years, numerous independent bird observatories and migration research stations have been established at migration hot spots in Canada and the United States. In 1994, a North American Migration Monitoring Council was formed in recognition of the need to expand and integrate migration monitoring activities under one umbrella program. While the North America-wide cooperative initiative is still in its early development, a Canada-wide network of bird migration monitoring stations was formally established in 1998 as the Canadian Migration Monitoring Network - Réseau canadien de surveillance des migrations (CMMN-RCSM; hereafter referred to as CMMN).

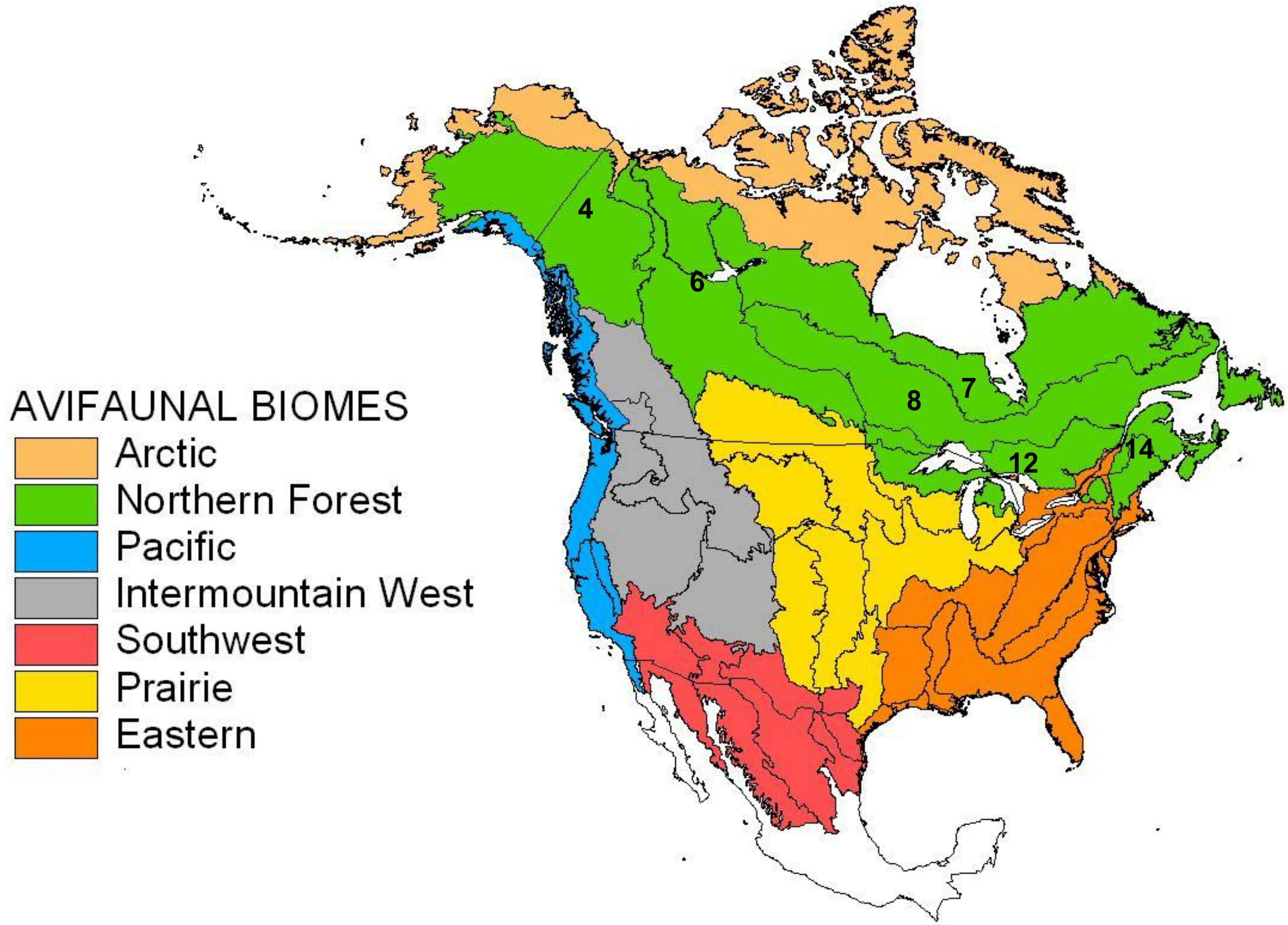


Figure 1. Avifaunal Biomes in North America. In Canada, the Northern Forest region includes (from left to right) Bird Conservation Region (BCR) 4 (Northwestern Interior Forest), BCR 6 (Boreal Taiga Plains), BCR 7 (Taiga Shield and Hudson Plains), BCR 8 (Boreal Softwood Shield), BCR 12 (Boreal Hardwood Transition), and BCR 14 (Atlantic Northern Forest).

The Canadian Migration Monitoring Network

The CMMN was formed in 1998 as a cooperative venture between independent migration monitoring stations, Bird Studies Canada (BSC; a non-profit research organization), and the federal government's Canadian Wildlife Service (CWS), an agency of Environment Canada. In addition to the formal member stations, several other stations contribute to the Network as associates (Figure 2). Collectively, over 25 stations in Canada now compile count information on millions of migrating birds each year, encompassing more than 250 species.

Since 1998, the CMMN has continued to expand and evolve. In 2005, a formal Steering Committee – composed of representatives from member stations, BSC and CWS – was formed. This committee provides guidance and technical advice to member stations, and helps support the future development of the CMMN. In 2007, the CMMN adopted the following Vision and Mission Statements, respectively:

- *To be an essential component of bird monitoring, migration research and conservation planning in the Western Hemisphere.*
- *To contribute to conservation, knowledge, and public understanding of Canadian migrant birds and migration through a collaborative network of independent migration monitoring and research stations.*

The CMMN monitors population trends of over 30 species of boreal/northern migrant landbirds that are identified as a priority for monitoring by PIF (Rich et al 2004), as well as at least 45 other neotropical migrant landbirds. There is also a large amount of interest in monitoring birds associated with the northern Pacific coastal rainforest region (BCR 5), because of the large number of range-limited species and subspecies that occur there.

The CMMN strives to address several recommendations made in the PIF *North American Landbird Conservation Plan* in regard to the development of migration monitoring in North America. These recommendations include: a) the need for continued improvement of migration monitoring to meet information needs of the large group of northern-nesting neotropical migrants that are largely inaccessible for monitoring; b) the need to conduct more evaluation and research on best analysis methods and precision estimation; and c) the institution of annual analysis and reporting (Rich et al. 2004). The CMMN also complements other high-priority actions that relate to migration monitoring, as identified in the *Canadian Landbird Monitoring Strategy* (Downes et al. 2000) and in PIF's *High Priority Needs for Range-wide Monitoring of North American Landbirds* document (Dunn et al. 2005).

CMMN Stations: A Brief Description

For the most part, stations included in the current suite of CMMN member stations (Table 1) were formed independently at sites where there was a fortuitous combination of large concentrations of migrating landbirds, a suitable site for doing migration counts, and sufficient local interest and capacity to organize and operate a migration station. Consequently, there is large variability in CMMN station organizational structure, history, and resources.

All member stations are operated by a registered charitable organization or operate under a formal agreement with a larger organization. The majority of stations rely heavily on volunteers for data collection. Many stations also have a small paid staff (usually seasonal), who train personnel and oversee operations.

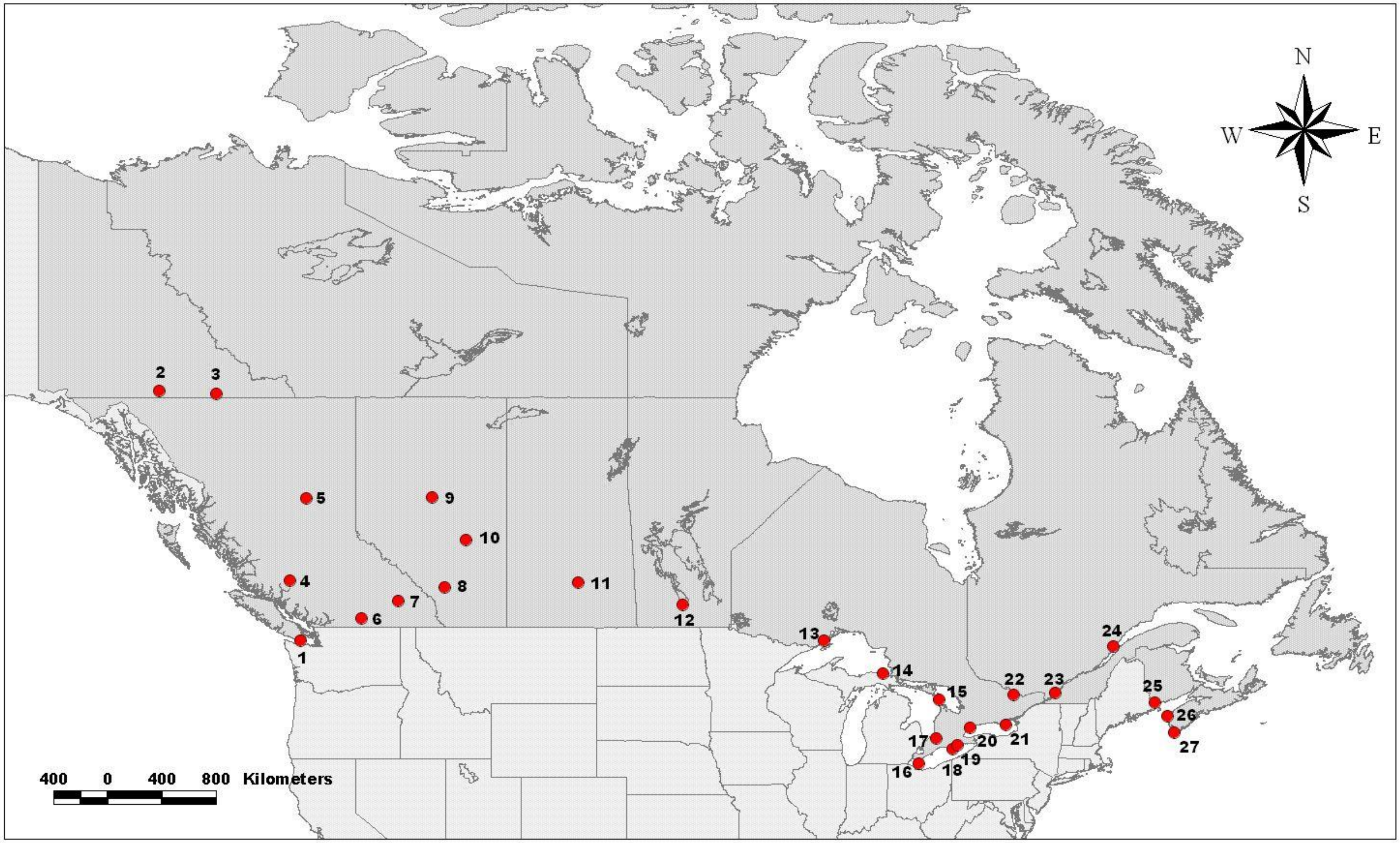
CMMN stations are often located at coastal sites or adjacent to inland lakes or river systems where large numbers of landbirds concentrate during migration. All stations have some form of enduring land-use arrangement that permits ongoing research at the site. Most are situated in protected areas such as National Wildlife Areas and regional or provincial parks, many of which are also designated as Important Bird Areas (IBAs).

Although most stations are accessible by car, some are accessible only by boat or long hike. On-site accommodation is provided at the more remote stations, and most stations welcome volunteers and are open to the visiting public. More information on each station can be found on the CMMN webpage (http://www.bsc-eoc.org/volunteer/cmmn); most stations also have their own dedicated websites.

Each station operates under a written protocol approved by the CMMN Steering Committee or its forerunner. These protocols describe a) the main groups of birds being targeted; b) the area being monitored, including station boundaries and location of survey routes, observation points and net or trap sites; c) the daily time period(s) during which the count(s) are conducted; d) the methods used to produce a migration count (e.g. 'daily estimated total'); e) procedures for recording stopover and resident individuals; f) local habitat; and g) how changes in habitat are to be monitored or controlled over time. This last point is of particular importance in order to monitor broad scale population trends of migrants. In cases where habitat succession is a concern, stations are asked to include a management approach that is designed to minimize succession and thereby reduce the likelihood that habitat change will influence population counts over the long term.

To be effective, stations are expected to run at least 5 days per week (including down time due to weather) during a consecutive period of at least one month during spring and/or fall. Seasonal coverage must adequately sample migration passage of the target species. For each species, guidelines for 'adequate' coverage are currently as follows: (a) a minimum annual coverage of at least 75% of the days is sampled during the target species' spring or fall migration period (the site-specific span of dates within which the middle 95% of individuals occur); (b) an average of at least 10 birds are recorded on an average of at least 5 dates per season; and (c) the majority of individuals detected are migrants and not breeding residents. For more details on field data collection, see Methods.

At stations where bird banding takes place, relevant on-site personnel must hold a valid permit and operate in accordance with the North American Banding Council's Bander's Code of Ethics (North American Banding Council 2001).



1	Rocky Point	8	Inglewood	15	Bruce Peninsula	22	Innis Point
2	Teslin Lake	9	Lesser Slave Lake	16	Pelee Island	23	McGill
3	Albert Creek	10	Beaverhill	17	Ausable	24	Tadoussac
4	Tatlayoko	11	Last Mountain	18	Long Point	25	St. Andrew's
5	Mackenzie	12	Delta Marsh	19	Haldimand	26	Brier Island
6	Vaseux Lake	13	Thunder Cape	20	Tommy Thompson Park	27	Atlantic
7	Revelstoke	14	Whitefish Point	21	Prince Edward Point		

FIGURE 2. LOCATION OF CMMN STATIONS AND AFFILIATES.

TABLE 1. YEARS OF OPERATION BY SEASON FOR EACH CMMN MEMBER STATION UP TO 2006. TOTAL NUMBER OF YEARS INCLUDED IN SEASONAL ANALYSIS AT EACH STATION IS INCLUDED IN 'YEARS' COLUMN. THE COUNT TYPE ON WHICH ANNUAL INDICES AND POPULATION TRENDS AT EACH STATION IS BASED IS PROVIDED (ET = ESTIMATED TOTALS; BAND = STANDARDIZED DAILY BANDING; VIS = STANDARDIZED DAILY VISUAL MIGRATION). TABLE DOES NOT INCLUDE STATIONS THAT ARE NOT FORMAL CMMN MEMBERS.

Province	Station Code	Station	Spring Years of Operation	Spring Years	Fall Years of Operation	Fall Years	Count Type
British Columbia	RPBO	Rocky Point Bird Observatory	-	-	1998-2006	9	ET
	MNO	Mackenzie Nature Observatory	-	-	1996-2006	11	ET
Alberta	BBO	Beaverhill Bird Observatory	1992-2006	15	1992-2006	15	ET
	IBS	Inglewood Bird Sanctuary	2001-2006	6	1995-2006	12	BAND
	LSLBO	Lesser Slave Lake Bird Observatory	1994-2006	12	1994-2006	13	ET
Saskatchewan	LMBO	Last Mountain Bird Observatory	1994-2006	13	1993-2006	14	ET
Manitoba	DMBO-E	Delta Marsh Bird Observatory – East (Delta Marsh Field Station)	1995-2005	11			ET
	DMBO-W	Delta Marsh Bird Observatory – West (U of Manitoba field station)	2006	1	1993-2006	14	ET
Ontario	TCBO	Thunder Cape Bird Observatory	1992-2006	15	1991-2006	16	ET
	BPBO	Bruce Peninsula Bird Observatory	2000-2006	7	2000-2006	7	ET
	PIBO	Pelee Island Bird Observatory	2003-2006	-	2003-2006	-	ET
	LPBO	Long Point Bird Observatory	1961-2006	46	1961-2006	46	ET
	HBO-SELK	Haldimand Bird Observatory – Selkirk	1996-2006	10	1998-2006	8	ET
	HBO-RUTH	Haldimand Bird Observatory – Ruthven	1998-2006	9	1998-2006	9	ET
	HBO-ROCK	Haldimand Bird Observatory – Rock Point	2001-2005	5	2000-2006	7	ET
	TTPBRS	Tommy Thompson Park Bird Research Station	2004-2006	-	2004-2006	-	ET
	PEPtBO	Prince Edward Point Bird Observatory	1995-2006	9	2001-2006	6	ET
	IPBO	Innis Point Bird Observatory	1997-2006	10	-	-	ET
Quebec	MBO	McGill Bird Observatory	2004-2006	-	2004-2006	-	ET
	OOT	Observatoire d'oiseaux de Tadoussac	-	-	1996-2006	11	VIS
Nova Scotia	ABO-BP	Atlantic Bird Observatory – Bon Portage Island	1997-2006	10	1997-2006	10	ET
	ABO-SI	Atlantic Bird Observatory – Seal Island	1997-2001	5	1997-2006	10	ET
Michigan	WPBO	Whitefish Point Bird Observatory		-	1993-intermittent	-	ET

Beyond Migration Counts: The Role of the Network in Collaborative Research

Although a primary focus of the CMMN is to count migrants for long-term population monitoring purposes, the scope of the Network is not restricted to monitoring bird population trends. All stations also collect banding data, which provides information on sex ratios, age structure, body condition (e.g. fat loads), and morphological measurements. In addition to other long-term research and education programs, some stations also participate in the MAPS (Monitoring Avian Productivity and Survival) program during the breeding season, which provides valuable information on survivorship and productivity of resident birds (see http://www.birdpop.org/maps.htm).

Collectively, the large databases of information collected by CMMN stations are of great value to researchers studying bird migration and ecology. Indeed, CMMN stations can contribute to many broad-scale research projects which, in the absence of this largely volunteer-based Network, would not be otherwise possible owing to the prohibitive costs associated with obtaining special permits and specialized equipment, the need to acquire and train sufficiently skilled field staff, and the need for centralized coordination. The involvement of individual stations in such collaborative research projects is voluntary; most choose to participate if they have sufficient time and capacity to handle whatever extra work may be involved.

Since 1998, CMMN stations participated in several broad-scale collaborative research studies that increased our understanding of migratory bird stop-over ecology (e.g., Dunn 2001, Dunn 2002), examined the effect of climate change on the seasonal timing of migration and stop-over site quality (Marra et al. 2005), assessed the role of migratory birds in the spread of diseases affecting wildlife and humans (e.g., Ogden et al. 2008a, Ogden et al. 2008b), and contributed to a large-scale DNA 'bar coding' project. In 2007, following on the work of Dunn et al. (2006), CMMN stations across Canada collected over 18,000 feathers from 22 species in an extensive collaborative research project that is presently underway on feather isotope signatures, which will further our understanding of the geographic origin of birds passing through each station. Information from this particular project will help interpret population trend results and can more clearly define geographic areas in need of conservation measures.

Scope of this Report

CMMN stations have been in operation for variable time periods (see Table 1). In this report, we focus our analyses on those stations that have been in operation for at least 10 years (spring and/or fall), up to and including 2006. In addition to reporting on population trends, we also examine the influence of geographic region and migration strategy (temperate vs. neotropical migrants) on annual indices and population trends. Although a large focus of this report is placed on northern breeding species, we also report on migratory species that inhabit other biogeographic regions. We restrict our analyses almost entirely to landbirds, especially passerines and near-passerines.

Methods

Migration Counts

Each CMMN station conducts standardized migration monitoring through one or more approved approaches. Approaches include standardized captures using mist nets, 'census' counts (which attempt to count all birds in a specified area during a specified time), and visual migration counts. Most CMMN stations employ a combination of approaches to derive a daily 'estimated total' (ET) for each species. Inglewood Bird Sanctuary (IBS) and l'Observatoire d'oiseaux de Tadoussac (OOT) are two exceptions; they base daily count estimates on standardized daily banding and standardized daily visual migration, respectively (Table 1).

ETs are estimates of the number of each species of migrant present within a designated area, on a given day, during a standard count period [see Hussell and Ralph (2005) for justifications for using ETs and advantages/disadvantages of different count methodologies]. ETs are normally based on three count estimation procedures (banding, census and general observation data), and can be based on a simple sum of the number of birds detected by the different methods or on an estimate of the number of birds present (which allows for extrapolation and/or adjustments made for multiple counting, stop-overs and residents). Though methods for estimating ETs vary among stations, stations maintain constant estimation procedures over time.

Seasonal Migration Windows

For each station, we first determined spring and fall migration windows for each species by examining plots of the daily mean log(count) across years sampled (see example in Figure 3; plots for additional species and stations are available online at http://www.birdscanada.org/birdmon/default/popindices.jsp). We restricted the bounds of migration windows to those days of the year when the station operated during at least 50% of total years in operation. If the number of years that each date was sampled varied widely during spring and/or fall, we excluded those days on the tail-end of the stations' coverage that were separated by four or more days with below 50% of years covered.

If a clear peak in migration was apparent within the average seasonal coverage at a station, the species was included in analysis. If a peak in migration was not apparent, then this suggested that the migration counts were confounded by the presence of substantial numbers of local breeding (or wintering) residents. These cases can be analyzed at a later date after an appropriate method is established for separating out the station-specific periods during which the number of birds counted can be expected to consist primarily of migrants.

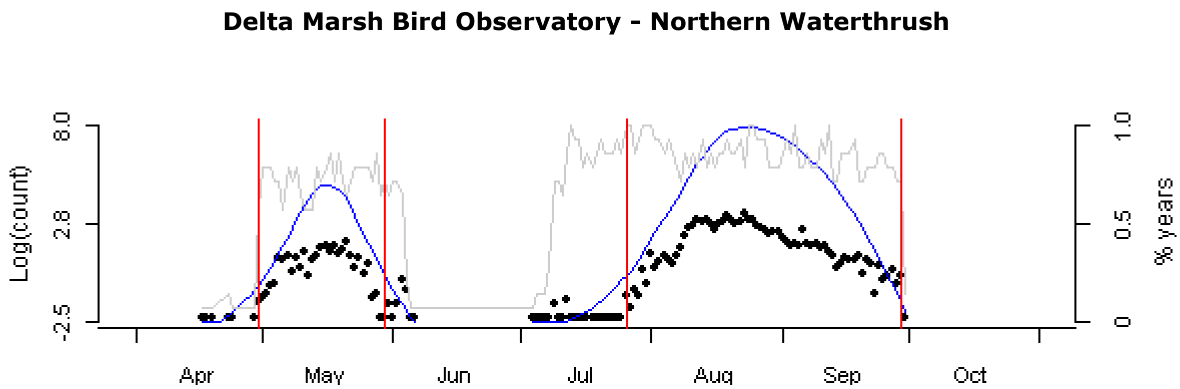


FIGURE 3. EXAMPLE OF SPRING AND FALL MIGRATION WINDOWS USING THE MEAN DAILY LOG(COUNT) OF NORTHERN WATERTHRUSH PASSING THROUGH DELTA MARSH BIRD OBSERVATORY, 1993-2006 (LEFT AXIS). THE BLUE LINE REPRESENTS THE SMOOTHED PROPORTION OF YEARS NORTHERN WATERTHRUSH WAS DETECTED EACH DAY; THE GREY LINE REPRESENTS THE PROPORTION OF YEARS THE STATION OPERATED EACH DAY (STATION COVERAGE; RIGHT AXIS). VERTICAL RED LINES DEPICT THE ASSIGNED MIGRATION WINDOWS FOR SPRING AND FALL.

Species Selection

Population trend analyses were restricted to migrants that were detected at a minimum rate of 10 individuals and 5 observation days per migratory season (spring or fall). Even with sufficient sample sizes, some species were excluded from analysis at particular stations because of the presence of local breeding populations or local roosts (especially swallows and blackbirds). Appendix B provides information on which species had sufficient sample sizes and were analyzed at each station.

Species Classifications and Guild Categories

Although several subspecies are routinely recognized and recorded by banders (e.g., Myrtle and Audubon's forms of the Yellow-rumped Warbler), we conducted all analyses at the species level. Because of the difficulty in distinguishing Alder and Willow flycatchers, however, we combined these two species as "Traill's" Flycatcher.

Species were classified into one of three migration strategies: neotropical migrants, temperate migrants, or 'other' (resident/irruptive/nomadic) based on assignments given by Environment Canada's Project Wildspace (Environment Canada 2008; see Appendix A). Species classified as 'intermediate' migrants by the Neotropical Migratory Bird Conservation Act were regarded as 'temperate' migrants. Population trends were generally not produced for species classified as 'Other', but exceptions were made on a station-by-station basis.

We also classified species by broad ecoregional affiliation. Species were classified either as 'boreal' if 50% or more of the estimated Western Hemisphere breeding population is found in northern forest regions, or as 'non-boreal' if less than 50% of the estimated population occurs in northern forest regions (Blancher and Wells 2005). The latter includes a few species that breed primarily in the tundra (e.g., Snow Bunting).

Annual Abundance Indices

For each station, annual population indices were estimated for each species in spring and/or fall by fitting a generalized linear model (GLM) with negative binomial distribution. In cases where a negative binomial provided a poor fit (model did not converge), a GLM with Poisson distribution was used. All models were fit using the GLM function in R-project (version 2.5.1; R Development Core Team 2007). Negative binomial models generally provide a good fit for aggregated data (e.g., data with many zero-count days, and other days with large counts). In a small number of cases (n=15) neither model provided good fit; these species/stations were not analyzed. All analyses were restricted to data collected within the defined migration season of each species.

All models included effects of date (day of the year, using 1^{st} to 5^{th} order polynomial terms) to model the seasonal variation in daily counts. To account for variation in daily effort and species abundance (e.g. to model the influx of new migrants), we also included a binomial variable that classified daily totals of all species as either above or below the 25^{th} percentile.

Annual indices were calculated by using parameters from the fitted models to predict the number of individuals observed on the middle date of the season for each year, with a daily total number of birds above the 25^{th} percentile.

Population Trends

Trends in annual abundance indices were calculated by fitting a regression model of the indices by year (described fully in Francis and Hussell 1998).

For stations with less than 10 years of data, we fit simple linear models—regressing the annual index on year. For stations with more than 10 years of data, we included polynomial terms for year, reparameterized as described in Francis and Hussell (1998), to estimate the change between the average indices of the first three years to the average indices of the last three years (e.g., at LPBO: 1967-1969 to 2004-2006). Basing the trend estimate on the mean of the first and last three years reduced the sensitivity of the model to poor estimates of the shape of the curve at the endpoints of the polynomial-fit curve (Francis and Hussell (1998).

The maximum number of polynomial terms included in the model was determined by dividing the number of years available for analysis by five. Thus, for the calculation of 10-year trends, first and second order polynomial terms were tested. The most parsimonious model was then chosen by minimizing the Akaike's Information Criterion (AIC). For stations that included 3^{rd} or higher-order polynomials, we used a step-wise procedure that began with the linear model and added polynomial terms only if the addition of the next polynomial term resulted in a lower AIC score. If it did not, then higher-order polynomial terms were not tested. It should be noted that this approach differs from that of Francis and Hussell (1998), who fit all polynomial terms, and selected the model with the lowest AIC.

In these reparameterized models, the slope of the first-order term gives an estimate of the annual percent change in population size through time (Francis and Hussell 1998). For all species, the change in population index was calculated for both the full time-frame available for each station and over the most recent 10 years with data (1997-2006) to allow among station comparisons in population change. For the purposes of this report, we focus on the 10-year trends.

Regional Comparisons

Spatial Correlations of Annual Indices

Stations located in close proximity to one another are more likely to be sampling individuals from the same migrant populations than are stations separated by larger geographic distances. We would therefore expect that nearby stations would show positive correlations in their annual indices and that the strength of those correlations would decline as the distance between stations increased. We explored this spatial relationship by calculating the Pearson correlation coefficient (cor.test, R Development Core Team 2007) for annual indices of all species-station pairs with sufficient data (1997-2006) and then plotting them against distance between stations.

Regional Trends of Neotropical, Temperate and Boreal Breeding Migrants

We also examined geographic trends in population change by fitting a logistic regression model that assessed whether the probability of a species showing a positive trend was related to migration strategy (i.e., neotropical migrant vs. temperate migrant), ecoregional affiliation (i.e., boreal vs. non-boreal), and longitudinal region. Five longitudinal regions were defined: Western (west of the Rockies); Prairies (Alberta, Saskatchewan and Manitoba); Ontario; and Eastern (Quebec and Atlantic).

Survey Comparison

In North America, the BBS is usually considered the best and most comprehensive long-term, broad-scale bird monitoring dataset with which to analyze bird population change. However, BBS coverage in the northern forests of Canada is very poor due to a lack of road coverage and the relatively small number of qualified volunteers available to run survey routes.

If migration monitoring is measuring a population signal that is comparable to BBS, then we would expect correlations of indices and trend estimates that are derived from the two surveys to be strongest in southern Canada where BBS coverage is best. We might also expect that correlations against northern BBS data would be equivocal or weak, depending somewhat on the geographic scale of population fluctuations. For example, if population changes occur synchronously over broad geographic areas, we would expect positive correlations. However, if regional populations are asynchronous, we would expect weak or negative correlations for species breeding in northern Canada.

We would also expect that the correlations between migration monitoring and BBS should be strongest in spring, when migrants are believed to follow a more direct north-south migration axis, than in fall, when migrants are thought to originate from a broader geographic region (Dunn et. al 2006).

We tested the above hypotheses by comparing annual indices and trends from Long Point Bird Observatory (LPBO) and Ontario BBS for the 1968-2006 time period. LPBO was chosen for this comparison because it is the longest-running CMMN station, with over 45 years of daily count data. Our analysis also updates a previous comparison conducted by Francis and Hussell (1998) by including an additional 10 years of data. We restricted our analysis to a subset of 12 'southern' species that breed primarily in BCR 13 (Great Lakes/St. Lawrence; see Figure 4), where BBS coverage is quite good, and a subset of 12 'northern' species that breed primarily in BCRs 8 and 7 (Boreal Softwood Shield and Taiga Shield/Hudson Plains, respectively), where BBS coverage is non existent or poor. Species' breeding ranges and abundance information were derived from Cadman et al. (2007). All 12 northern species chosen to represent BCRs 8 and 7 were also classified as 'boreal' based on the classification described earlier. Finally, in addition to testing the correlation of population trends between the two survey types, we also examined the correlation of annual indices for each of the 24 species.

We obtained BBS annual indices and trends (1968-2006) for Ontario from the Canadian Wildlife Service's National Wildlife Research Center (Canadian Wildlife Service 2008). BBS annual indices were estimated using a three-factor model which includes terms for route, year and observer. A trend line was then fitted through the annual indices using estimating equations.

We used the cor.test function in R 2.5.1 (R Development Core Team 2007) with the option for Pearson's statistic for all correlations. A maximum type I error rate of 10% was used to judge whether a correlation was significantly different from 0 ($\alpha = 0.1$).

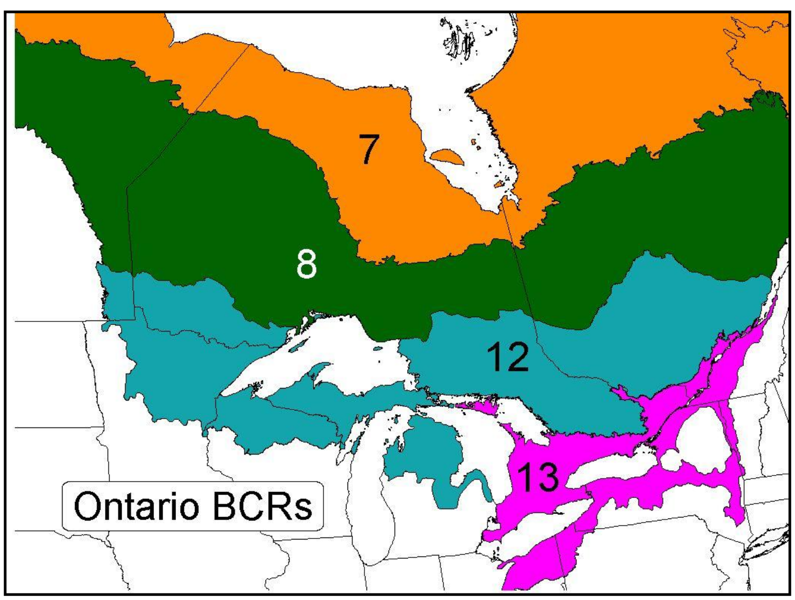


FIGURE 4. LOCATION OF BIRD CONSERVATION REGIONS (BCRS) IN ONTARIO; BCR 7 = TAIGA SHIELD AND HUDSON PLAINS; BCR 8 = BOREAL SOFTWOOD SHIELD; BCR 12 = BOREAL HARDWOOD TRANSITION; BCR 13 = LOWER GREAT LAKES / ST. LAWRENCE PLAIN.

Results

Trend Analysis

Eleven stations in spring and 12 stations in fall had sufficient data for the analysis of 10-year population trends for the period 1997-2006 (Table 1). Analyses involved 94 and 124 species in spring and fall, respectively (Appendix B). Population trends for the 10-year period are presented in Table 2 (spring) and Table 3 (fall). Trends for stations with only 9 years of data are presented with 10-year trends in Tables 2 and 3 because an additional year of data was not expected to have a large impact on the observed result. Longer-term trends (>10 years) and trends for stations with less than 9 years of data in one or both seasons can be found online at http://www.birdscanada.org/birdmon/default/popindices.jsp, and are not discussed further in this report.

Table 2. Population trends (%/year) of landbirds detected in spring at CMMN stations over a 10-year period (1997-2006). Trends in bold are significant at $P < 0.05$. Trends for Haldimand – Ruthven station (HALD_RUTH), shown in italics, are based on nine years of data (1998-2006). Species are listed in taxonomic order. Species denoted by '*' include permanent residents, irruptive migrants, raptors, shorebirds, swallows and blackbirds; results for these species should be interpreted with caution. Table excludes situations where counts were likely confounded by the presence of local residents.

Region	Prairies				Ontario						Eastern
Species	LSLBO	BBO	LMBO	DMBO	TCBO	LPBO	HALD_SELK	*HALD_RUTH*	PEPtBO	IPBO	ABO_BP
NOHA*	.	.	.	.	.	0.4	.	.	.	.	.
SSHA*	.	.	.	.	.	**-9.5**	.	.	.	.	.
AMKE*	.	.	.	.	.	**2.8**	.	.	.	.	.
BBCU	.	.	.	.	.	**6.1**	.	.	**19.2**	.	.
RTHU	.	.	.	2.5	-0.9	3.0	8.7	.	**11.8**	5.3	.
RHWO	.	.	.	.	.	**-3.3**	.	.	.	.	.
YBSA	-5.0	.	.	.	.	**7.7**	-13.8	.	12.8	.	.
NOFL	1.0	.	.	.	.	**-1.1**	-4.1	.	4.8	.	-18.3
OSFL	.	.	.	.	-18.0	.	.	.	.	.	.
EAWP	.	.	.	.	.	-5.1	.	.	-1.2	.	.
YBFL	.	.	.	.	-10.4	1.2	.	.	15.3	.	.
TRFL	.	**-13.0**	.	1.3	-5.9	.	.	.	.	.	5.7
LEFL	-7.0	.	.	.	-8.5	0.7	-6.4	.	**9.0**	0.7	.
EAPH	10.1	.	.	8.9	.	**3.3**	-6.6	.	.	.	.
GCFL	.	.	.	.	.	-0.3	.	.	.	.	.
EAKI	.	.	.	.	-10.9	.	**-20.3**	.	.	.	.
BHVI	.	.	.	.	.	**6.4**	.	.	**17.6**	.	8.8
WAVI	.	.	.	.	.	**9.5**	2.5	.	**17.0**	.	.
PHVI	.	.	.	.	-6.7	**3.0**	.	.	14.1	.	.
REVI	.	-9.6	.	.	0.1	-1.8	0.5	*10.4*	**12.5**	.	-2.5
BLJA*	8.9	.	.	.	**18.8**	**1.7**	.	.	12.1	.	.

Region	Prairies				Ontario						Eastern
Species	**LSLBO**	**BBO**	**LMBO**	**DMBO**	**TCBO**	**LPBO**	**HALD_SELK**	***HALD_RUTH***	**PEPtBO**	**IPBO**	**ABO_BP**
TRES*	9.3	.	.	.	.	.	.	.	.	.	.
BANS*	.	.	.	.	.	.	-22.2	***-21.1***	.	.	.
BCCH*	.	.	.	.	41.0	.	.	.	.	.	.
RBNU*	-17.8	.	.	.	9.4	.	0.2	.	.	.	.
BRCR	.	.	.	.	.	**-14.5**	**-8.0**	.	-4.3	.	.
HOWR	.	.	.	.	.	**3.4**	.	.	.	.	.
WIWR	.	.	.	.	.	**-5.5**	1.7	.	-5.0	.	-1.9
MAWR	.	.	.	**-33.0**	.	.	.	.	.	.	.
GCKI	.	.	.	.	.	**-15.9**	-6.2	*-0.1*	-16.3	.	-1.3
RCKI	**20.6**	-4.6	.	-4.8	-6.2	**2.7**	0.4	*2.4*	4.3	8.3	**-24.4**
BGGN	.	.	.	.	.	-0.8	-5.1	.	.	.	.
EABL	.	.	.	.	4.0	.	.	.	.	.	.
VEER	.	.	.	.	.	**-1.1**	-1.5	.	**14.5**	.	.
GCTH	.	.	.	**-21.6**	.	**1.9**	0.7	.	15.7	.	.
SWTH	2.6	1.8	-0.6	-3.2	-2.7	-3.5	**-9.2**	*-0.9*	10.2	.	-4.1
HETH	**23.0**	9.9	.	-12.1	.	**1.2**	-0.7	*7.4*	-1.8	.	**21.6**
WOTH	.	.	.	.	.	-0.2	.	.	**19.4**	.	.
AMRO	.	.	.	.	.	**3.1**	.	.	.	.	.
GRCA	.	.	.	.	.	**9.5**	.	.	.	.	-5.1
BRTH	.	.	.	.	.	4.6	1.4	.	.	.	.
AMPI	-2.1	.	.	.	.	.	.	.	.	.	.
CEDW*	.	12.3	.	.	.	2.6	.	.	7.7	.	.
TEWA	**11.7**	11.9	12.9	-1.7	3.1	-4.4	.	.	6.6	.	.
OCWA	-0.2	-5.2	0.4	-8.2	11.3	.	.	.	.	.	.
NAWA	.	.	.	-0.4	8.4	**2.7**	22.4	*21.0*	20.5	6.0	5.2
NOPA	.	.	.	.	-3.7	.	.	.	**20.9**	.	4.0
YWAR	1.4	.	.	.	-5.2	3.6	.	.	.	.	-3.9
CSWA	.	.	.	-10.9	**-8.8**	**3.1**	-2.7	*13.2*	**9.7**	-0.7	-1.9
MAWA	-10.2	.	.	**-21.6**	**-10.3**	**3.0**	5.1	*5.9*	7.2	5.3	-2.5
CMWA	.	.	.	2.5	**-16.4**	**-8.9**	.	.	.	.	.
BTBW	.	.	.	.	**-15.1**	**3.8**	-3.1	.	5.7	.	.
YRWA	1.5	-5.6	3.9	-12.6	-4.4	**5.9**	-2.7	*3.7*	**14.0**	-7.2	-1.0
BTNW	.	.	.	.	-3.0	**3.2**	1.9	*4.6*	8.8	-5.0	-6.2
BLBW	.	.	.	.	-4.8	**2.4**	.	.	**12.9**	.	.
PAWA	-12.8	.	.	-10.9	4.4	**5.8**	-3.9	.	**17.4**	1.6	-3.8
BBWA	.	.	.	.	-8.6	**-6.8**	.	.	4.9	.	.
BLPW	.	12.3	6.2	**-12.9**	.	**4.6**	.	*-2.2*	0.0	7.0	-3.4
BAWW	2.4	.	.	-12.9	-5.1	**3.8**	0.1	.	6.5	.	**23.6**
AMRE	-0.7	**9.5**	.	**-13.2**	-9.0	**2.6**	0.0	*-6.6*	2.7	-0.4	1.7
OVEN	.	.	.	**-18.7**	3.7	0.5	2.9	.	6.7	.	.
NOWA	-0.5	.	.	-2.4	-2.4	-1.2	.	.	4.0	.	.
MOWA	-5.1	.	.	-11.6	5.9	1.1	3.2	.	0.8	.	.
COYE	**-13.1**	**-6.4**	.	.	-6.3	**1.4**	.	.	.	.	**-6.9**
WIWA	**-19.0**	.	.	**-14.7**	-6.8	1.1	-3.8	*1.9*	9.3	9.7	.

Region	**Prairies**				**Ontario**						**Eastern**
Species	**LSLBO**	**BBO**	**LMBO**	**DMBO**	**TCBO**	**LPBO**	**HALD_SELK**	***HALD_RUTH***	**PEPtBO**	**IPBO**	**ABO_BP**
CAWA	0.5	.	.	1.0	-9.3	-2.5	-4.3	*-1.6*	2.0	.	.
SCTA	.	.	.	.	.	0.1	.	.	**15.3**	.	.
WETA	**-23.5**	.	.	.	.	.	.	.	.	.	.
EATO	.	.	.	.	.	**-3.9**	.	.	.	.	.
ATSP	-33.7	.	.	.	.	.	1.4	.	.	.	.
CHSP	.	-7.1	2.0	**-11.0**	0.3	2.3	**19.4**	.	.	.	**-13.8**
CCSP	0.6	.	-1.7	-11.2	9.1	.	.	.	.	.	.
FISP	.	.	.	.	.	0.3	4.0	.	.	.	.
VESP	.	8.8	.	.	.	**-3.2**	.	.	.	.	.
SAVS	-0.7	.	.	**-25.6**	.	-2.5	.	.	.	-7.1	**-12.4**
FOSP	.	.	.	.	.	**-4.8**	6.5	.	-4.2	.	.
SOSP	.	**-8.6**	.	.	-1.3	-0.6	.	.	.	.	.
LISP	0.1	-7.4	4.1	**-11.6**	6.0	0.0	5.6	*7.4*	6.4	.	.
SWSP	.	.	.	**-11.9**	-3.9	**-1.2**	.	.	8.4	.	7.9
WTSP	.	3.6	-6.9	-6.1	-2.8	**-1.3**	**7.2**	*0.3*	9.2	.	6.6
HASP	.	.	.	**-16.1**	.	.	.	.	.	.	.
WCSP	-9.6	.	-9.4	.	17.5	**6.1**	**11.5**	***30.4***	**18.6**	.	-5.2
DEJU	-12.3	-12.7	.	-8.6	.	-1.2	1.7	***-8.5***	3.9	.	6.0
RBGR	**7.2**	.	.	**-26.6**	4.1	1.0	5.2	.	**19.2**	1.2	-16.6
INBU	.	.	.	.	**19.7**	-0.4	.	.	**18.1**	.	.
RWBL*	-1.3	.	.	.	.	.	.	.	.	.	.
RUBL*	.	.	.	.	.	.	.	.	27.1	.	.
COGR*	-5.0	.	.	.	.	.	.	.	.	.	.
BHCO*	10.4	.	.	.	.	.	.	.	.	.	.
BAOR	.	**-5.9**	-4.3	.	.	**6.9**	.	.	**13.3**	.	-19.3
PUFI*	-1.1	.	.	.	11.2	.	.	.	19.3	.	.
PISI*	0.4	.	.	.	-16.1	.	.	.	23.1	.	.
AMGO*	.	.	-2.8	.	4.5	.	.	.	0.9	.	.
EVGR*	-6.7	.	.	.	**-24.9**	.	.	.	.	.	.

TABLE 3. POPULATION TRENDS (%/YEAR) OF LANDBIRDS DETECTED IN FALL AT CMMN STATIONS OVER A 10-YEAR PERIOD (1997-2006). TRENDS IN BOLD ARE SIGNIFICANT AT $P < 0.05$. TRENDS FOR ROCKY POINT BIRD OBSERVATORY (RPBO), HALDIMAND BIRD OBSERVATORY – RUTHVEN STATION (HALD_RUTH), HALDIMAND BIRD OBSERVATORY – SELKIRK STATION (HALD_SELK), SHOWN IN ITALICS, ARE BASED ON NINE YEARS OF DATA (1998-2006). SPECIES ARE LISTED IN TAXONOMIC ORDER. SPECIES DENOTED BY '*' INCLUDE PERMANENT RESIDENTS, IRRUPTIVE MIGRANTS, RAPTORS, SHOREBIRDS, SWALLOWS AND BLACKBIRDS; RESULTS FOR THESE SHOULD BE INTERPRETED WITH CAUTION. TABLE EXCLUDES SITUATIONS WHERE COUNTS WERE LIKELY CONFOUNDED BY THE PRESENCE OF LOCAL RESIDENTS.

Region	Western		Prairies					Ontario				Eastern		
Species	*RPBO*	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	LPBO	HALD_RUTH	HALD_SELK	OOT	ABO_BP	ABO_SI
NOHA*	.	.	.	.	.	.	.	.	-2.7	.	.	.	.	.
SSHA*	.	.	.	.	.	.	.	.	**2.8**	.	.	.	.	.
AMKE*	.	.	.	.	.	.	.	.	**-7.2**	.	.	.	.	.
SOSA*	.	.	.	2.2	.	.	.	.	.	.	.	.	.	.
BTPI	***13.8***	.	.	.	.	.	.	.	.	.	.	.	.	.
BBCU	.	.	.	.	.	.	**-30.2**	.	1.2	.	*10.3*	.	.	.
YBCU	.	.	.	.	.	.	.	.	.	.	*-11.0*	.	.	.
CONI	.	.	.	.	.	.	.	**-15.5**	.	.	.	.	.	.
RTHU	.	.	.	.	.	.	-6.4	4.4	4.3	.	*5.4*	.	.	.
RUHU	*-7.6*	.	.	.	.	.	.	.	.	.	.	.	.	.
BEKI	.	.	.	.	.	.	.	.	.	.	.	.	-10.2	.
RHWO	.	.	.	.	.	.	.	.	3.3	.	.	.	.	.
YBSA	.	.	9.6	.	.	.	.	-11.5	0.0	*-8.7*	.	.	**29.6**	-5.3
TTWO*	.	.	.	.	.	.	.	.	.	.	.	**30.6**	.	.
BBWO*	.	.	.	.	.	.	.	.	.	.	.	**17.0**	.	.
NOFL	*8.0*	.	.	.	.	.	.	8.3	0.8	.	*-0.3*	-1.1	6.6	-6.6
OSFL	***9.2***	.	.	.	.	.	.	-3.7	.	.	.	.	.	.
WEWP	.	.	.	0.1	.	.	.	.	.	.	.	.	.	.
EAWP	.	.	.	.	.	.	.	.	**3.3**	.	.	.	.	.
YBFL	.	.	.	.	.	.	.	**-12.7**	2.6	.	***14.3***	.	**21.0**	.
TRFL	***15.6***	-4.5	.	**11.1**	**-7.3**	**-5.1**	-4.3	1.2	.	.	.	.	**8.9**	.
LEFL	.	.	**-8.3**	**10.0**	.	.	.	-3.9	0.1	.	*5.2*	.	3.0	.

Region	Western		Prairies					Ontario				Eastern		
Species	*RPBO*	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	LPBO	HALD_RUTH	HALD_SELK	OOT	ABO_BP	ABO_SI
HAFL	*10.4*	-1.9	.	.	.	.	.	.	.	.	.	.	.	.
DUFL	.	-0.7	.	.	.	.	.	.	.	.	.	.	.	.
EAPH	.	.	16.4	.	.	.	0.2	.	4.7	.	*-4.0*	.	.	.
GCFL	.	.	.	.	.	.	-46.8	.	**-1.8**	.	.	.	.	.
WEKI	.	.	.	.	.	.	-0.1	.	.	.	.	.	.	.
EAKI	.	.	-3.3	.	.	.	.	-6.6	.	.	***-32.0***	.	.	.
NSHR*	.	.	.	.	.	.	.	.	.	.	.	3.3	.	.
CAVI	*-10.4*	.	.	.	.	.	.	.	.	.	.	.	.	.
BHVI	.	.	.	.	.	.	.	4.0	**3.4**	.	*0.0*	.	20.2	-1.7
WAVI	*4.4*	-5.9	.	4.0	.	.	.	.	**4.5**	.	*-2.8*	.	.	.
PHVI	.	.	-3.2	.	.	.	-4.7	3.2	-1.0	*13.8*	.	.	.	.
REVI	.	.	.	.	1.0	2.6	-1.4	3.4	-0.8	*1.8*	*6.2*	.	10.7	4.8
STJA*	*30.1*	.	.	.	.	.	.	.	.	.	.	.	.	.
BLJA*	.	.	2.9	.	.	.	**-19.0**	**28.3**	6.5	.	.	.	.	.
HOLA	.	.	.	.	.	.	.	2.7	.	.	.	2.3	.	.
PUMA*	*-13.3*	.	.	.	.	.	.	.	.	.	.	.	.	.
NRWS*	***-14.9***	-2.6	.	.	.	.	.	.	.	.	.	.	.	.
BANS*	.	14.1	.	.	.	.	.	.	.	.	***-22.6***	.	.	.
CLSW*	*-7.9*	.	.	.	.	.	.	.	.	.	.	.	.	.
BARS*	*6.8*	.	.	.	.	.	.	.	.	.	.	.	.	.
BCCH*	.	.	.	.	.	.	.	-7.5	.	.	.	.	.	.
RBNU*	.	.	**-15.0**	.	-8.2	-12.0	-16.6	1.2	.	*25.6*	*16.7*	8.1	.	.
BRCR	.	.	.	.	.	.	1.3	**16.4**	**1.5**	*-3.6*	***19.0***	.	14.8	-4.4
HOWR	.	.	.	.	.	.	.	.	**2.6**	.	.	.	.	.
WIWR	*7.4*	.	.	.	.	.	.	-4.8	-1.1	*-9.4*	*2.6*	.	6.7	-10.1
MAWR	*5.8*	.	.	.	.	.	-18.0	.	.	.	.	.	.	.
GCKI	*0.4*	1.9	-5.9	.	.	.	.	2.3	**5.0**	*-7.6*	*7.8*	.	0.6	-1.9
RCKI	*13.6*	8.1	**18.6**	6.8	**16.6**	0.1	-12.3	-2.9	**2.9**	***7.5***	***15.8***	.	3.6	-11.8
BGGN	.	.	.	.	.	.	.	.	**7.1**	.	*-14.1*	.	.	.

Region	Western		Prairies					Ontario				Eastern		
Species	*RPBO*	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	LPBO	HALD_RUTH	HALD_SELK	OOT	ABO_BP	ABO_SI
VEER	.	.	.	.	.	.	.	-12.9	0.5	.	*-10.0*	.	.	.
GCTH	.	.	.	.	.	.	-1.0	8.4	-1.3	*-5.3*	*-4.4*	.	.	.
SWTH	***14.4***	-2.5	3.4	3.2	**8.9**	**14.8**	-5.9	5.4	**-1.2**	*-1.6*	*0.8*	.	-0.6	.
HETH	*13.8*	.	-6.2	.	1.3	4.6	-20.1	4.2	0.8	*10.1*	*8.8*	.	5.4	.
WOTH	.	.	.	.	.	.	.	.	2.4	.	.	.	.	.
AMRO	*5.9*	8.0	-6.5	1.1	13.4	.	**-16.1**	.	**6.7**	.	.	-5.7	.	.
VATH*	***33.6***	.	.	.	.	.	.	.	.	.	.	.	.	.
GRCA	.	.	.	.	.	.	.	.	**11.3**	.	.	.	-1.1	-8.9
BRTH	.	.	.	.	.	.	.	.	**-2.6**	.	*7.5*	.	.	.
AMPI	*8.3*	6.8	7.2	.	.	.	.	**-12.3**	.	.	***-22.3***	0.1	-8.6	-12.0
CEDW*	.	.	-3.4	.	-2.1	.	.	.	**5.3**	*-6.8*	*-10.0*	.	.	-2.7
TEWA	.	7.1	11.9	-0.9	**-10.2**	7.1	3.5	**25.2**	**-6.7**	*0.6*	*8.5*	.	.	.
OCWA	*2.5*	5.9	4.5	-0.4	2.1	-3.9	-10.2	**26.5**	.	.	.	.	.	.
NAWA	.	.	.	.	.	.	-6.4	**20.9**	**1.5**	*-5.4*	***8.9***	.	1.7	.
NOPA	.	.	.	.	.	.	.	3.3	.	.	.	.	0.5	.
YWAR	***16.0***	.	4.3	0.0	.	.	.	7.9	**3.9**	.	.	.	-1.7	.
CSWA	.	.	.	.	.	.	-15.4	3.3	0.9	*4.2*	*5.5*	.	**-11.7**	.
MAWA	.	5.6	**-9.3**	.	**5.5**	0.7	**-21.1**	2.8	**1.4**	*3.7*	*3.0*	.	-7.7	.
CMWA	.	.	.	.	.	.	-7.9	10.4	**-6.2**	.	.	.	.	.
BTBW	.	.	.	.	.	.	.	-4.6	**3.3**	.	*-1.4*	.	4.4	-13.8
YRWA	*6.6*	10.8	9.5	-1.2	3.1	-1.4	-8.9	1.6	1.6	*-17.9*	*10.8*	-13.9	2.1	5.2
BTYW	*11.0*	.	.	.	.	.	.	.	.	.	.	.	.	.
BTNW	.	.	.	.	.	.	.	-6.5	**1.6**	*3.6*	*11.6*	.	-7.9	0.5
TOWA	*9.8*	1.8	.	.	.	.	.	.	.	.	.	.	.	.
BLBW	.	.	.	.	.	.	.	-10.9	-4.6	.	.	.	.	.
PAWA	.	.	**-16.4**	.	.	**-12.9**	-13.4	-0.1	1.5	*9.5*	*-2.6*	.	7.9	-1.2
BBWA	.	.	.	.	.	.	-5.7	-7.9	**-13.5**	.	*-6.0*	.	.	.
BLPW	.	9.9	-7.4	-4.7	-2.6	**-8.0**	**-18.8**	**18.3**	**2.2**	*-15.5*	*0.6*	.	6.4	22.6
BAWW	.	.	.	.	.	-3.3	**-14.9**	1.5	2.9	*4.2*	*8.5*	.	-4.9	.

Region	Western		Prairies					Ontario				Eastern		
Species	*RPBO*	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	LPBO	HALD_RUTH	HALD_SELK	OOT	ABO_BP	ABO_SI
AMRE	.	.	.	0.0	1.1	0.4	**-10.4**	2.5	**1.5**	*6.3*	*3.9*	.	-3.2	.
OVEN	.	.	.	4.3	**22.5**	**12.6**	-9.3	5.9	-0.4	.	*-0.3*	.	-5.4	.
NOWA	.	.	-4.8	2.8	6.9	-6.0	**-7.6**	5.8	**-1.4**	.	*-14.3*	.	**-5.1**	.
MOWA	.	.	**-8.5**	.	.	-5.3	**-16.2**	-0.7	-0.7	.	.	.	**-20.0**	.
MGWA	*6.0*	0.0	.	.	.	.	.	.	.	.	.	.	.	.
COYE	.	.	-2.1	.	**-14.9**	**-15.0**	.	9.4	**4.7**	*5.8*	*10.2*	.	2.8	.
WIWA	*-2.1*	4.3	-10.9	3.3	2.4	**-5.9**	**-19.4**	2.0	0.7	*6.0*	*-4.7*	.	-8.1	.
CAWA	.	.	-4.1	.	.	1.4	-8.2	-4.8	**-5.0**	.	*3.2*	.	.	.
SCTA	.	.	.	.	.	.	.	.	**-1.6**	.	.	.	.	.
WETA	***12.6***	.	1.6	.	.	.	.	.	.	.	.	.	.	.
EATO	.	.	.	.	.	.	.	.	**8.4**	.	.	.	.	.
ATSP	.	3.6	-8.4	.	0.8	-6.9	.	-3.8	.	.	***-16.4***	.	.	.
CHSP	*-8.3*	-5.2	2.5	-8.7	.	-1.0	-4.1	7.2	**11.1**	.	.	.	2.8	**-20.5**
CCSP	.	.	.	-3.1	.	.	-12.1	.	.	.	.	.	.	.
FISP	.	.	.	.	.	.	.	.	**5.3**	.	.	.	.	.
VESP	.	.	.	.	.	.	.	.	3.4	.	.	.	.	.
SAVS	*-8.7*	-2.9	-2.8	.	.	.	-16.0	**14.4**	**-3.7**	.	.	.	-12.8	-12.2
FOSP	***14.8***	.	.	.	.	.	-6.2	.	4.4	***33.0***	***28.7***	.	.	.
SOSP	.	-2.2	.	-0.1	**21.0**	.	.	3.9	1.8	.	.	.	.	.
LISP	*2.1*	-1.4	9.8	5.5	5.2	**-7.1**	-7.5	2.8	-0.4	*6.8*	*-10.4*	.	-3.7	-19.4
SWSP	.	.	.	.	.	.	**-19.0**	0.9	-1.4	.	.	.	0.0	-20.6
WTSP	.	4.4	.	0.7	**44.4**	-1.5	1.6	-3.2	**4.4**	*-0.9*	*10.7*	.	-7.0	**-17.8**
HASP	.	.	.	.	.	-3.0	-11.6	.	.	.	.	.	.	.
WCSP	.	5.5	-4.9	0.3	.	-5.4	.	3.0	**7.2**	*-5.1*	*-4.0*	3.6	-14.4	**-30.6**
GCSP	***13.8***	.	.	.	.	.	.	.	.	.	.	.	.	.
DEJU	*1.6*	.	20.7	7.3	8.3	3.5	4.6	-10.6	**1.0**	*-11.0*	*5.4*	2.5	-8.3	-10.5
LALO	.	.	17.8	.	.	.	.	-1.8	.	.	.	.	.	.
SNBU	.	.	.	.	.	.	.	8.4	.	.	.	.	.	.
RBGR	.	.	11.2	.	.	.	**-12.0**	-12.1	**-2.7**	.	.	.	.	.

Region	Western		Prairies					Ontario				Eastern		
Species	*RPBO*	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	LPBO	HALD_RUTH	HALD_SELK	OOT	ABO_BP	ABO_SI
BHGR	*23.1*	.	.	.	.	.	.	.	.	.	.	.	.	.
INBU	.	.	.	.	.	.	.	.	-1.2	.	.	.	.	.
RWBL*	*7.7*	.	-30.7	.	.	.	.	.	.	*8.1*	.	.	.	.
RUBL*	.	.	.	.	.	.	.	5.5	.	*-4.1*	.	-7.4	.	.
COGR*	.	.	-6.5	.	.	.	.	**10.4**	.	*-12.4*	.	1.0	.	.
BHCO*	*-2.9*	.	.	.	.	.	.	.	.	.	.	.	.	.
BAOR	.	.	.	-10.0	2.7	-5.8	.	.	**7.0**	.	.	.	15.1	.
PIGR*	.	.	.	.	.	.	.	.	.	.	.	-10.3	.	.
PUFI*	.	.	6.3	.	.	.	.	6.5	.	.	*-2.7*	1.0	.	2.9
RECR*	.	.	.	.	.	.	.	.	.	.	.	8.6	.	.
WWCR*	.	.	.	.	.	.	.	**-35.9**	.	.	.	12.8	.	.
CORE*	.	.	.	.	.	.	.	.	.	.	.	5.3	.	.
PISI*	*-22.1*	.	-7.2	.	.	-11.3	.	3.1	.	.	*-28.6*	-4.2	.	.
AMGO*	.	.	.	.	.	.	.	0.7	.	.	.	.	.	0.6
EVGR*	*1.9*	.	-12.1	.	.	.	.	-22.5	.	.	.	-11.2	.	.

Regional Comparisons

Annual Index Correlations

In spring, the between-station correlation of species-specific annual population indices was positively correlated at short distances, and declined to no correlation at approximately 2000 km. At inter-station distances greater than 2000 km, we observed a negative correlation (Figure 5).

A positive correlation of annual indices was also observed at shorter distances in fall, and declined to almost zero at approximately 1700 km (Figure 5). Beyond that distance, the correlation among stations remained relatively constant, but did show a slight positive increase.

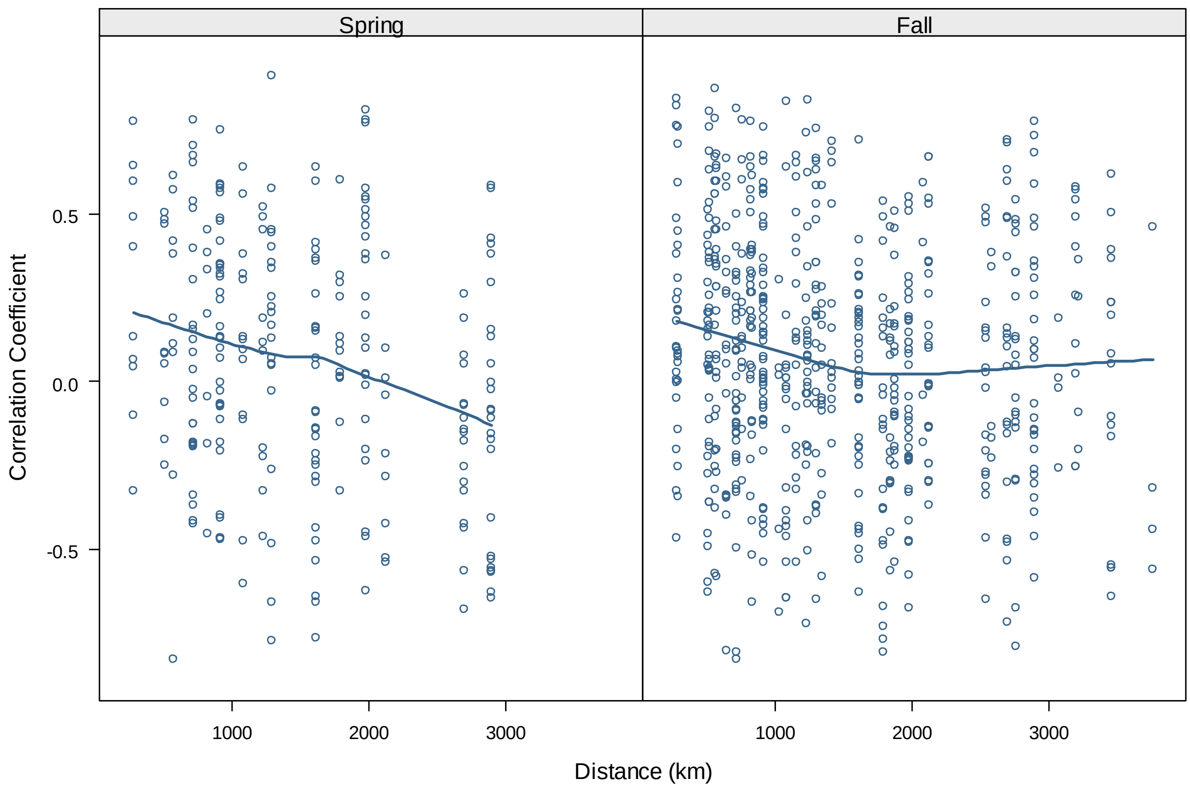


FIGURE 5. CORRELATION OF SPECIES ANNUAL INDICES (1997-2006) BETWEEN STATION PAIRS, PLOTTED AGAINST DISTANCE BETWEEN STATIONS (KM) FOR SPRING AND FALL. EACH VERTICAL LINE OF CIRCLES REPRESENTS THE ANNUAL INDEX CORRELATION OF ALL SPECIES DETECTED AT BOTH STATIONS IN A STATION-STATION COMPARISON. BLUE LINES REPRESENT THE SMOOTHED RELATIONSHIP BETWEEN ANNUAL INDEX CORRELATIONS AND DISTANCE BETWEEN STATIONS.

Regional Trends of Neotropical, Temperate and Boreal Breeding Migrants

For spring migration, data from stations in the Prairie, Ontario and Eastern regions were available for inclusion in the analysis (Tables 4 and 5). A significant effect of region was observed on the 10-year trends ($F = 15.8$, $p(>F) = <0.0001$), with more positive trends occurring on average in Ontario, and more negative trends in the Prairie and Eastern regions (Table 4).

In Ontario, spring trends were predominantly positive for all stations except TCBO, where there were more declining than increasing trends. In the Prairie region, the predominance of declining population trends in spring was driven primarily by the DMBO station, where 28% of migrants declined over the past 10 years (13% registered statistically significant declines). An interaction between region and migration strategy was not statistically significant ($F = 0.20$, $p = 0.82$; Table 5), nor was the effect of boreal vs non-boreal ecoregional affiliation ($F = 3.06$, $p = 0.08$; Table 5).

In fall, stations in all four regions were available for inclusion in the analysis (Tables 4 and 5). Results support an effect of region ($F = 6.18$, $p = < 0.0001$), with predominantly positive trends in the Western and Ontario regions, predominantly negative trends in the Prairie region, and a comparable proportion of species with increasing and declining population trends in the Eastern region (Table 4). An interaction between region and migration strategy on population trends was not statistically significant in fall ($F = 0.97$, $p = 0.41$), nor was there an effect of boreal vs non-boreal ecoregional affiliation ($F = 0.68$, $p = 0.41$).

Comparison of Trend Results between BBS and Migration Monitoring

Annual Indices

The annual indices derived from LPBO migration data for the period 1968-2006 were more strongly correlated with BBS indices for the 12 southern species examined than for a comparable group of 12 northern species (Table 6; Figures 6 and 7). In spring, annual indices for 6 of the 12 southern species were significantly positively correlated, compared to 4 of 12 northern species. In fall, 8 of 12 southern species showed significant positive correlations compared to only 2 of 12 northern species.

Taking spring and fall together, significant negative correlations between LPBO and BBS annual indices were observed more frequently with the northern species group (6/24) than with the southern species (1/24; Table 6).

Population Trends

As was found in the comparison of annual indices, population trend estimates derived from LPBO and BBS were also more highly correlated for southern-breeding than northern-breeding birds—both in spring (northern: -0.06, $p = 0.85$, southern: 0.81, $p = <0.01$) and fall (northern: -0.26, $p = 0.41$; southern: 0.63, $p = 0.03$; Figure 8).

TABLE 4. TOTAL NUMBER/PERCENT OF SPECIES WITH POSITIVE OR NEGATIVE SPRING AND FALL POPULATION TRENDS (1997-2006) AT EACH CMMN STATION. NUMBER/PERCENT OF SIGNIFICANT TRENDS ($P < 0.05$) IS SHOWN IN PARENTHESES.

Region	Station	Spring		Fall	
		Positive	Negative	Positive	Negative
Western	MNO			16 (0)	10 (0)
Western Total				16 (0)	10 (0)
Western Percent (%)				62 (0)	38 (0)
Prairies	LSLBO	17 (4)	21 (3)	17 (1)	23 (5)
	IBS			17 (2)	8 (0)
	BBO	8 (1)	11 (4)	18 (6)	6 (3)
	LMBO	6 (0)	6 (0)	10 (2)	19 (6)
	DMBO	5 (0)	28 (13)	5 (0)	39 (12)
Prairies Total		36 (5)	66 (20)	67 (11)	95 (26)
Prairies Percent (%)		35 (5)	65 (20)	41 (7)	59 (16)
Ontario	TCBO	19 (2)	30 (5)	42 (8)	25 (4)
	LPBO	43 (28)	27 (14)	47 (27)	23 (12)
	HALD_SELK	24 (3)	18 (3)		
	PEPtBO	48 (18)	7 (0)		
	IPBO	9 (0)	5 (0)		
Ontario Total		143 (51)	87 (22)	89 (35)	48 (16)
Ontario Percent (%)		62 (22)	38 (10)	65 (26)	35 (12)
Eastern	OOT			13 (2)	7 (0)
	ABO_BP	10 (2)	20 (4)	21 (3)	20 (3)
	ABO_SI			6 (0)	19 (3)
Eastern Total		10 (2)	20 (4)	40 (5)	46 (6)
Eastern Percent (%)		33 (7)	67 (13)	47 (6)	53 (7)
Overall Total		189 (58)	173 (46)	212 (51)	199 (48)
Overall Percent (%)		52 (16)	48 (13)	52 (12)	48 (12)

TABLE 5. TOTAL NUMBER OF SPECIES WITH POSITIVE OR NEGATIVE SPRING AND FALL POPULATION TRENDS (1997-2006) AT EACH CMMN STATION, SUMMARIZED BY MIGRATION STRATEGY AND AFFILIATION WITH THE BOREAL/NORTHERN FOREST. NUMBER OF SIGNIFICANT TRENDS IS SHOWN IN PARENTHESES.

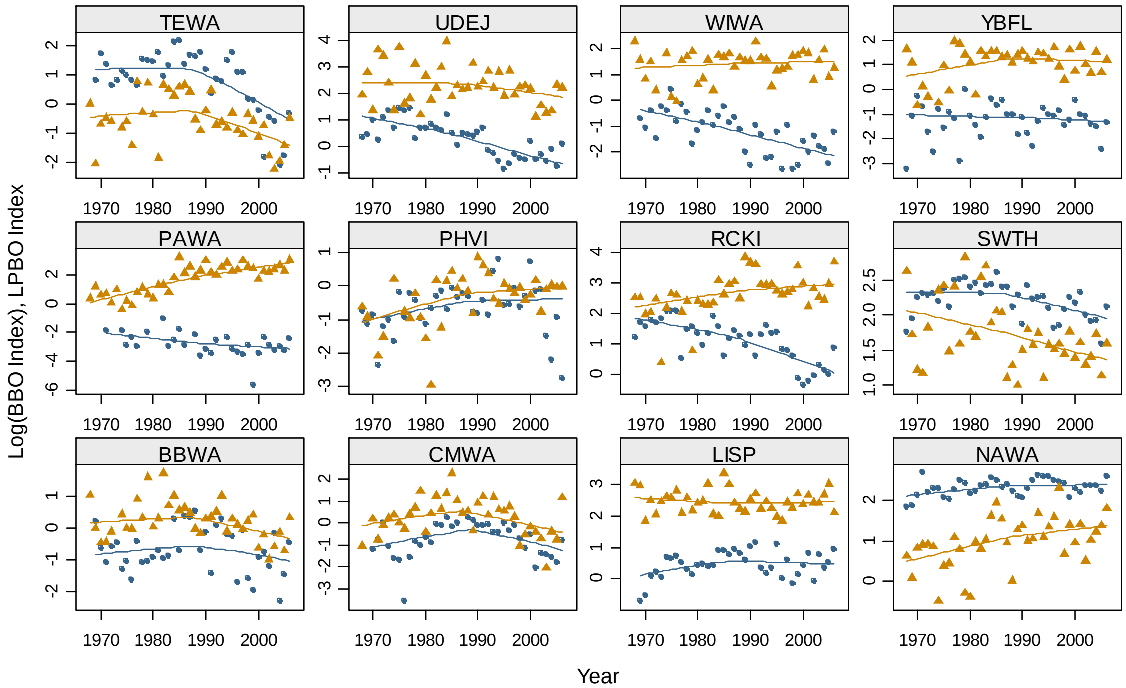
Season	Region	Station	Neotropical		Temperate		Boreal		Non-boreal	
			Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Spring	Prairies	LSLBO	8 (2)	8 (3)	9 (2)	12 (0)	9 (3)	10 (1)	8 (1)	11 (2)
		BBO	4 (1)	5 (3)	4 (0)	6 (1)	5 (0)	6 (1)	3 (1)	5 (3)
		LMBO	3 (0)	3 (0)	3 (0)	3 (0)	5 (0)	4 (0)	1 (0)	2 (0)
		DMBO	4 (0)	16 (8)	1 (0)	12 (5)	3 (0)	20 (6)	2 (0)	8 (7)
	Prairies Total		19 (3)	32 (14)	17 (2)	33 (6)	22 (3)	40 (8)	14 (2)	26 (12)
	Prairies Percent (%)		37 (6)	63 (27)	34 (4)	66 (12)	35 (5)	65 (13)	35 (5)	65 (3)
	Ontario	TCBO	9 (1)	23 (4)	8 (1)	7 (1)	8 (0)	19 (2)	11 (2)	11 (3)
		LPBO	26 (16)	13 (3)	17 (12)	14 (11)	20 (15)	10 (5)	23 (13)	17 (9)
		HALD_SELK	13 (0)	10 (2)	10 (3)	8 (1)	12 (2)	8 (1)	12 (1)	10 (2)
		PEPtBO	32 (14)	2 (0)	16 (4)	5 (0)	27 (6)	3 (0)	21 (12)	4 (0)
		IPBO	7 (0)	3 (0)	2 (0)	2 (0)	7 (0)	2 (0)	2 (0)	3 (0)
	Ontario Total		87 (31)	51 (9)	53 (20)	36 (13)	74 (23)	42 (8)	69 (28)	45 (14)
	Ontario Percent (%)		63 (22)	37 (7)	60 (22)	40 (15)	64 (20)	36 (7)	61 (25)	39 (12)
	Eastern	ABO_BP	5 (1)	11 (1)	5 (1)	9 (3)	8 (2)	8 (1)	2 (0)	12 (3)
	Eastern Total		5 (1)	11 (1)	5 (1)	9 (3)	8 (2)	8 (1)	2 (0)	12 (3)
	Eastern Percent (%)		31 (6)	69 (6)	36 (7)	64 (21)	50 (13)	50 (6)	14 (0)	86 (21)
	Overall Total		111 (35)	94 (24)	75 (23)	78 (22)	104 (28)	90 (17)	85 (30)	83 (29)
	Overall Percent (%)		54 (17)	46 (12)	49 (15)	51 (14)	54 (14)	46 (9)	51 (18)	49 (17)
Fall	Western	MNO	7 (0)	7 (0)	9 (0)	3 (0)	9 (0)	3 (0)	7 (0)	7 (0)
	Western Total		7 (0)	7 (0)	9 (0)	3 (0)	9 (0)	3 (0)	7 (0)	7 (0)
	Western Percent (%)		50 (0)	50 (0)	75 (0)	25 (0)	75 (0)	25 (0)	50 (0)	50 (0)
	Prairies	LSLBO	6 (0)	10 (3)	11 (1)	12 (1)	8 (1)	11 (4)	9 (0)	12 (1)
		IBS	12 (2)	4 (0)	5 (0)	4 (0)	11 (2)	5 (0)	6 (0)	3 (0)
		BBO	9 (3)	4 (3)	9 (3)	1 (0)	11 (4)	3 (2)	7 (2)	3 (1)
		LMBO	7 (2)	9 (5)	3 (0)	9 (1)	7 (1)	12 (5)	3 (1)	7 (1)
		DMBO	1 (0)	25 (9)	4 (0)	13 (3)	3 (0)	23 (7)	2 (0)	16 (5)
	Prairies Total		35 (7)	52 (20)	32 (4)	39 (5)	40 (8)	54 (18)	27 (3)	41 (8)
	Prairies Percent (%)		40 (8)	60 (23)	45 (6)	55 (7)	43 (9)	57 (19)	40 (4)	60 (12)
	Ontario	TCBO	21 (3)	13 (2)	20 (5)	10 (1)	20 (4)	14 (2)	22 (4)	11 (2)
		LPBO	22 (13)	17 (9)	25 (14)	6 (3)	18 (9)	12 (6)	29 (18)	11 (6)
	Ontario Total		43 (16)	30 (11)	45 (19)	16 (4)	38 (13)	26 (8)	51 (22)	22 (8)
	Ontario Percent (%)		59 (22)	41 (15)	74 (31)	26 (7)	59 (20)	41 (13)	70 (30)	30 (11)
	Eastern	OOT			8 (0)	6 (0)	5 (2)	3 (0)	8 (0)	4 (0)
		ABO_BP	10 (2)	13 (3)	11 (1)	7 (0)	11 (3)	12 (2)	10 (0)	8 (1)
		ABO_SI	3 (0)	3 (0)	3 (0)	16 (3)	3 (0)	9 (2)	3 (0)	10 (1)
	Eastern Total		13 (2)	16 (3)	22 (1)	29 (3)	19 (5)	24 (4)	21 (0)	22 (2)
	Eastern Percent (%)		45 (7)	55 (10)	43 (2)	57 (6)	44 (12)	56 (9)	49 (0)	51 (5)
	Overall Total		**98 (25)**	**105 (34)**	**108 (24)**	**87 (12)**	**106 (26)**	**107 (30)**	**106 (25)**	**92 (18)**
	Overall Percent (%)		**48 (12)**	**52 (17)**	**55 (12)**	**45 (6)**	**50 (12)**	**50 (14)**	**54 (13)**	**46 (9)**

Table 6. Correlation of spring and fall annual indices from Long Point Bird Observatory (LPBO) with annual indices from the Breeding Bird Survey (BBS – Ontario) for the 1968-2006 period for northern and southern species. Significant correlations ($p < 0.05$) are in bold. Bird Conservation Regions (BCRs) 8 and 7 refer to the Northern Shield and Hudson Bay Lowlands, respectively.

Guild	Species Code	Species Name	% of Ontario population in BCRs 8 and 7	Spring		Fall	
				Correlation	*p*(t)	Correlation	*p*(t)
Northern	BBWA	Bay-breasted Warbler	99	0.19	0.27	0.10	0.56
	CMWA	Cape May Warbler	97	**0.46**	**<0.01**	-0.03	0.86
	LISP	Lincoln's Sparrow	100	0.12	0.47	0.02	0.89
	NAWA	Nashville Warbler	92	**0.39**	**0.01**	0.21	0.20
	PAWA	Palm Warbler	100	**-0.33**	**0.08**	**-0.38**	**0.04**
	PHVI	Philadelphia Vireo	98	0.14	0.42	-0.09	0.61
	RCKI	Ruby-crowned Kinglet	100	**-0.32**	**0.05**	**-0.31**	**0.06**
	SWTH	Swainson's Thrush	97	**0.32**	**0.05**	**0.37**	**0.02**
	TEWA	Tennessee Warbler	100	**0.46**	**<0.01**	**0.28**	**0.09**
	DEJU	Dark-eyed Junco	99	0.21	0.20	-0.18	0.27
	WIWA	Wilson's Warbler	99	-0.13	0.45	**-0.35**	**0.03**
	YBFL	Yellow-bellied Flycatcher	99	-0.18	0.27	**-0.29**	**0.07**
Southern	BAOR	Baltimore Oriole	2	0.05	0.77	-0.03	0.87
	BRTH	Brown Thrasher	5	**0.70**	**<0.01**	**0.29**	**0.08**
	EATO	Eastern Towhee	4	**0.38**	**0.02**	**0.34**	**0.04**
	EAWP	Eastern Wood-Pewee	16	-0.13	0.44	**-0.34**	**0.03**
	FISP	Field Sparrow	3	0.10	0.56	-0.07	0.68
	GRCA	Gray Catbird	5	0.18	0.27	**0.32**	**0.05**
	HOWR	House Wren	6	**0.57**	**<0.01**	**0.47**	**<0.01**
	INBU	Indigo Bunting	7	**0.64**	**<0.01**	**0.47**	**<0.01**
	RHWO	Red-headed Woodpecker	<1	**0.54**	**<0.01**	**0.34**	**0.03**
	SOSP	Song Sparrow	28	0.10	0.56	0.25	0.14
	WAVI	Warbling Vireo	3	**0.68**	**<0.01**	**0.84**	**<0.01**
	WOTH	Wood Thrush	4	0.25	0.13	**0.28**	**0.09**

FIGURE 6. LOG(BBS ANNUAL INDEX; BLUE CIRCLES) AND SPRING LPBO ANNUAL INDEX (ORANGE TRIANGLES) PLOTTED AGAINST YEAR FOR NORTHERN AND SOUTHERN BREEDING BIRDS. TREND LINES ARE SMOOTHED LINES REPRESENTING THE RELATIONSHIP AMONG ANNUAL INDICES, AND ARE NOT NECESSARILY REPRESENTATIVE OF THE CALCULATED POPULATION TRENDS. SPECIES CODES ARE PROVIDED IN APPENDIX A.

Spring - Northern



Spring - Southern

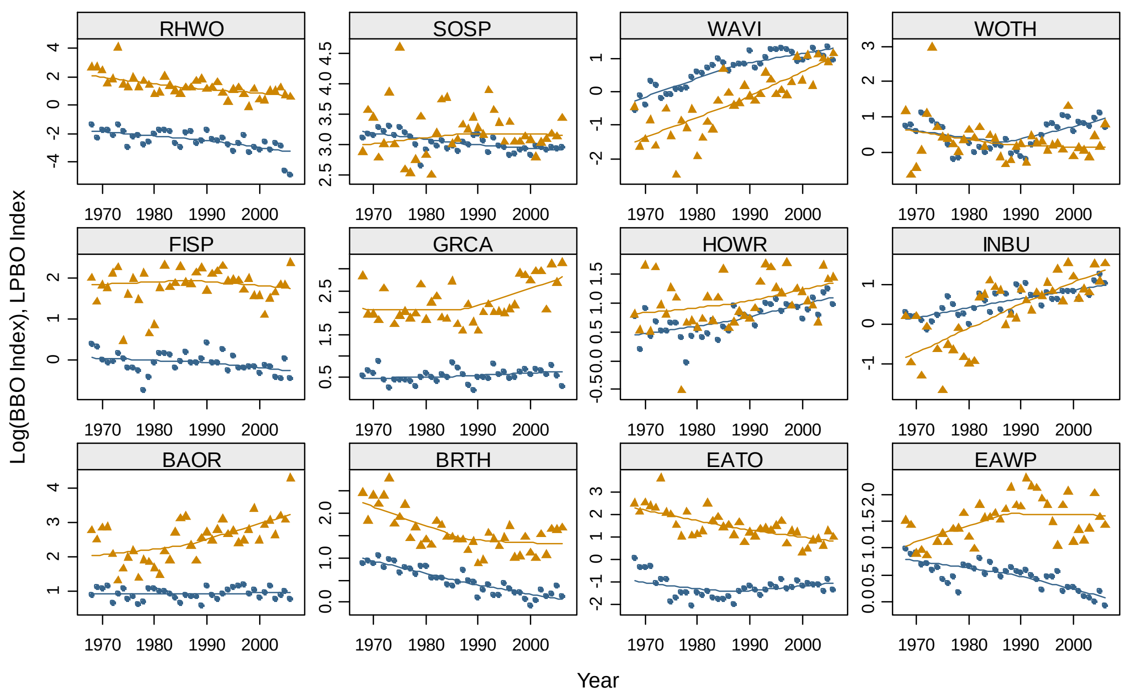
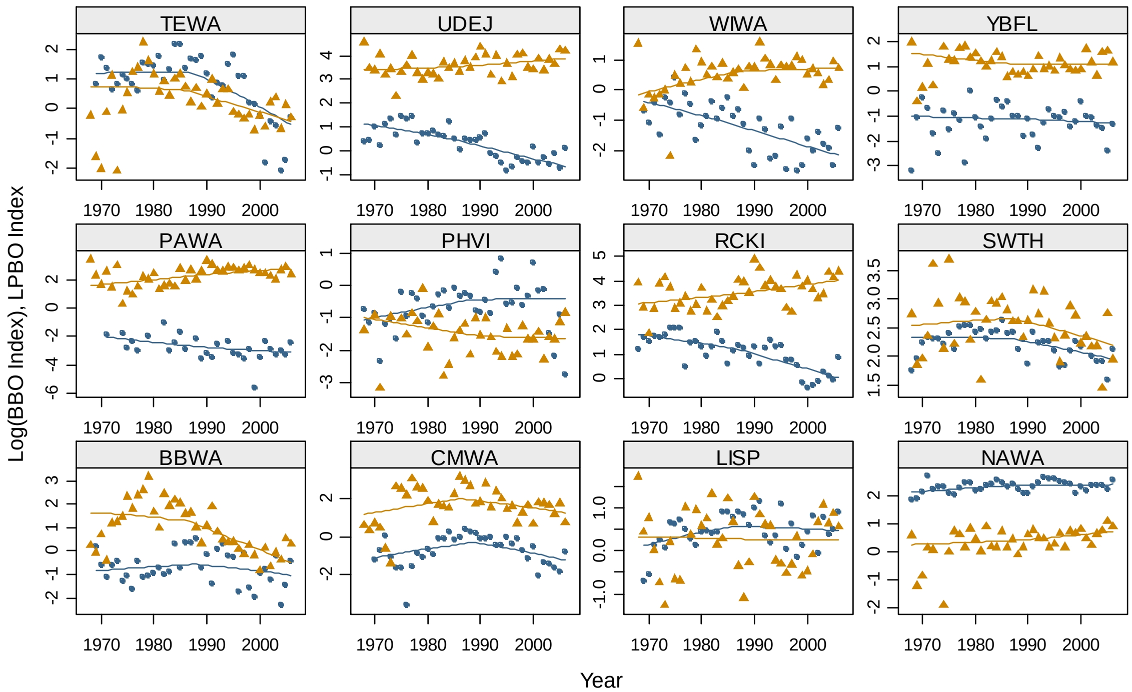


Figure 7. Log(BBS annual index; blue circles) and fall LPBO annual index (orange triangles) plotted against year for Northern and Southern breeding birds. Trend lines are smoothed lines representing the relationship among annual indices, and are not representative of the calculated population trends. Species codes are provided in Appendix A.

Fall - Northern



Fall - Southern

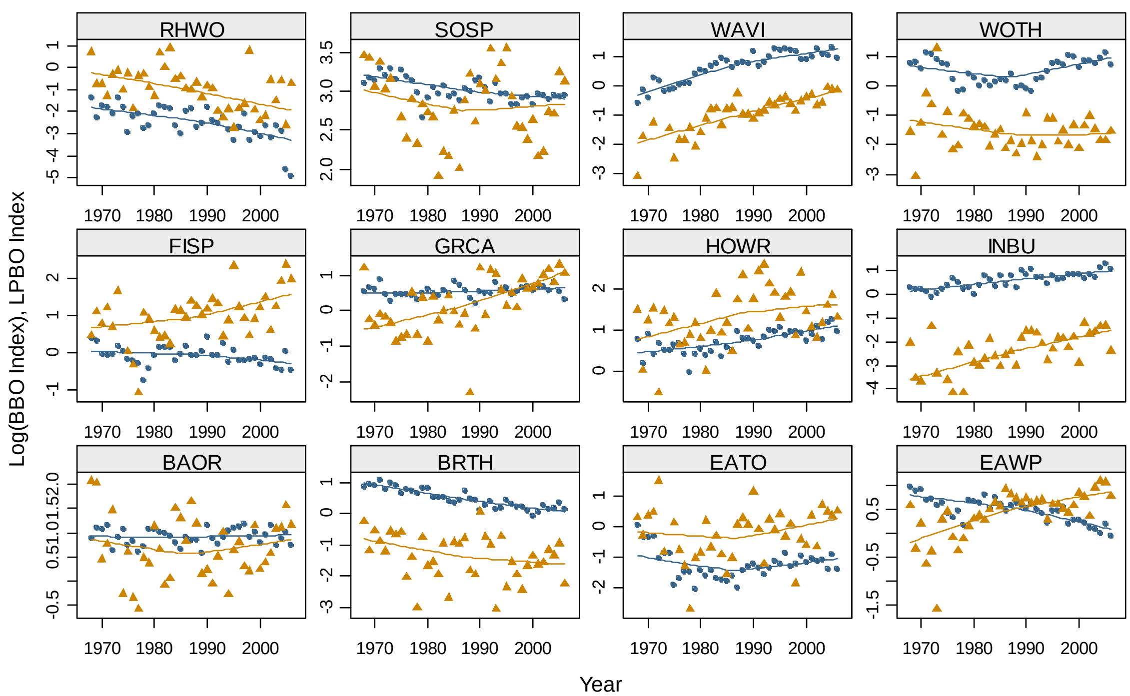
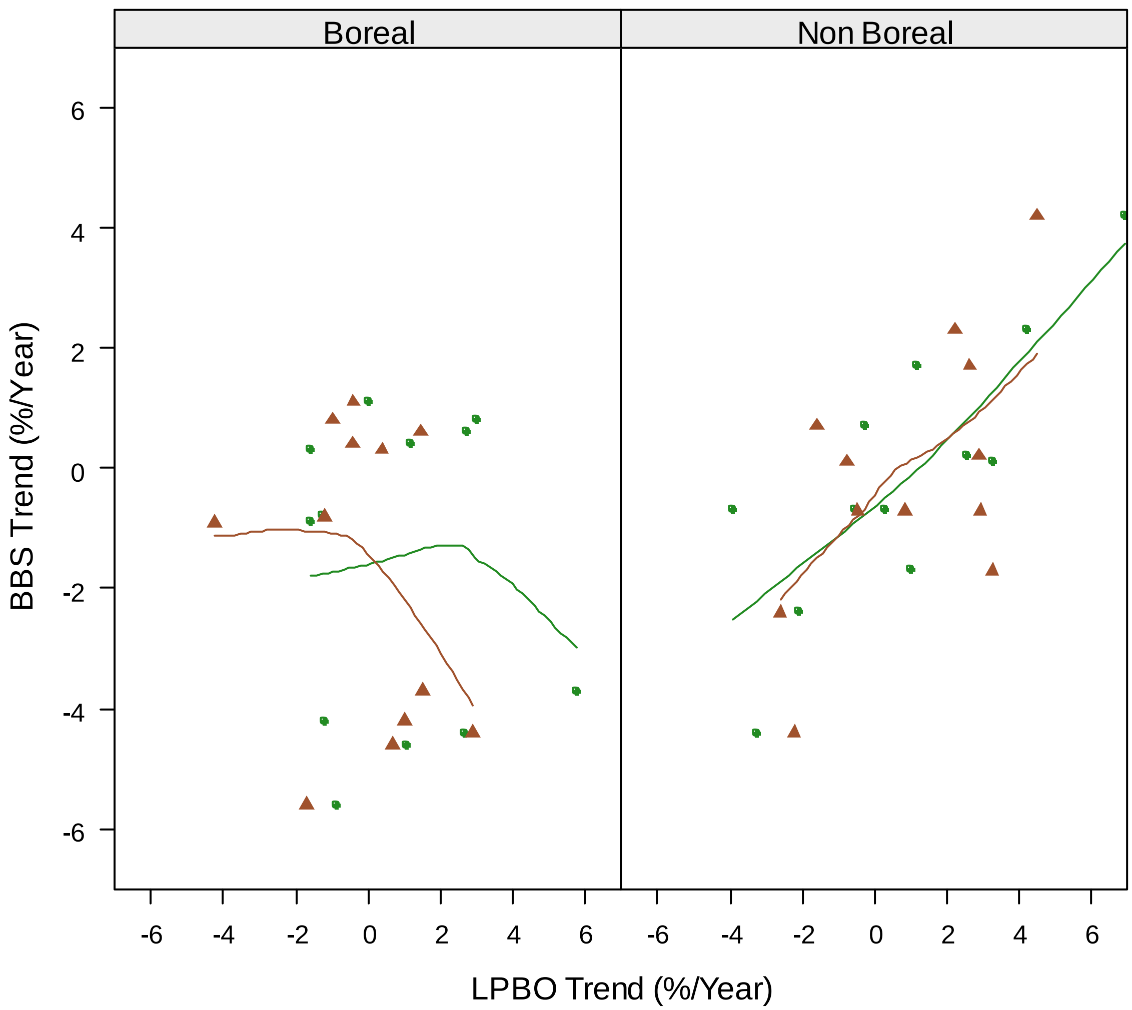


FIGURE 8. CORRELATION OF LPBO AND BBS POPULATION TRENDS FOR 12 BOREAL AND 12 NON-BOREAL BREEDING BIRDS IN SPRING (GREEN CIRCLES) AND FALL (RED TRIANGLES). A SIGNIFICANT CORRELATION WAS OBSERVED FOR NON-BOREAL BREEDING BIRDS IN BOTH SPRING (R^2 = 0.79, *P* = 0.002) AND FALL (R^2 = 0.61, *P* = 0.04), BUT NOT FOR BOREAL BREEDING BIRDS IN SPRING (R^2 = 0.02, *P* = 0.95) OR FALL (R^2 = -0.34, *P* = 0.28), WHERE BBS COVERAGE IS WEAKEST. LINES ARE LOCALLY WEIGHTED REGRESSIONS.



Discussion

Interpretation of Annual Indices and Population Trends

The analytical methods used to generate annual indices and population trends were developed to measure population change of migrant passerines which, ideally, do not stop-over at a count site for more than 24 hours. The appropriateness of these techniques for other species groups (waterbirds, raptors, shorebirds) and for resident and irruptive species has not yet been examined. Although some resident and irruptive species were included in our analysis on a station by station basis (e.g. Common Redpoll, Pine Grosbeak, Pine Siskin), trends for such species should be interpreted with caution.

Regional Spatial Trends

Annual Index Correlations

The positive correlation among stations at short distances, followed by a decline to almost no correlation at approximately 2000 km in both spring and fall supported our prediction that stations in proximity should show more similar estimates of population change than stations farther apart because they are more likely to be sampling the same source population of migrants. Beyond 2000 km, stations tended to show no correlation in fall, and even a tendency towards negative correlation in spring. The negative correlation in spring suggests that populations of species being sampled by widely-separated stations in eastern and western Canada are not changing in synchronous ways, which is not a surprising result. At the macro (e.g. national) level, populations of widespread species would not necessarily be expected to change in the same direction. As evidenced by BBS trend maps, there are nearly always regional differences in the geographic patterns of population trends at continental scales (see BBS trend maps at http://www.mbr-pwrc.usgs.gov/bbs/htm03/trend2003_v2.html).
.

Even migration monitoring stations that are in relatively close proximity to one another do not necessarily sample the same segment of the breeding bird population. Geographic features such as mountains, ridges, rivers, lakes, and expanses of treeless areas also shape migration pathways, even for stations that may be geographically close together.

Regional patterns of population trend estimates are also influenced by local weather patterns which also shape migration patterns. At any given site, local weather conditions may favor or hinder migration and/or stop-over probability in certain years more than others.

Despite all of the above, we still observed regional similarities in trend estimates, which suggest that nearby stations are indeed effectively monitoring either the same or overlapping breeding bird populations of many species.

Regional Trends of Neotropical, Temperate and Boreal Breeding Migrants

Our comparison of population trends for migration and ecoregion guilds also supported a spatial effect on population change. Population trends within a geographic region were more similar than trends between regions in both spring and fall. Even so, variation in the proportion of increasing and declining population trends between stations within a given region was also apparent, regardless of guild.

Over the 10-year period, we generally found that Prairie and Eastern regions showed predominantly declining population trends for all guilds examined in both spring and fall, whereas Ontario and Western regions showed predominantly positive trends. Taking all regions of Canada together, however, about half of the species in each guild showed increases while the other half declined.

For this part of the analysis, we simply used political boundaries to define geographic regions, but patterns of bird occurrence seldom coincide with such boundaries. Species-specific spatial relationships are more readily apparent when population trends are mapped across the network of stations. For example, population trends of Black-and-white Warbler and Magnolia Warbler declined in spring at both DMBO (Prairies Region) and TCBO (Ontario Region), but increased at LPBO (another Ontario Region station; see Figure 9a,b). The more similar patterns seen at DMBO and TCBO suggest that there is more overlap in the 'catchment areas' of species passing through these two sites than through TCBO and LPBO. This is to be expected, given that TCBO is geographically closer to DMBO than LPBO. Similarly, the fall population trend for Ovenbird was negative at DMBO, but positive at other stations in the Prairies region (LMBO and BBO; Figure 9c). The fall trend for Blackpoll Warbler was negative in the Prairies (DMBO and LMBO), but positive in Ontario (TCBO and LPBO; Figure 9d). Other examples are posted online (see http://www.birdscanada.org/birdmon/default/popindices.jsp).

Identifying the geographic sources (catchment areas) of species that are encountered at migration monitoring stations is an important priority for the CMMN. An upcoming species-by-species synthesis of feather isotope and band recovery data will greatly strengthen our understanding and interpretation of broad regional bird population trends.

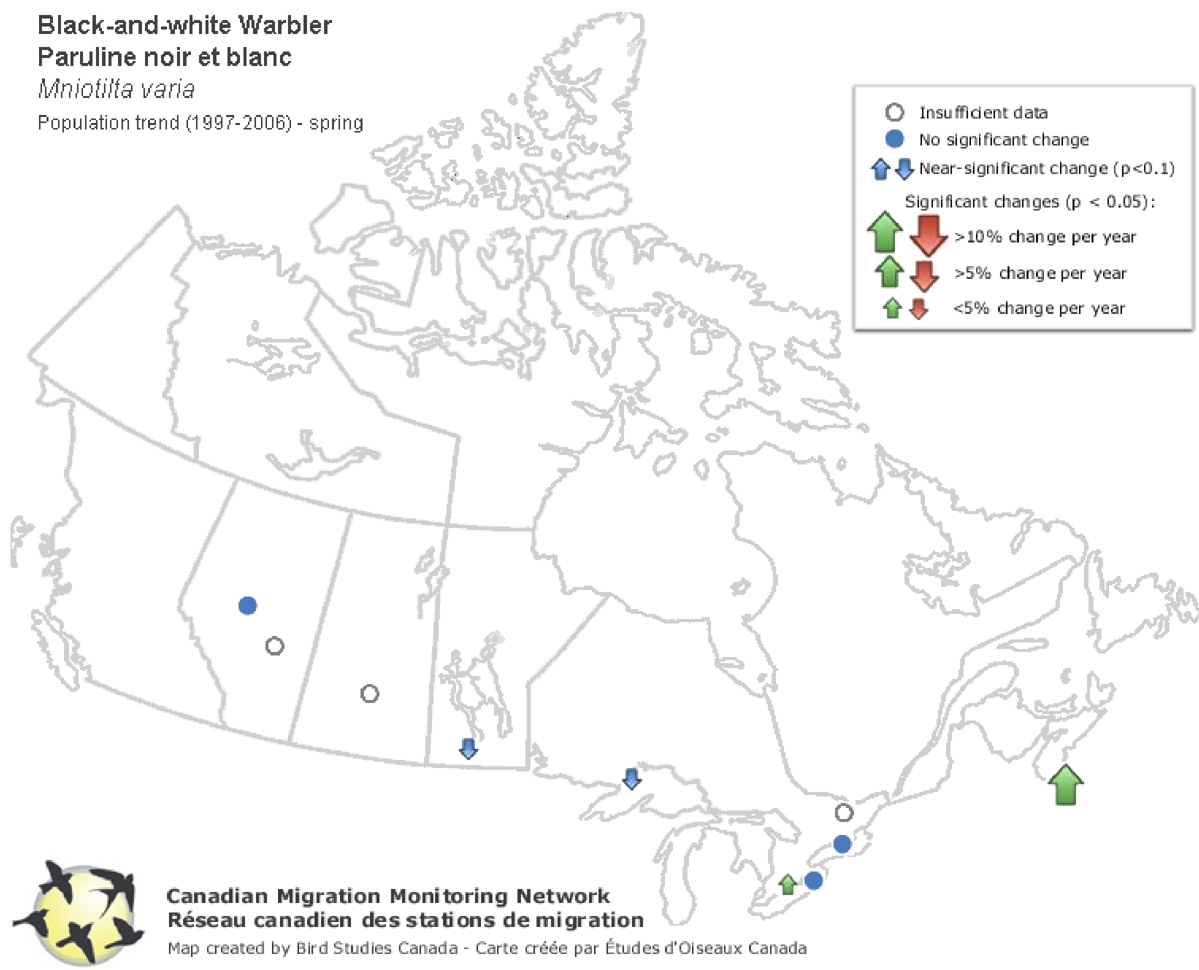
Comparison between results from Migration Monitoring and BBS

Comparative analyses of both annual population indices and long-term trends from migration monitoring at LPBO and from BBS (Ontario) further strengthen Francis and Hussell's (1998) earlier study, which showed that migration monitoring is indeed measuring a population signal similar to BBS for many of the southern Ontario breeding species examined. Our analysis also demonstrated that this relationship breaks down for northern-breeding birds where BBS coverage is poor. Similar analyses should be undertaken at other CMMN stations.

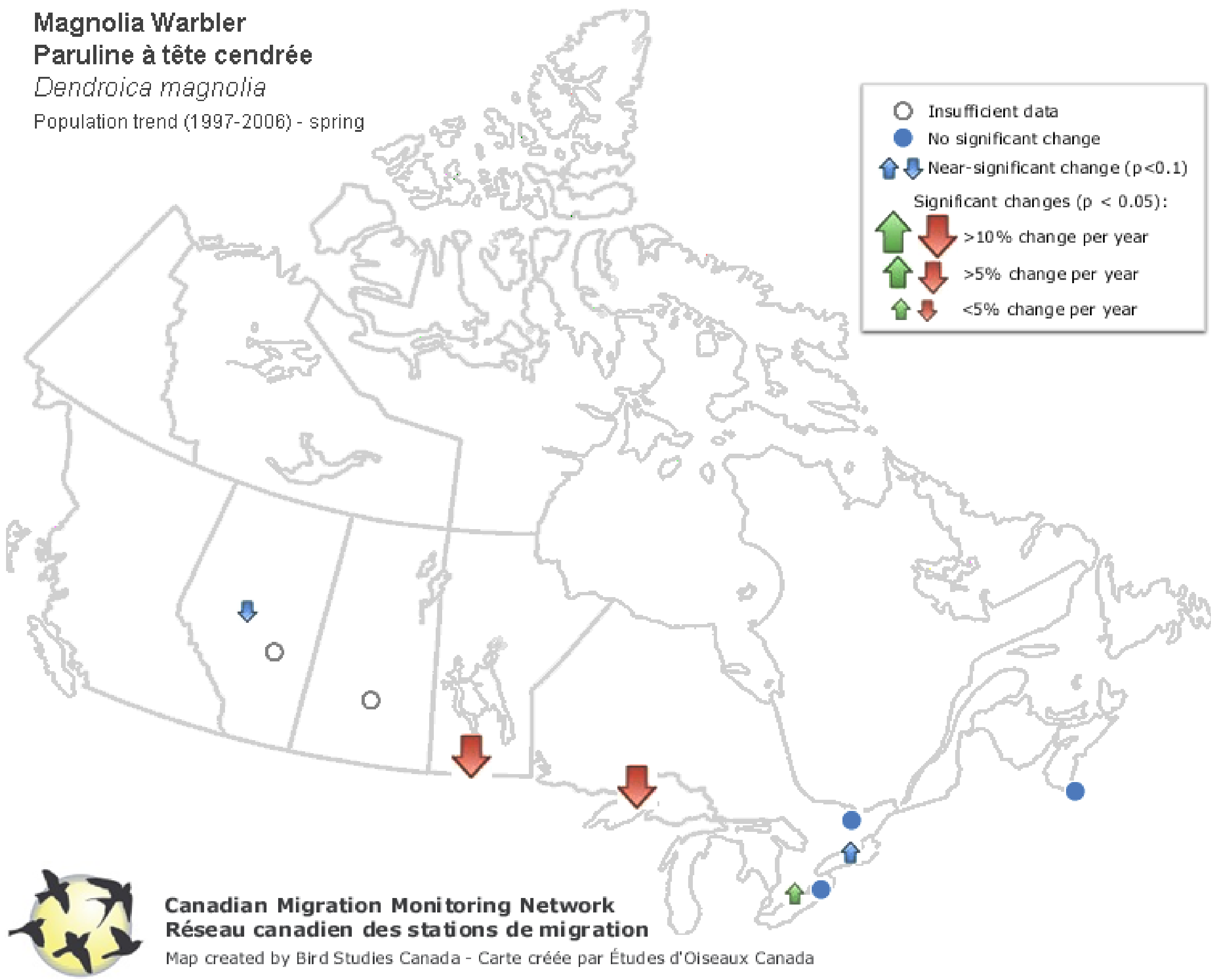
Given that migration monitoring gives a comparable trend signal to BBS in regions of southern Canada where BBS coverage is well developed, then this provides independent corroboration of the two monitoring programs. We further suggest that migration counts are also likely providing valuable trend information for species that reside in northern areas where BBS coverage is largely lacking. As noted earlier, the value of migration monitoring information for northern birds will be greatly enhanced once geographic catchment areas of migrants are better delineated through isotope studies now underway.

Figure 9. Map showing the strength and significance of population trends for a) Black-and-white Warbler (spring), b) Magnolia Warbler (spring), c) Ovenbird (fall), and d) Blackpoll Warbler (Fall) across all CMMN stations that analyzed each species (1997-2006). Trend maps for other species can be found at: [HTTP://WWW.BIRDSCANADA.ORG/BIRDMON/DEFAULT/POPINDICES.JSP](http://www.birdscanada.org/birdmon/default/popindices.jsp).

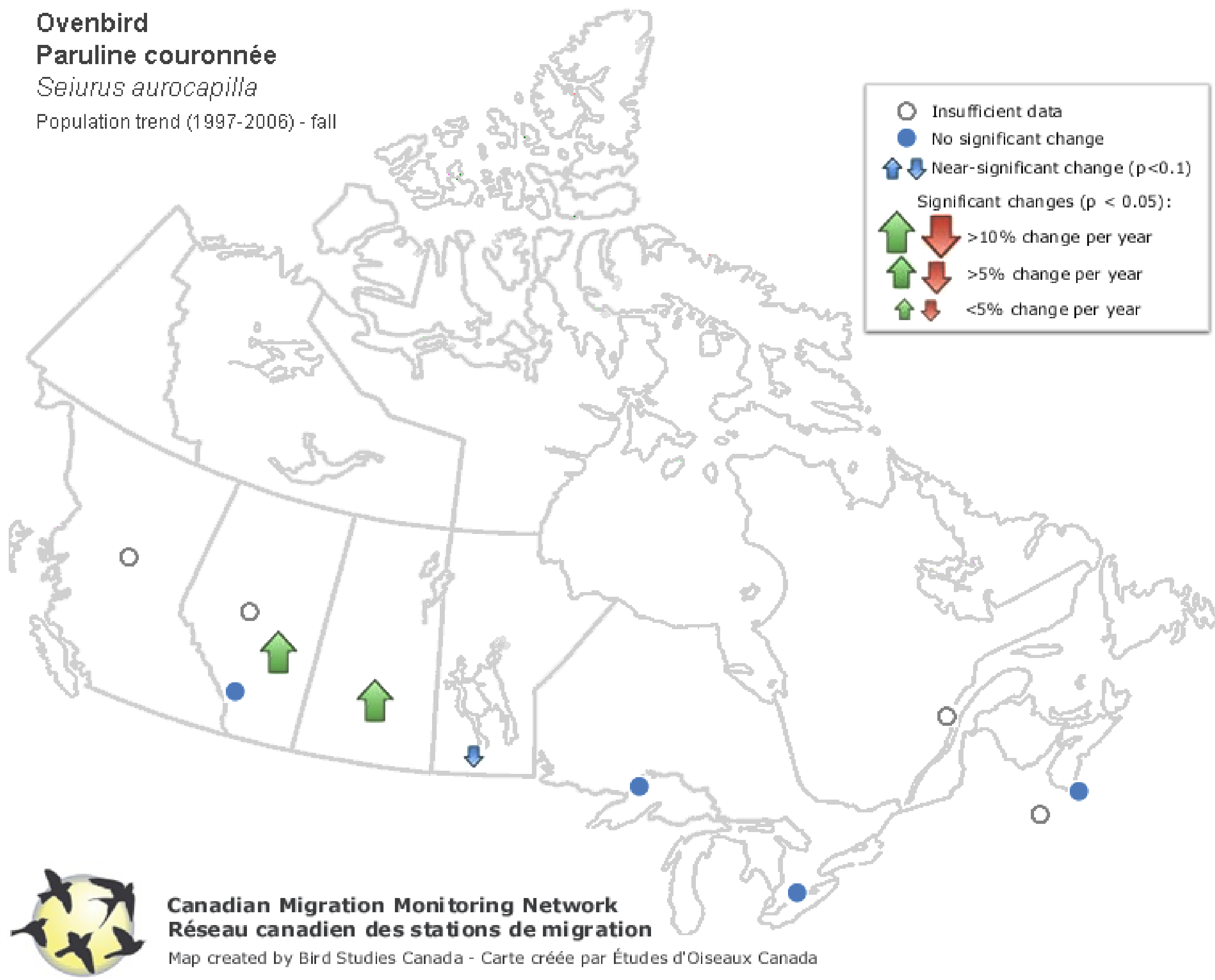
a)



b)

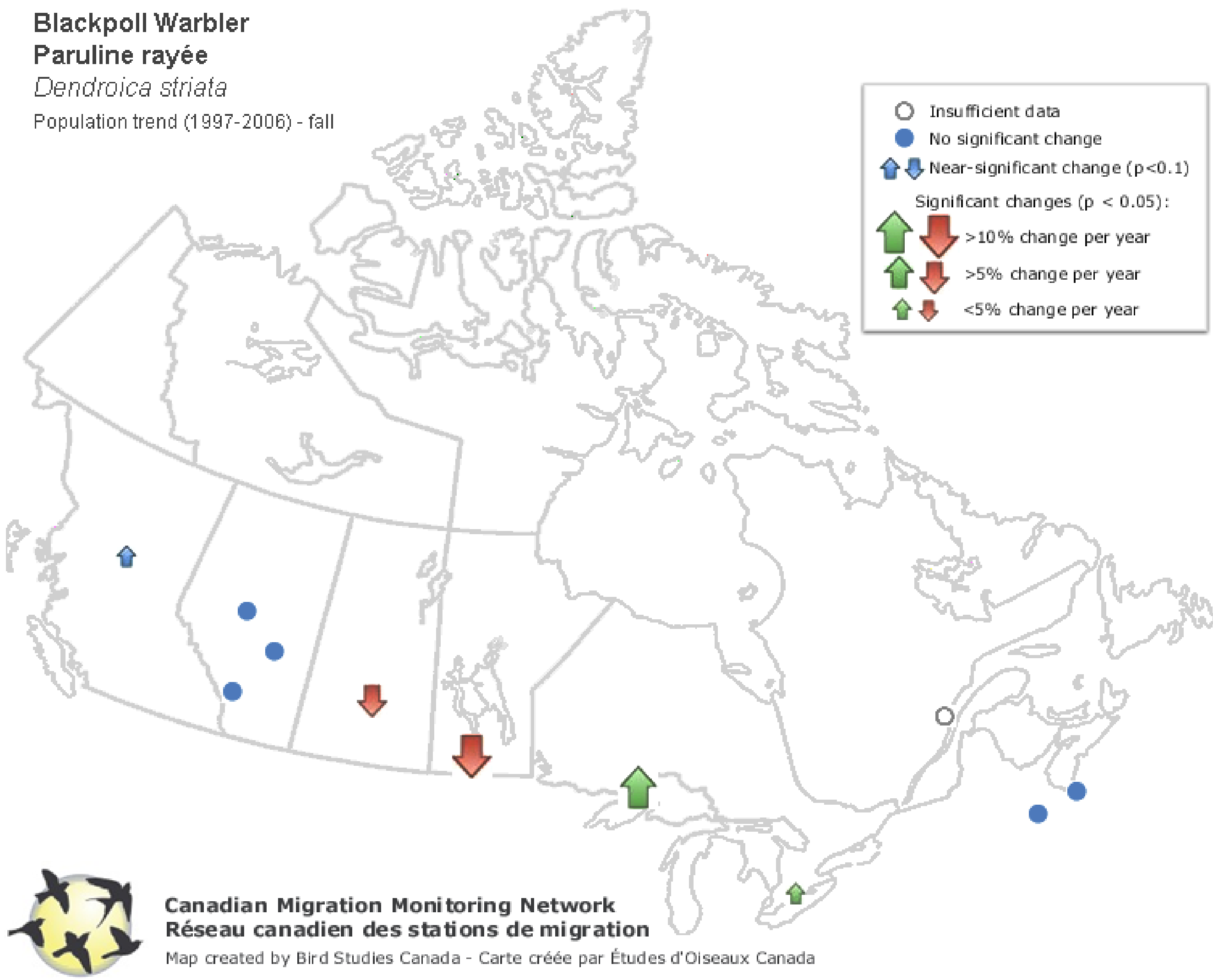

Magnolia Warbler
Paruline à tête cendrée
Dendroica magnolia
Population trend (1997-2006) - spring
Insufficient data
No significant change
Near-significant change (p<0.1)
Significant changes (p < 0.05):
>10% change per year
>5% change per year
<5% change per year
Canadian Migration Monitoring Network
Réseau canadien des stations de migration
Map created by Bird Studies Canada - Carte créée par Études d'Oiseaux Canada

c)



Ovenbird
Paruline couronnée
Seiurus aurocapilla
Population trend (1997-2006) - fall
Insufficient data
No significant change
Near-significant change (p<0.1)
Significant changes (p < 0.05):
>10% change per year
>5% change per year
<5% change per year
Canadian Migration Monitoring Network
Réseau canadien des stations de migration
Map created by Bird Studies Canada - Carte créée par Études d'Oiseaux Canada

d)


Blackpoll Warbler
Paruline rayée
Dendroica striata
Population trend (1997-2006) - fall
Insufficient data
No significant change
Near-significant change (p<0.1)
Significant changes (p < 0.05):
>10% change per year
>5% change per year
<5% change per year
Canadian Migration Monitoring Network
Réseau canadien des stations de migration
Map created by Bird Studies Canada - Carte créée par Études d'Oiseaux Canada

Although results from migration monitoring and BBS corresponded well for many southern breeding species, there were a few exceptions, which suggest that there are likely important differences between the two types of surveys. For example, annual spring and fall indices of Eastern Wood-Pewee from LPBO were negatively correlated with BBS. Likewise, spring and fall trends of migrant Eastern Wood-Pewees increased significantly at LPBO, whereas breeding populations of pewees in southern Ontario declined non-significantly over the same time period using BBS data. There are at least two likely explanations for these differences. First, the pool of individuals sampled during migration at LPBO may largely originate from outside the southern Ontario BBS area of interest (e.g., include birds associated with several adjacent U.S. states and Quebéc). Second, because BBS is a roadside-based survey, it does not necessarily represent changes in populations across the broader landscape.

Of the northern breeding birds we examined, five species (Wilson's Warbler, Palm Warbler, Ruby-crowned Kinglet, Dark-eyed Junco, and Tennessee Warbler) stood out as statistical outliers, with strong negative trends measured by BBS compared to more positive trends at LPBO. In Ontario, breeding abundance of all five species is concentrated well north of the limit of BBS coverage (see Cadman et al. 2007). Hence, it is reasonable to suggest that the apparent negative BBS trend signals do not necessarily apply to core populations occurring in the northern ranges of these species. Conversely, because most of the individuals that are sampled during migration probably originate from these high-density northern regions, migration monitoring should be yielding reliable trend signals for these and other species associated with inaccessible northern regions.

For migration monitoring, we are often interested in assessing which of the count periods (spring or fall) best reflects real population changes in breeding populations, especially for stations that operate in both seasons. Results from our analysis showed that population trends derived from spring migration at LPBO were more closely correlated with BBS than fall trends. However, the opposite was found in the correlation of annual indices. Even so, in all but one case (Warbling Vireo) the magnitude of the correlation coefficient for spring was higher than in the fall, sometimes considerably so. Contrary to our results, an earlier study by Francis and Hussell (1998) suggested that fall trends at LPBO were a better approximation of BBS trends than spring. However, their study was based on a shorter time series and involved a slightly different group of species. Because results are mixed, we cannot yet make any general conclusion about the relative performance of spring versus fall sampling. The answer undoubtedly depends very much on the overall breeding distribution of the individual species in question and their seasonal migration routes in relation to the geographic position of the migration station.

In our comparative analysis, we found that LPBO trends tended to be more positive than BBS trends in both spring and fall and for both northern and southern breeding species. The apparent positive bias at LPBO (relative to BBS) could result from unknown changes in count-estimation procedures, observer skill, or local changes in habitat. Although Long Point is generally considered to be stable habitat, census routes and net lanes have been modified periodically as a result of erosion. In addition, two large culls of white-tailed deer since the early 1990s are known to have resulted in the enhancement of ground layer habitat attributes that might be affecting stop-over suitability, especially for species that forage on or near the ground. Alternatively, changes in roadside habitat and/or increases in vehicular traffic along BBS routes could result in a negative bias of BBS trends. Francis and Hussell (1998) provide a good review of potential sources of bias both within migration monitoring and BBS. This is an obvious area deserving further research across the CMMN.

Factors Affecting Population Trend Estimates

The precision and reliability of bird population trend estimates are influenced by a variety of factors, including the particular time period analyzed, local habitat changes, and changes in sampling effort, data collection methods, or analytical techniques employed. Length of the time series during which data are collected is one of the most critical features of any monitoring program that purports to measure bird population trend. All else being equal, the reliability of trend estimates increases with time. This means that estimates that are based upon 10 or more years of data have much more reliability than those that are based on fewer years. Only a handful of CMMN stations have been in operation for over a decade. As such, this report focuses on a common 10-year period in order to maximize the number of stations contributing data from across the country.

To illustrate the value of having a long time-series available, we use the Cape May Warbler example from LPBO. Over a short (10-year) period spanning 1997-2006, migration count data indicate that Cape May Warbler populations declined significantly at LPBO by -6.5%/year (p = 0.05) in fall at LPBO (Table 3). However, over the full 45-year time period at LPBO, the longer-term data suggest much more modest overall change, showing an initial increase and subsequent decline in population (Figure 12), that corresponds well with outbreaks of spruce budworm in Ontario. In the absence of long-term monitoring, the context of the most recent 10-year change can be lost, and the importance of current population changes can be over or under estimated.

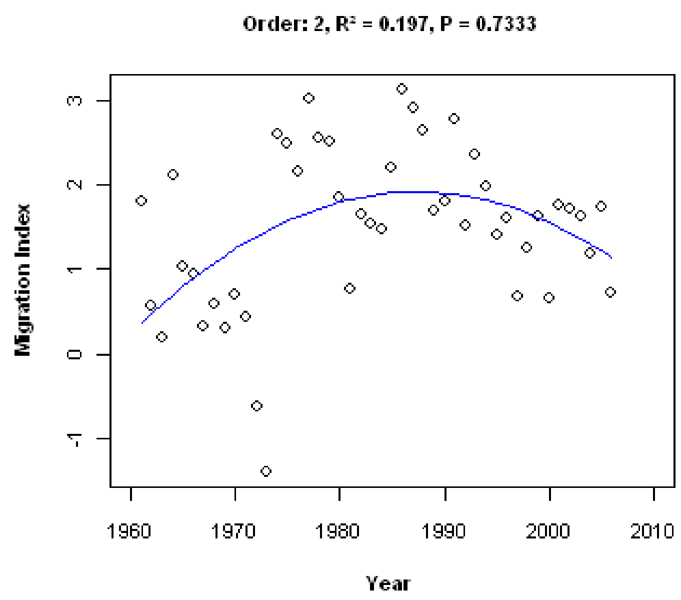


FIGURE 12. POPULATION INDICES FOR CAPE MAY WARBLER AT LONG POINT BIRD OBSERVATORY IN SPRING (1961-2006) DEMONSTRATING NON-LINEAR TREND PATTERNS THAT FREQUENTLY OCCUR OVER LONG TIME PERIODS.

Habitat change at count sites can also influence annual indices derived from migration data. Habitat stability is an important criteria involved in selecting migration monitoring stations, though early to mid-successional habitat is recommended for better banding and viewing opportunities. In addition to natural habitat succession, seasonal flooding can temporarily change stop-over habitat suitability, while fire and insect outbreaks can have longer-lasting and more dramatic effects. At present, habitat composition is not well quantified on a regular basis at the majority of CMMN stations, but habitat is known to have changed at some sites. To help interpret population trends, CMMN stations are asked to regularly submit photographs of their site to give a general sense of whether and how habitat is changing over time.

Changes in sampling effort over time can also affect annual indices. This could include a change in the number or arrangement of nets, a change in census route location, a change in the method of calculating ETs, or a change in the number of hours dedicated to individual count methods. Effort can also vary within a season and among years as a result of changes in personnel, rotation of volunteers, or a change in the number and quality of personnel and volunteers. A good, transparent record of such changes is necessary at each station, so population trends can be interpreted appropriately.

Some Suggested Next Steps

1. Feather isotope analysis is currently a high priority for the CMMN; a large collaborative project that is currently underway is expected to be complete by the end of 2009. Knowledge of species catchment areas at CMMN stations will provide valuable information to help interpret regional trends, station correlations, and correlations with other bird monitoring programs. It could also provide insight into where conservation efforts should be directed if, for example, there is a predominance of declining population trends within a particular geographic catchment. Results from the feather isotope analysis can also be used to perform a gap analysis to determine where new stations should be located in order to maximize coverage of the northern forest region.

2. In addition to continued work on isotopes, there is strong merit in producing population trends separately for easily identifiable subspecies, especially where linkages can be made to relatively distinct geographic regions.

3. One of the goals of the CMMN is to refine methods for computing annual indices and calculating trends, and to conduct rigorous assessments of their utility. In this report, we used generalized linear models with negative binomial or Poisson distribution to estimate annual population indices. Analysis techniques and approaches need to be refined further, and results published. Statistical approaches can and should also be developed to analyze population trends for species that occur in small numbers at CMMN stations, for non-passerine and irruptive species, and for numerous situations where migration counts may be confounded by the presence of seasonally large numbers of locally breeding or wintering residents. Developing these approaches will dramatically increase the number of species that can be analyzed and reported on across the Network.

4. Weather can affect both the probability that an individual will stop-over at a site and the duration of stop-over. By correcting for daily weather variables, variation in annual indices can be reduced (Hussell et al. 1992). Such corrections should also result in stronger correlations of annual indices among stations sampling populations from the same catchment. Although weather was found to have little impact on long-term population trend estimates at Long Pont Bird Observatory (Crewe 2006), the effects of weather at other CMMN stations should be explored, particularly if average annual

weather conditions exhibit a trend over time, as might be anticipated with climate change.

5. Further analytical work needs to be done to investigate effects of local habitat change on population indices.

6. Most stations summarize daily counts using estimated totals (ETs) for each species, but Inglewood Bird Sanctuary (Alberta) and l'Observatoire d'oiseaux de Tadoussac (Québec) base their counts on standardized banding and visual migration, respectively. The effect that differences in count estimation procedure has on both the detection probability of birds and variation in annual indices requires further study. A preliminary examination suggests that there have been unexplained patterns of change (positive and negative) in ETs over time at some stations. These changes may reflect real overall population changes, but the extent to which they reflect changes in habitat, personnel, effort or methodology needs to be better understood. For example, Dunn et al. (2004) found that for the majority of species analyzed at Long Point Bird Observatory, ETs were positively biased, possibly as a result of a change in estimation procedure introduced in the early 1990s. Improving our understanding of the relationship between ETs and the components that contribute to the ET (banding, census and general observations) will allow us to improve our understanding and interpretation of observed population changes.

7. Finally, age ratio data from CMMN stations should be examined to determine its usefulness as a means to monitor annual breeding productivity (fall migration) or over-winter survival (spring migration), which could lead to a much better understanding of where population 'bottlenecks' may be occurring for species in decline.

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Appendix A. Species Classifications

TABLE A-1. Species classification by migration strategy (T=temperate, N=neotropical); 'other' migration strategy (R=resident, I=irruptive, N=nomadic; see Environment Canada 2008) and by boreal breeding classification (see Blancher and Wells 2005). Records are ordered alphabetically by Species Code. Table includes all species currently analyzed at one or more CMMN stations.

Species Code	Species Name (English/French)	*Species Name (Scientific)*	Migration Strategy	Other	Boreal
AMGO	American Goldfinch/Chardonneret jaune	*Carduelis tristis*	T	R/I	.
AMKE	American Kestrel/Crécerelle d'Amérique	*Falco sparverius*	T	.	.
AMPI	American Pipit/Pipit d'Amérique	*Anthus rubescens*	T	.	.
AMRE	American Redstart/Paruline flamboyante	*Setophaga ruticilla*	N	.	.
AMRO	American Robin/Merle d'Amérique	*Turdus migratorius*	T	.	.
ATSP	American Tree Sparrow/Bruant hudsonien	*Spizella arborea*	T	.	.
BANS	Bank Swallow/Hirondelle de rivage	*Riparia riparia*	N	.	.
BAOR	Baltimore Oriole/Oriole de Baltimore	*Icterus galbula*	N	.	.
BARS	Barn Swallow/Hirondelle rustique	*Hirundo rustica*	N	.	.
BAWW	Black-and-white Warbler/Paruline noir et blanc	*Mniotilta varia*	N	.	Y
BBCU	Black-billed Cuckoo/Coulicou à bec noir	*Coccyzus erythropthalmus*	N	.	.
BBWA	Bay-breasted Warbler/Paruline à poitrine baie	*Dendroica castanea*	N	.	Y
BBWO	Black-backed Woodpecker/Pic à dos noir	*Picoides arcticus*	.	R	Y
BCCH	Black-capped Chickadee/Mésange à tête noire	*Poecile atricapillus*	.	R/I	.
BEKI	Belted Kingfisher/Martin-pêcheur d'Amérique	*Ceryle alcyon*	T	.	.
BGGN	Blue-gray Gnatcatcher/Gobemoucheron gris-bleu	*Polioptila caerulea*	N	.	.
BHCO	Brown-headed Cowbird/Vacher à tête brune	*Molothrus ater*	T	.	.
BHGR	Black-headed Grosbeak/Cardinal à tête noire	*Pheucticus melanocephalus*	N	.	.
BHVI	Solitary Vireo/Viréo à tête bleue	*Vireo solitarius*	T	.	Y
BHVI	Blue-headed Vireo/Viréo à tête bleue	*Vireo solitarius*	T	.	Y
BLBW	Blackburnian Warbler/Paruline à gorge orangée	*Dendroica fusca*	N	.	Y
BLJA	Blue Jay/Geai bleu	*Cyanocitta cristata*	T	R/I	.
BLPW	Blackpoll Warbler/Paruline rayée	*Dendroica striata*	N	.	Y
BOWA	Bohemian Waxwing/Jaseur boréal	*Bombycilla garrulus*	T	N/I	Y
BRCR	Brown Creeper/Grimpereau brun	*Certhia americana*	T	.	.
BRTH	Brown Thrasher/Moqueur roux	*Toxostoma rufum*	T	.	.
BTBW	Black-throated Blue Warbler/Paruline bleue	*Dendroica caerulescens*	N	.	.
BTNW	Black-throated Green Warbler/Paruline à gorge noire	*Dendroica virens*	N	.	Y
BTPI	Band-tailed Pigeon/Pigeon à queue barrée	*Patagioenas fasciata*	T	.	.
BTYW	Black-throated Gray Warbler/Paruline grise	*Dendroica nigrescens*	N	.	.
CAVI	Cassin's Vireo/Viréo de Cassin	*Vireo cassinii*	N	.	.
CAWA	Canada Warbler/Paruline du Canada	*Wilsonia canadensis*	N	.	Y
CCSP	Clay-colored Sparrow/Bruant des plaines	*Spizella pallida*	N	.	Y
CEDW	Cedar Waxwing/Jaseur d'Amérique	*Bombycilla cedrorum*	T	R/I	.
CHSP	Chipping Sparrow/Bruant familier	*Spizella passerina*	T	.	.
CLSW	Cliff Swallow/Hirondelle à front blanc	*Petrochelidon pyrrhonota*	N	.	.
CMWA	Cape May Warbler/Paruline tigrée	*Dendroica tigrina*	N	.	Y
COGR	Common Grackle/Quiscale bronzé	*Quiscalus quiscula*	T	.	.

Species Code	Species Name (English/French)	*Species Name (Scientific)*	Migration Strategy	Other	Boreal
CONI	Common Nighthawk/Engoulevent d'Amérique	*Chordeiles minor*	N	.	.
CORE	Common Redpoll/Sizerin flammé	*Carduelis flammea*	T	I	.
COYE	Common Yellowthroat/Paruline masquée	*Geothlypis trichas*	N	.	.
CSWA	Chestnut-sided Warbler/Paruline à flancs marron	*Dendroica pensylvanica*	N	.	.
DEJU	Dark-eyed Junco/Junco ardoisé	*Junco hyemalis*	T	.	Y
DUFL	Dusky Flycatcher/Moucherolle sombre	*Empidonax oberholseri*	N	.	.
EABL	Eastern Bluebird/Merlebleu de l'Est	*Sialia sialis*	T	.	.
EAKI	Eastern Kingbird/Tyran tritri	*Tyrannus tyrannus*	N	.	.
EAPH	Eastern Phoebe/Moucherolle phébi	*Sayornis phoebe*	T	.	.
EATO	Eastern Towhee/Tohi à flancs roux	*Pipilo erythrophthalmus*	T	.	.
EAWP	Eastern Wood-Pewee/Pioui de l'Est	*Contopus virens*	N	.	.
EVGR	Evening Grosbeak/Gros-bec errant	*Coccothraustes vespertinus*	T	R/I	.
FISP	Field Sparrow/Bruant des champs	*Spizella pusilla*	T	.	.
FOSP	Fox Sparrow/Bruant fauve	*Passerella iliaca*	T	.	Y
GCFL	Great Crested Flycatcher/Tyran huppé	*Myiarchus crinitus*	N	.	.
GCKI	Golden-crowned Kinglet/Roitelet à couronne dorée	*Regulus satrapa*	T	.	.
GCSP	Golden-crowned Sparrow/Bruant à couronne dorée	*Zonotrichia atricapilla*	T	.	Y
GCTH	Gray-cheeked Thrush/Grive à joues grises	*Catharus minimus*	N	.	Y
GRCA	Gray Catbird/Moqueur chat	*Dumetella carolinensis*	N	.	.
HAFL	Hammond's Flycatcher/Moucherolle de Hammond	*Empidonax hammondii*	N	.	.
HASP	Harris's Sparrow/Bruant à face noire	*Zonotrichia querula*	T	.	.
HETH	Hermit Thrush/Grive solitaire	*Catharus guttatus*	T	.	Y
HOLA	Horned Lark/Alouette hausse-col	*Eremophila alpestris*	T	.	.
HOWR	House Wren/Troglodyte familier	*Troglodytes aedon*	T	.	.
INBU	Indigo Bunting/Passerin indigo	*Passerina cyanea*	N	.	.
LALO	Lapland Longspur/Bruant lapon	*Calcarius lapponicus*	T	.	.
LEFL	Least Flycatcher/Moucherolle tchébec	*Empidonax minimus*	N	.	Y
LISP	Lincoln's Sparrow/Bruant de Lincoln	*Melospiza lincolnii*	N	.	Y
MAWA	Magnolia Warbler/Paruline à tête cendrée	*Dendroica magnolia*	N	.	Y
MAWR	Marsh Wren/Troglodyte des marais	*Cistothorus palustris*	T	.	.
MGWA	MacGillivray's Warbler/Paruline des buissons	*Oporornis tolmiei*	N	.	.
MOWA	Mourning Warbler/Paruline triste	*Oporornis philadelphia*	N	.	Y
NAWA	Nashville Warbler/Paruline à joues grises	*Vermivora ruficapilla*	N	.	Y
NOFL	Northern Flicker/Pic flamboyant	*Colaptes auratus*	T	.	.
NOHA	Northern Harrier/Busard Saint-Martin	*Circus cyaneus*	T	.	.
NOPA	Northern Parula/Paruline à collier	*Parula americana*	N	.	.
NOWA	Northern Waterthrush/Paruline des ruisseaux	*Seiurus noveboracensis*	N	.	Y
NRWS	Northern Rough-winged Swallow/Hirondelle à ailes hérissées	*Stelgidopteryx serripennis*	N	.	.
NSHR	Northern Shrike/Pie-grièche grise	*Lanius excubitor*	T	R/I	.
OCWA	Orange-crowned Warbler/Paruline verdâtre	*Vermivora celata*	T	.	Y
OSFL	Olive-sided Flycatcher/Moucherolle à côtés olive	*Contopus cooperi*	N	.	Y
OVEN	Ovenbird/Paruline couronnée	*Seiurus aurocapilla*	N	.	.
PAWA	Palm Warbler/Paruline à couronne rousse	*Dendroica palmarum*	T	.	Y
PHVI	Philadelphia Vireo/Viréo de Philadelphie	*Vireo philadelphicus*	N	.	Y
PIGR	Pine Grosbeak/Durbec des sapins	*Pinicola enucleator*	.	N/R/I	Y
PISI	Pine Siskin/Tarin des pins	*Carduelis pinus*	T	R/I	.

Species Code	Species Name (English/French)	*Species Name (Scientific)*	Migration Strategy	Other	Boreal
PIWA	Pine Warbler/Paruline des pins	*Dendroica pinus*	T	.	.
PSFL	Pacific-slope Flycatcher/Moucherolle côtier	*Empidonax difficilis*	N	.	.
PUFI	Purple Finch/Roselin pourpré	*Carpodacus purpureus*	T	R/I	.
PUMA	Purple Martin/Hirondelle noire	*Progne subis*	N	.	.
RBGR	Rose-breasted Grosbeak/Cardinal à poitrine rose	*Pheucticus ludovicianus*	N	.	.
RBNU	Red-breasted Nuthatch/Sittelle à poitrine rousse	*Sitta canadensis*	.	R/I	.
RCKI	Ruby-crowned Kinglet/Roitelet à couronne rubis	*Regulus calendula*	T	.	Y
RECR	Red Crossbill/Bec-croisé des sapins	*Loxia curvirostra*	.	R/I	.
REVI	Red-eyed Vireo/Viréo aux yeux rouges	*Vireo olivaceus*	N	.	.
RHWO	Red-headed Woodpecker/Pic à tête rouge	*Melanerpes erythrocephalus*	T	.	.
RTHU	Ruby-throated Hummingbird/Colibri à gorge rubis	*Archilochus colubris*	N	.	.
RUBL	Rusty Blackbird/Quiscale rouilleux	*Euphagus carolinus*	T	.	Y
RUHU	Rufous Hummingbird/Colibri roux	*Selasphorus rufus*	N	.	.
RWBL	Red-winged Blackbird/Carouge à épaulettes	*Agelaius phoeniceus*	T	.	.
SAVS	Savannah Sparrow/Bruant des prés	*Passerculus sandwichensis*	T	.	.
SCTA	Scarlet Tanager/Tangara écarlate	*Piranga olivacea*	N	.	.
SEWR	Sedge Wren/Troglodyte à bec court	*Cistothorus platensis*	T	.	.
SNBU	Snow Bunting/Bruant des neiges	*Plectrophenax nivalis*	T	.	.
SOSA	Solitary Sandpiper/Chevalier solitaire	*Tringa solitaria*	N	.	Y
SOSP	Song Sparrow/Bruant chanteur	*Melospiza melodia*	T	.	.
SSHA	Sharp-shinned Hawk/Épervier brun	*Accipiter striatus*	T	.	.
STJA	Steller's Jay/Geai de Steller	*Cyanocitta stelleri*	.	R	.
SWSP	Swamp Sparrow/Bruant des marais	*Melospiza georgiana*	T	.	Y
SWTH	Swainson's Thrush/Grive à dos olive	*Catharus ustulatus*	N	.	Y
TEWA	Tennessee Warbler/Paruline obscure	*Vermivora peregrina*	N	.	Y
TOWA	Townsend's Warbler/Paruline de Townsend	*Dendroica townsendi*	N	.	.
TRES	Tree Swallow/Hirondelle bicolore	*Tachycineta bicolor*	T	.	.
TRFL	Trail's Flycatcher /Moucherolle des saules ou des aulnes	*Empidonax traillii or alnorum*	N	.	Y
TTWO	Three-toed Woodpecker/Pic tridactyle	*Picoides tridactylus*	.	R	Y
VASW	Vaux's Swift/Martinet de Vaux	*Chaetura vauxi*	N	.	.
VATH	Varied Thrush/Grive à collier	*Ixoreus naevius*	T	R/I	.
VEER	Veery/Grive fauve	*Catharus fuscescens*	N	.	.
VESP	Vesper Sparrow/Bruant vespéral	*Pooecetes gramineus*	T	.	.
VGSW	Violet-green Swallow/Hirondelle à face blanche	*Tachycineta thalassina*	N	.	.
WAVI	Warbling Vireo/Viréo mélodieux	*Vireo gilvus*	N	.	.
WBNU	White-breasted Nuthatch/Sittelle à poitrine blanche	*Sitta carolinensis*	T	.	.
WCSP	White-crowned Sparrow/Bruant à couronne blanche	*Zonotrichia leucophrys*	T	.	Y
WEKI	Western Kingbird/Tyran de l'Ouest	*Tyrannus verticalis*	N	.	.
WETA	Western Tanager/Tangara à tête rouge	*Piranga ludoviciana*	N	.	.
WEWP	Western Wood-Pewee/Pioui de l'Ouest	*Contopus sordidulus*	N	.	.
WIWA	Wilson's Warbler/Paruline à calotte noire	*Wilsonia pusilla*	N	.	Y
WIWR	Winter Wren/Troglodyte mignon	*Troglodytes troglodytes*	T	.	.
WOTH	Wood Thrush/Grive des bois	*Hylocichla mustelina*	N	.	.
WTSP	White-throated Sparrow/Bruant à gorge blanche	*Zonotrichia albicollis*	T	.	Y
WWCR	White-winged Crossbill/Bec-croisé bifascié	*Loxia leucoptera*	.	N/R	Y
YBCU	Yellow-billed Cuckoo/Coulicou à bec jaune	*Coccyzus americanus*	N	.	.

Species Code	Species Name (English/French)	*Species Name (Scientific)*	Migration Strategy	Other	Boreal
YBFL	Yellow-bellied Flycatcher/Moucherolle à ventre jaune	*Empidonax flaviventris*	N	.	Y
YBSA	Yellow-bellied Sapsucker/Pic maculé	*Sphyrapicus varius*	T	.	Y
YRWA	Yellow-rumped Warbler/Paruline à croupion jaune	*Dendroica coronata*	T	.	Y
YWAR	Yellow Warbler/Paruline jaune	*Dendroica petechia*	N	.	.

Appendix B. Species Sampled at CMMN Stations in Spring and Fall.

Table B-1. Species detected in low numbers at CMMN stations (○); species that met minimum sample size requirements (10 individuals and 5 observation days on average) and may be candidates for future trend analysis (●); and species analyzed in this report (●). Species are listed in taxonomic order. Listing excludes species that seldom if ever breed in Canada. Only a subset of data was available for the IBS and OOT stations.

Species Code	Species Name (English/French)	Season	RPBO	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	BPBO	LPBO_OC	LPBO_BW	LPBO_TIP	HBO_RUTH	HBO_ROCK	HBO_SELK	PEPtBO	IPBO	OOT	ABO_SI	ABO_BP
GWFG	Greater White-fronted Goose/Oie rieuse	Spring					●															
GWFG	Greater White-fronted Goose/Oie rieuse	Fall	○	○	○		●	○	○	○		○										
SNGO	Snow Goose/Oie des neiges	Spring			○		○	○	○	○	○	○	○	○	○		○	○	○			
SNGO	Snow Goose/Oie des neiges	Fall	○	○	○		●	●	●	○	○	○		○	○		○	○			○	○
ROGO	Ross's Goose/Oie de Ross	Spring					○										○					
ROGO	Ross's Goose/Oie de Ross	Fall						○	○								○					
BRAN	Brant/Bernache cravant	Spring									○		○					○	○		○	○
BRAN	Brant/Bernache cravant	Fall									○			○				○			○	○
CACG	Cackling Goose/Bernache de Hutchins	Spring								○												
CACG	Cackling Goose/Bernache de Hutchins	Fall								○				○								
CAGO	Canada Goose/Bernache du Canada	Spring			●		●	○	●	●	●	●	●	●	●	●	●	●	●		○	●
CAGO	Canada Goose/Bernache du Canada	Fall	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●			●	○
MUSW	Mute Swan/Cygne tuberculé	Spring									○	●	●	○		○	○	○				
MUSW	Mute Swan/Cygne tuberculé	Fall										○	○	○			○	○				
TRUS	Trumpeter Swan/Cygne trompette	Spring			○								○				○					
TRUS	Trumpeter Swan/Cygne trompette	Fall	○	○									○				○					
TUSW	Tundra Swan/Cygne siffleur	Spring			○		○	○	●	○		●	●	○	○	○	●	○	○			
TUSW	Tundra Swan/Cygne siffleur	Fall			○		○	○	○	○		●	○	●	○	○	○					
WODU	Wood Duck/Canard branchu	Spring			○				●	○	○	●	●	●	●	●	●	●	●		○	
WODU	Wood Duck/Canard branchu	Fall	○			○			○	○	○	●	●	●	●	○	●	○			○	○
GADW	Gadwall/Canard chipeau	Spring			○		●	○	●	○	○	○	●	○		○	○	●	○			
GADW	Gadwall/Canard chipeau	Fall	○	○	○		○		○	○	○	○	○	○	○		○	○			○	○
AMWI	American Wigeon/Canard d'Amérique	Spring			●		●	○	○	○	○	●	●	○	○	○	●	○	○		●	○
AMWI	American Wigeon/Canard d'Amérique	Fall	●	●	●		○	○	○	○	○	●	●	●	○	○	●	○			○	○
ABDU	American Black Duck/Canard noir	Spring							○	○		●	●	○	○	○	●	○	●		○	●
ABDU	American Black Duck/Canard noir	Fall							○	○	○	●	●	●	○	○	●	●			●	●
BWTE	Blue-winged Teal/Sarcelle à ailes bleues	Spring			●		●	○	●	○	○	●	●	●	○	●	●	○	●		○	○
BWTE	Blue-winged Teal/Sarcelle à ailes bleues	Fall	○	●	●		●		●	○	○	●	●	●	○	○	●	●			●	○

Species Code	Species Name (English/French)	Season	RPBO	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	BPBO	LPBO_OC	LPBO_BW	LPBO_TIP	HBO_RUTH	HBO_ROCK	HBO_SELK	PEPtBO	IPBO	OOT	ABO_SI	ABO_BP
CITE	Cinnamon Teal/Sarcelle cannelle	Spring					○															
CITE	Cinnamon Teal/Sarcelle cannelle	Fall		○			○															
NSHO	Northern Shoveler/Canard souchet	Spring			●		●	○	●	○	○	○	○	○	○		○	○	○			
NSHO	Northern Shoveler/Canard souchet	Fall	○	●	○		●		○	○	○	○	○	○	○		○	○			○	○
NOPI	Northern Pintail/Canard pilet	Spring			○		●	○	●	○	○	○	○	○	○	○	○	○	○		○	○
NOPI	Northern Pintail/Canard pilet	Fall	●	●	○		○		○	○	○	●	●	●	○		●	○			○	○
AGWT	Green-winged Teal/Sarcelle d'hiver	Spring			●		⊙	○	○	○	○	●	●	●	○	○	●	○	○		○	○
AGWT	Green-winged Teal/Sarcelle d'hiver	Fall	●	●	○		○		○	○	○	●	●	●	○	○	●	●			●	⊙
MALL	Mallard/Canard colvert	Spring	○		⊙		●	○	●	●	●	●	●	●	●	●	●	●	●		●	○
MALL	Mallard/Canard colvert	Fall	●	●	●	○	●	○	●	●	●	●	●	●	●	●	●	●			●	⊙
CANV	Canvasback/Fuligule à dos blanc	Spring			○		●		○	○		●	○	○			○					
CANV	Canvasback/Fuligule à dos blanc	Fall		○	○		○		○	○		●	○	○				○				
REDH	Redhead/Fuligule à tête rouge	Spring			○		●		●	○		○	●	○			○		○			
REDH	Redhead/Fuligule à tête rouge	Fall		○	○		○		○	○	○	○	○	●			○	○				
RNDU	Ring-necked Duck/Fuligule à collier	Spring			○		○		○	○	○	●	○	○	○	○	○	○	●			
RNDU	Ring-necked Duck/Fuligule à collier	Fall	○	●			○		○	○	○	○	○	○		○	○	○				
GRSC	Greater Scaup/Fuligule milouinan	Spring			○		○		○	●	○	○	●	○		○	●	○	●			
GRSC	Greater Scaup/Fuligule milouinan	Fall	○	○			○			●	○	○	○	●		○	○	●			○	○
LESC	Lesser Scaup/Petit Fuligule	Spring			○		●	○	○	●	○	●	●	●	○	○	●	○	●			
LESC	Lesser Scaup/Petit Fuligule	Fall		○	○		○		○	●	○	●	○	●	○	○	○	○				
KIEI	King Eider/Eider à tête grise	Spring											○	○								○
KIEI	King Eider/Eider à tête grise	Fall												○								
COEI	Common Eider/Eider à duvet	Spring																			●	●
COEI	Common Eider/Eider à duvet	Fall																○			●	●
HARD	Harlequin Duck/Arlequin plongeur	Spring			○					○												
HARD	Harlequin Duck/Arlequin plongeur	Fall	●							○				○								
SUSC	Surf Scoter/Macreuse à front blanc	Spring			●					○	○	○	○	○				○	○		○	○
SUSC	Surf Scoter/Macreuse à front blanc	Fall	●	○	○					○	○	○	○	●				○			○	○
WWSC	White-winged Scoter/Macreuse brune	Spring			●		○	○		●	●	○	●	●				●	○		○	○
WWSC	White-winged Scoter/Macreuse brune	Fall	●	○	○		○		○	●	●	○	○	●				●			○	○
BLSC	Black Scoter/Macreuse noire	Spring								○	○		○	○				○	○			○
BLSC	Black Scoter/Macreuse noire	Fall	○							○	○	○	○	●				○			○	○
LTDU	Long-tailed Duck/Harelde kakawi	Spring			○					●	●	○	●	●		○	○	●	○			○
LTDU	Long-tailed Duck/Harelde kakawi	Fall	○							○	○	○	○	●			○	●				○
BUFF	Bufflehead/Petit Garrot	Spring			●		●		○	●	●	●	●	●	○	○	●	●	●			

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BUFF	Bufflehead/Petit Garrot	Fall	○	●	●		○		○	○	●	○	○	●	○	○	○	○				
COGO	Common Goldeneye/Garrot à oeil d'or	Spring			●		○		○	●	●	○	○	●	○	○	●	●	●			
COGO	Common Goldeneye/Garrot à oeil d'or	Fall		○	●		○		○	●	●	○	○	●	○	○	○	●				
BAGO	Barrow's Goldeneye/Garrot d'Islande	Spring																	○			
BAGO	Barrow's Goldeneye/Garrot d'Islande	Fall		●																		
HOME	Hooded Merganser/Harle couronné	Spring			○		○		○	○	○	○	○	○	○	○	●	○	○			
HOME	Hooded Merganser/Harle couronné	Fall	●	●	○			○	○	○	●	○	○	○	○		○	○				
COME	Common Merganser/Grand Harle	Spring			●		○		○	●	●	●	●	●	●	●	●	●	●		○	○
COME	Common Merganser/Grand Harle	Fall	●	○	●		○		○	●	●	○	○	●	○	○	●	●			○	○
RBME	Red-breasted Merganser/Harle huppé	Spring			●		○	○	○	●	●	●	●	●	○	●	●	●	●		○	○
RBME	Red-breasted Merganser/Harle huppé	Fall	○	○	○				○	●	●	●	○	●	○	○	●	●			○	○
RUDU	Ruddy Duck/Érismature rousse	Spring					●		○			○	○	○			○		○			
RUDU	Ruddy Duck/Érismature rousse	Fall		○	○		○		○			○	○	●		○	○				○	○
GRPA	Gray Partridge/Perdrix grise	Spring					○	○														
GRPA	Gray Partridge/Perdrix grise	Fall						○														
RIPH	Ring-necked Pheasant/Faisan de Colchide	Spring										○	○				○					
RIPH	Ring-necked Pheasant/Faisan de Colchide	Fall	○									○		○			○					
RUGR	Ruffed Grouse/Gélinotte huppée	Spring			●		●		○	●	●	○		○		○	○	●	●			○
RUGR	Ruffed Grouse/Gélinotte huppée	Fall	○	●	●		●	○	○	●	●	○		○	○	○	○	●		○		
SPGR	Spruce Grouse/Tétras du Canada	Fall								○												
BGSE	Blue Grouse/Tétras sombre	Fall		○																		
STGR	Sharp-tailed Grouse/Tétras à queue fine	Spring			○		○	○														
STGR	Sharp-tailed Grouse/Tétras à queue fine	Fall					○	○														
WITU	Wild Turkey/Dindon sauvage	Spring											○	○	○	○	○	●	○			
WITU	Wild Turkey/Dindon sauvage	Fall										○			○	○	○	○				
CAQU	California Quail/Colin de Californie	Spring	○																			
CAQU	California Quail/Colin de Californie	Fall	●																			
RTLO	Red-throated Loon/Plongeon catmarin	Spring			○					●	○	○	○	○			○	○	○			
RTLO	Red-throated Loon/Plongeon catmarin	Fall	○	○						●	○	○		○			○	○			○	○
PALO	Pacific Loon/Plongeon du Pacifique	Spring			○					○												
PALO	Pacific Loon/Plongeon du Pacifique	Fall	●							○												
COLO	Common Loon/Plongeon huard	Spring			●		○		○	●	●	●	●	●	●	●	●	●	●		●	●
COLO	Common Loon/Plongeon huard	Fall	●	●	●		○	○	○	●	●	●	●	●	○	○	●	●			●	●
YBLO	Yellow-billed Loon/Plongeon à bec blanc	Spring			○																	
YBLO	Yellow-billed Loon/Plongeon à bec blanc	Fall	○		○					○												

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PBGR	Pied-billed Grebe/Grèbe à bec bigarré	Spring			○		○		○		○	●	●	○	○		○	○	●			
PBGR	Pied-billed Grebe/Grèbe à bec bigarré	Fall	○	●	○		○		○	○		○	●	○			○	○			○	○
HOGR	Horned Grebe/Grèbe esclavon	Spring			○		○		○	●	●	○	○	○	○	○	○	○	●			
HOGR	Horned Grebe/Grèbe esclavon	Fall	○	○	●		○		○	●	●	○	○	●		○	○	○				○
RNGR	Red-necked Grebe/Grèbe jougris	Spring			●		○		○	●	●		○	○				○	●			
RNGR	Red-necked Grebe/Grèbe jougris	Fall	●	●	●		○		○	●	●			○				○			○	○
EAGR	Eared Grebe/Grèbe à cou noir	Spring			○		○		○	○												
EAGR	Eared Grebe/Grèbe à cou noir	Fall			○		○		○					○			○					
WEGR	Western Grebe/Grèbe élégant	Spring			○		○		●	○												
WEGR	Western Grebe/Grèbe élégant	Fall	○		●		●		●													
CLGR	Clark's Grebe/Grèbe à face blanche	Fall							○													
NOFU	Northern Fulmar/Fulmar boréal	Fall	○																			
MASH	Manx Shearwater/Puffin des Anglais	Spring																				○
MASH	Manx Shearwater/Puffin des Anglais	Fall																				○
LHSP	Leach's Storm-Petrel/Océanite cul-blanc	Spring																				●
LHSP	Leach's Storm-Petrel/Océanite cul-blanc	Fall	○																			○
NOGA	Northern Gannet/Fou de Bassan	Spring																			○	●
NOGA	Northern Gannet/Fou de Bassan	Fall																			●	●
AWPE	American White Pelican/Pélican d'Amérique	Spring			●		●	○	●	○		○	○	○								
AWPE	American White Pelican/Pélican d'Amérique	Fall			●		●	●	●	○												
BRPE	Brown Pelican/Pélican brun	Fall	○																			
BRAC	Brandt's Cormorant/Cormoran de Brandt	Fall	●																			
DCCO	Double-crested Cormorant/Cormoran à aigrettes	Spring			○		○	○	●	●	●	●	●	●	●	●	●	●	●		●	●
DCCO	Double-crested Cormorant/Cormoran à aigrettes	Fall	●	○	○		○	○	●	●	●	●	●	●	●	●	●	●			●	●
GRCO	Great Cormorant/Grand Cormoran	Spring																			○	○
GRCO	Great Cormorant/Grand Cormoran	Fall																			●	●
PECO	Pelagic Cormorant/Cormoran pélagique	Fall	●																			
AMBI	American Bittern/Butor d'Amérique	Spring					●		●		○	●	●	○	○		○	○	○		○	○
AMBI	American Bittern/Butor d'Amérique	Fall		○			○		●	○		●	○	○	○		○	○			○	○
LEBI	Least Bittern/Petit Blongios	Spring										○	○	○			○					
LEBI	Least Bittern/Petit Blongios	Fall										○	○	○			○					
GBHE	Great Blue Heron/Grand Héron	Spring	○		○		○	○	○	●	●	●	●	●	●	●	●	●	●		●	●
GBHE	Great Blue Heron/Grand Héron	Fall	●	●	○		○	○	●	●	●	●	●	●	●	●	●	●			●	●
GREG	Great Egret/Grande Aigrette	Spring									○	○	○	○	○		○		○		○	○
GREG	Great Egret/Grande Aigrette	Fall							○		○	○	○	○	○		○				○	○

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SNEG	Snowy Egret/Aigrette neigeuse	Spring					○					○	○	○			○				○	○
SNEG	Snowy Egret/Aigrette neigeuse	Fall															○				○	
LBHE	Little Blue Heron/Aigrette bleue	Spring										○	○									
LBHE	Little Blue Heron/Aigrette bleue	Fall												○								
TRHE	Tricolored Heron/Aigrette tricolore	Spring											○	○					○			
CAEG	Cattle Egret/Héron garde-boeufs	Spring						○						○	○						○	
CAEG	Cattle Egret/Héron garde-boeufs	Fall	○					○				○	○	○		○						
GRHE	Green Heron/Héron vert	Spring									○	●	○	○	○	●	○	○	○		○	○
GRHE	Green Heron/Héron vert	Fall	○									●	○	●	○	○	●	○			○	
BCNH	Black-crowned Night-Heron/Bihoreau gris	Spring					○	○	○			○	○	○			○	○	○		○	○
BCNH	Black-crowned Night-Heron/Bihoreau gris	Fall					●	○	○			●	○	○			○	○			○	●
TUVU	Turkey Vulture/Urubu à tête rouge	Spring	○						○	●	●	●	●	●	●	●	●	●	●		○	
TUVU	Turkey Vulture/Urubu à tête rouge	Fall	●					○	○	●	●	●	○	●	●	●	●	●			○	○
OSPR	Osprey/Balbuzard pêcheur	Spring			●		○	○	○	○	○	○	○	○	●	○	○	○	●		○	○
OSPR	Osprey/Balbuzard pêcheur	Fall	●	●	●			○	○	●	○	●	●	●	●	○	●	○			●	●
BAEA	Bald Eagle/Pygargue à tête blanche	Spring	○		●		○		○	●	●	○	●	○	○	○	○	○	○		○	○
BAEA	Bald Eagle/Pygargue à tête blanche	Fall	●	●	●		○	○	●	●	●	○	●	●	○	○	●	●			○	○
NOHA	Northern Harrier/Busard Saint-Martin	Spring			●		●	○	●	○	●	⬤	⬤	⬤	○	○	●	●	○		○	●
NOHA	Northern Harrier/Busard Saint-Martin	Fall	●	●	●		●	○	●	●	○	⬤	⬤	⬤	○	○	●	●			●	●
SSHA	Sharp-shinned Hawk/Épervier brun	Spring			●		○	○	●	●	●	⬤	●	⬤	○	●	○	●	○		○	○
SSHA	Sharp-shinned Hawk/Épervier brun	Fall	●	●	●	○	○	○	●	●	●	⬤	⬤	⬤	●	●	●	●			●	●
COHA	Cooper's Hawk/Épervier de Cooper	Spring			○		○	○	○	○	○	○	○	○	○	○	○	○	○			
COHA	Cooper's Hawk/Épervier de Cooper	Fall	●	○	○	○	●	○	●	○	○	●	○	●	○	○	●	●			○	○
NOGO	Northern Goshawk/Autour des palombes	Spring			○		○		○	○	○	○		○		○		○	○			○
NOGO	Northern Goshawk/Autour des palombes	Fall	○	○	○	○	○	○		●	○	○	○	○	○	○	○	●			○	○
RSHA	Red-shouldered Hawk/Buse à épaulettes	Spring								○	○	○	○	○	○	○	○	○	○			
RSHA	Red-shouldered Hawk/Buse à épaulettes	Fall									○	●	○	○	○	○	○	●			○	
BWHA	Broad-winged Hawk/Petite Buse	Spring			○		○	○	○	○	●	○	○	○	○		○	○	○		○	○
BWHA	Broad-winged Hawk/Petite Buse	Fall	●	○	○	○	○	○	○	●	●	●	○	●	○	○	○	●			○	○
SWHA	Swainson's Hawk/Buse de Swainson	Spring					○	○	○			○										
SWHA	Swainson's Hawk/Buse de Swainson	Fall	○	○	○		○	○	○			○										
RTHA	Red-tailed Hawk/Buse à queue rousse	Spring			○		●	○	○	○	●	●	●	●	●	○	●	●	○		○	
RTHA	Red-tailed Hawk/Buse à queue rousse	Fall	●	●	○	○	●	○	●	●	●	●	●	●	●	○	●	●			○	○
FEHA	Ferruginous Hawk/Buse rouilleuse	Spring					○											○				
FEHA	Ferruginous Hawk/Buse rouilleuse	Fall							○								○					

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RLHA	Rough-legged Hawk/Buse pattue	Spring			○		○		○	○	●	○	○	○	○	○	○	○	○			
RLHA	Rough-legged Hawk/Buse pattue	Fall	○	○	○		○		○	●	○	○		○	○	○	○	○			○	○
GOEA	Golden Eagle/Aigle royal	Spring			○		○				○		○					○				
GOEA	Golden Eagle/Aigle royal	Fall	○	○	○				○	●	○	○		○	○		○	○				
AMKE	American Kestrel/Crécerelle d'Amérique	Spring			○		○	○	○	○	●	⬤	●	⬤	○	○	○	○	○		○	○
AMKE	American Kestrel/Crécerelle d'Amérique	Fall	●	●	○		○	○	○	●	○	⬤	⬤	⬤	○	○	●	●			●	●
MERL	Merlin/Faucon émerillon	Spring			●		○	○	○	●	●	○	○	●	○	○	○	○	○		○	○
MERL	Merlin/Faucon émerillon	Fall	●	●	●		○	○	●	●	●	●	●	●	○	○	○	●			●	●
GYRF	Gyrfalcon/Faucon gerfaut	Spring										○									○	
GYRF	Gyrfalcon/Faucon gerfaut	Fall			○					○				○							○	○
PEFA	Peregrine Falcon/Faucon pèlerin	Spring			○		○		○	●	○	○	○	○	○		○	○	○		○	
PEFA	Peregrine Falcon/Faucon pèlerin	Fall	●	○	○		○		○	●	○	○	○	●	○	○	○	○			●	●
PRFA	Prairie Falcon/Faucon des prairies	Fall			○		○	○	○					○								
YERA	Yellow Rail/Râle jaune	Spring					○															
YERA	Yellow Rail/Râle jaune	Fall					○															
KIRA	King Rail/Râle élégant	Spring										○	○	○		○	○					
KIRA	King Rail/Râle élégant	Fall											○	○			○					
VIRA	Virginia Rail/Râle de Virginie	Spring							○			○	○	○		○	○	○	○			
VIRA	Virginia Rail/Râle de Virginie	Fall	●									○	○	○			○	○				
SORA	Sora/Marouette de Caroline	Spring			○		●	○	●	○		○	○	○	○	○	○	○	○		○	
SORA	Sora/Marouette de Caroline	Fall	●	○	○		●		○	○		○	○	○			○				○	○
COMO	Common Moorhen/Gallinule poule-d'eau	Spring										○	●	○		○	○					
COMO	Common Moorhen/Gallinule poule-d'eau	Fall										○	○	○			○				○	
AMCO	American Coot/Foulque d'Amérique	Spring			○		●		●		○	○	○	○			○					
AMCO	American Coot/Foulque d'Amérique	Fall	○	●			●	○	○	○		○	○	○			○				○	
SACR	Sandhill Crane/Grue du Canada	Spring			●		○	○	○	○	●	●	●	○	○	○	○	○				
SACR	Sandhill Crane/Grue du Canada	Fall	○	●	○		●	●	●	○	○	●	○				○	○				
BBPL	Black-bellied Plover/Pluvier argenté	Spring			○		○		○	○	○	○	●	●		○	○		○		○	○
BBPL	Black-bellied Plover/Pluvier argenté	Fall	○	○	○		○	○	○	○	○	○	●	●	○	○	○	●			●	●
LEGP	Lesser Golden-Plover/Pluvier bronzé sp.	Spring					○	○					○									
LEGP	Lesser Golden-Plover/Pluvier bronzé sp.	Fall	○				○		○	○		○	○	○								
AMGP	American Golden-Plover/Pluvier bronzé	Spring			○		○					○	○	○					○			
AMGP	American Golden-Plover/Pluvier bronzé	Fall	○	○	○					○	○	○	○	○			○	○			○	○
PAGP	Pacific Golden-Plover/Pluvier fauve	Fall	○																			
SEPL	Semipalmated Plover/Pluvier semipalmé	Spring			○		○		○	○	○	○	●	●	○	○	○	○	○			

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SEPL	Semipalmated Plover/Pluvier semipalmé	Fall	●	●	○		○		○	○	○	○	●	●	○	○	○	●			●	●
PIPL	Piping Plover/Pluvier siffleur	Spring											○	○								
PIPL	Piping Plover/Pluvier siffleur	Fall											○	○								
KILL	Killdeer/Pluvier kildir	Spring	○		●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	○
KILL	Killdeer/Pluvier kildir	Fall	●	●	○		●	●	●	○	○	●	●	●	●	●	●	●			○	○
BLOY	Black Oystercatcher/Huîtrier de Bachman	Fall	●																			
AMAV	American Avocet/Avocette d'Amérique	Spring			○		●		○													
AMAV	American Avocet/Avocette d'Amérique	Fall					○		○				○	○								○
SPSA	Spotted Sandpiper/Chevalier grivelé	Spring			●		○	○	○	○	●	○	●	●	●	○	●	●	●		○	○
SPSA	Spotted Sandpiper/Chevalier grivelé	Fall	●	○	●	○	○	●	●	●	●	○	●	●	●	○	●	●			●	●
SOSA	Solitary Sandpiper/Chevalier solitaire	Spring			○		○	○	○	○	○	○	○	●	○	○	○	○	○		○	
SOSA	Solitary Sandpiper/Chevalier solitaire	Fall	○	●	○	● (black)	○	○	○	○	○	○	○	●	○	○	○	○			○	○
WILL	Willet/Chevalier semipalmé	Spring					●	○	○	○		○	○	○							○	●
WILL	Willet/Chevalier semipalmé	Fall					○	○	○				○	○							○	●
GRYE	Greater Yellowlegs/Grand Chevalier	Spring	○		●		○		○	○	●	●	●	●	○	○	○	○	○		●	○
GRYE	Greater Yellowlegs/Grand Chevalier	Fall	●	●	●		○	●	●	○	○	●	●	●	○	○	●	○			●	●
LEYE	Lesser Yellowlegs/Petit Chevalier	Spring			○		○	○	○	○	○	○	●	●	○		○	○	○		○	○
LEYE	Lesser Yellowlegs/Petit Chevalier	Fall	○	●	●		○	○	●	●	○	●	●	●	●	○	●	●			○	●
UPSA	Upland Sandpiper/Maubèche des champs	Spring			○			○	○			○	○	○	○		○	○				
UPSA	Upland Sandpiper/Maubèche des champs	Fall	○	○	○							○	○	○			●	○				○
WHIM	Whimbrel/Courlis corlieu	Spring			○				○	○	○	○	○	○	○	○	○	○				
WHIM	Whimbrel/Courlis corlieu	Fall	○						○	○	○	○	○	○		○	○	○			○	●
LBCU	Long-billed Curlew/Courlis à long bec	Fall	○																			
HUGO	Hudsonian Godwit/Barge hudsonienne	Spring					○						○	○								
HUGO	Hudsonian Godwit/Barge hudsonienne	Fall		○			○		○			○	○	○							○	
MAGO	Marbled Godwit/Barge marbrée	Spring			○		●	○	○	○			○									
MAGO	Marbled Godwit/Barge marbrée	Fall	○				○	○	○					○								○
RUTU	Ruddy Turnstone/Tournepierre à collier	Spring			○		○	○	○	○			●	●	○	○	○	○	○			
RUTU	Ruddy Turnstone/Tournepierre à collier	Fall	○						○	○		○	○	●		○	○	○		○	○	●
BLTU	Black Turnstone/Tournepierre noir	Fall	●																			
SURF	Surfbird/Bécasseau du ressac	Fall	●																			
REKN	Red Knot/Bécasseau maubèche	Spring										○	○	○					○			
REKN	Red Knot/Bécasseau maubèche	Fall	○								○	○	○	○				○				○
SAND	Sanderling/Bécasseau sanderling	Spring			○		○		○	○			●	●			○	○			○	
SAND	Sanderling/Bécasseau sanderling	Fall	○		○		○		●	○	○	○	●	●		○	○	●			●	●

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SESA	Semipalmated Sandpiper/Bécasseau semipalmé	Spring			○		○		○	○	○	○	●	●		○	○	○	○		○	
SESA	Semipalmated Sandpiper/Bécasseau semipalmé	Fall	○	○	○		○		○	○	○	○	●	●	○	○	○	●			●	●
WESA	Western Sandpiper/Bécasseau d'Alaska	Spring					○						○	○								
WESA	Western Sandpiper/Bécasseau d'Alaska	Fall	●	○									○	○			○	○				○
LESA	Least Sandpiper/Bécasseau minuscule	Spring			○		○		○	○	○	○	○	●	○	○	○	○	○		○	○
LESA	Least Sandpiper/Bécasseau minuscule	Fall	●	●	○		○		○	●	○	○	●	●	○	○	●	●			○	●
WRSA	White-rumped Sandpiper/Bécasseau à croupion blan	Spring					○		○	○			○	○			○	○				
WRSA	White-rumped Sandpiper/Bécasseau à croupion blan	Fall					○		○	○		○	○	○	○		○				○	●
BASA	Baird's Sandpiper/Bécasseau de Baird	Spring			○		○							○								
BASA	Baird's Sandpiper/Bécasseau de Baird	Fall	○	○	○		○		○	○			○	●			○	○			○	○
PESA	Pectoral Sandpiper/Bécasseau à poitrine cend	Spring			○		○		○			○	○	○			○		○			
PESA	Pectoral Sandpiper/Bécasseau à poitrine cend	Fall	○	●	○		○		○	○		○	○	○	○		●	○			○	●
PUSA	Purple Sandpiper/Bécasseau violet	Spring												○							○	
PUSA	Purple Sandpiper/Bécasseau violet	Fall												○		○	○				○	○
DUNL	Dunlin/Bécasseau variable	Spring					○		○	○		○	●	●		○	○	○	○		○	○
DUNL	Dunlin/Bécasseau variable	Fall	○							○	○	○	○	●	○		●	○			○	○
STSA	Stilt Sandpiper/Bécasseau à échasses	Spring					○		○													
STSA	Stilt Sandpiper/Bécasseau à échasses	Fall		○			○			○		○	○	○			○	○			○	
BBSA	Buff-breasted Sandpiper/Bécasseau roussâtre	Fall	○										○	○								○
SBDO	Short-billed Dowitcher/Bécassin roux	Spring			○		○		○	○		○	○	○			○	○	○			
SBDO	Short-billed Dowitcher/Bécassin roux	Fall	●	○			○		○	○	○	○	●	●			○	○				○
LBDO	Long-billed Dowitcher/Bécassin à long bec	Spring			○		○												○			
LBDO	Long-billed Dowitcher/Bécassin à long bec	Fall	●	●			○	○				○										
COSN	Wilson's Snipe/Bécassine de Wilson	Spring			○		●	○	○	○	●	●	○	●	○	●	○	●	●			○
COSN	Wilson's Snipe/Bécassine de Wilson	Fall	●	●	○	○	○	○	○	○	○	●	○	●	○	○	●	○			●	●
AMWO	American Woodcock/Bécasse d'Amérique	Spring								○	●	●	●	●	○	●	●	○	●		○	○
AMWO	American Woodcock/Bécasse d'Amérique	Fall							○	○	○	●	○	●	○	●	●	○			○	●
WIPH	Wilson's Phalarope/Phalarope de Wilson	Spring					●		○				○						○			
WIPH	Wilson's Phalarope/Phalarope de Wilson	Fall		○	○		○		○												○	
RNPH	Red-necked Phalarope/Phalarope à bec étroit	Spring					○							○								
RNPH	Red-necked Phalarope/Phalarope à bec étroit	Fall	⊙	○			○		○			○		○								○
REPH	Red Phalarope/Phalarope à bec large	Spring																			○	
REPH	Red Phalarope/Phalarope à bec large	Fall	○	○						○				○								
LAGU	Laughing Gull/Mouette atricille	Spring										○	○	○								○
LAGU	Laughing Gull/Mouette atricille	Fall											○	○							○	

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FRGU	Franklin's Gull/Mouette de Franklin	Spring			●		●	○	●				○	○								
FRGU	Franklin's Gull/Mouette de Franklin	Fall	○		●		●	○	●	○		○	○	○								
LIGU	Little Gull/Mouette pygmée	Spring										○	○	○			○	○				
LIGU	Little Gull/Mouette pygmée	Fall	○						○			○	○	●		○	○	○				
BOGU	Bonaparte's Gull/Mouette de Bonaparte	Spring			○		○	○	○	○		●	●	●	○	●	●	●	●			
BOGU	Bonaparte's Gull/Mouette de Bonaparte	Fall	●	○	○		○	○	●	○	○	●	●	●	○	●	●	●			○	○
MEGU	Mew Gull/Goéland cendré	Spring			○																	
MEGU	Mew Gull/Goéland cendré	Fall	●	○	○									○								
RBGU	Ring-billed Gull/Goéland à bec cerclé	Spring			●		●	○	●	●	●	●	●	●	●	●	●	●	●		○	○
RBGU	Ring-billed Gull/Goéland à bec cerclé	Fall	●	○	●		●	●	●	●	●	●	●	●	●	●	●	●			●	●
CAGU	California Gull/Goéland de Californie	Spring			○		○	○						○								
CAGU	California Gull/Goéland de Californie	Fall	●	○	○		○	○						○								
HERG	Herring Gull/Goéland argenté	Spring			●		○		●	●	●	●	●	●	●	●	●	●	●		●	●
HERG	Herring Gull/Goéland argenté	Fall	○	●	●		○		●	●	●	●	●	●	●	●	●	●			●	●
THGU	Thayer's Gull/Goéland de Thayer	Spring										○	○	○								
THGU	Thayer's Gull/Goéland de Thayer	Fall	●											○								
ICGU	Iceland Gull/Goéland arctique	Spring								○	○	○	○	●			○	○	○			
ICGU	Iceland Gull/Goéland arctique	Fall								○	○			○		○						
WEGU	Western Gull/Goéland d'Audubon	Fall	○																			
GWGU	Glaucous-winged Gull/Goéland à ailes grises	Spring	○																			
GWGU	Glaucous-winged Gull/Goéland à ailes grises	Fall	●																			
GLGU	Glaucous Gull/Goéland bourgmestre	Spring					○			○		○	○	●	○	○	○		○			○
GLGU	Glaucous Gull/Goéland bourgmestre	Fall	○									○		○			○					○
GBBG	Great Black-backed Gull/Goéland marin	Spring								○	○	●	●	●	○	●	●	●	●		●	●
GBBG	Great Black-backed Gull/Goéland marin	Fall								○	●	●	●	●		●	●	●			●	●
SAGU	Sabine's Gull/Mouette de Sabine	Fall	○							○				○								
BLKI	Black-legged Kittiwake/Mouette tridactyle	Spring											○	○								
BLKI	Black-legged Kittiwake/Mouette tridactyle	Fall	○											○				○			○	
CATE	Caspian Tern/Sterne caspienne	Spring			○			○	●	○	●	●	●	●		●	●	●	○			
CATE	Caspian Tern/Sterne caspienne	Fall	○		○				●	○	●	●	●	●	●	●	●	●			○	○
BLTE	Black Tern/Guifette noire	Spring			○		●	○	○			●	●	○	○			○	●			
BLTE	Black Tern/Guifette noire	Fall		○	○		●	○	●			○	●	○				○				○
COTE	Common Tern/Sterne pierregarin	Spring			●		○	○	●	○	●	●	●	●	○	●	●	○	●		○	○
COTE	Common Tern/Sterne pierregarin	Fall	○	○	●		○	○	●	○	●	●	●	●	○	●	●	○			○	●
ARTE	Arctic Tern/Sterne arctique	Spring												○					○			○

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ARTE	Arctic Tern/Sterne arctique	Fall	○											○								○
FOTE	Forster's Tern/Sterne de Forster	Spring			○		○	○	◍		○	◍	◍	◍		○	○					
FOTE	Forster's Tern/Sterne de Forster	Fall			◍		○	○	◍			◍	◍	◍	○			○				
POJA	Pomarine Jaeger/Labbe pomarin	Fall								○				○				○				
PAJA	Parasitic Jaeger/Labbe parasite	Spring			○					○				○								
PAJA	Parasitic Jaeger/Labbe parasite	Fall	○		○		○		○	○		○	○	○				○			○	
LTJA	Long-tailed Jaeger/Labbe à longue queue	Fall	○										○	○								
DOVE	Dovekie/Mergule nain	Spring																			○	
DOVE	Dovekie/Mergule nain	Fall																			○	○
COMU	Common Murre/Guillemot marmette	Spring																			○	
COMU	Common Murre/Guillemot marmette	Fall	◍		○																	○
BLGU	Black Guillemot/Guillemot à miroir	Spring																			◍	○
BLGU	Black Guillemot/Guillemot à miroir	Fall																			○	◍
PIGU	Pigeon Guillemot/Guillemot colombin	Spring	○																			
PIGU	Pigeon Guillemot/Guillemot colombin	Fall	◍																			
MAMU	Marbled Murrelet/Guillemot marbré	Fall	◍																			
ANMU	Ancient Murrelet/Guillemot à cou blanc	Fall	○																			
CAAU	Cassin's Auklet/Starique de Cassin	Fall	○																			
RHAU	Rhinoceros Auklet/Macareux rhinocéros	Spring	○																			
RHAU	Rhinoceros Auklet/Macareux rhinocéros	Fall	◍																			
ATPU	Atlantic Puffin/Macareux moine	Spring																				○
ATPU	Atlantic Puffin/Macareux moine	Fall																			○	○
TUPU	Tufted Puffin/Macareux huppé	Fall	○																			
RODO	Rock Pigeon/Pigeon biset	Spring					○			○	○	◍	◍	◍	◍	○	◍	○	○			
RODO	Rock Pigeon/Pigeon biset	Fall	○		○		○	○	○	○	○	◍	◍	◍	◍	○	◍	○		○		
BTPI	Band-tailed Pigeon/Pigeon à queue barrée	Fall	●																			
MODO	Mourning Dove/Tourterelle triste	Spring			○		○	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍		○	○
MODO	Mourning Dove/Tourterelle triste	Fall	○				○	◍	◍	○	○	◍	◍	◍	◍	◍	◍	◍		◍	◍	◍
YBCU	Yellow-billed Cuckoo/Coulicou à bec jaune	Spring										○	○	○	○	○	○	○	○			
YBCU	Yellow-billed Cuckoo/Coulicou à bec jaune	Fall								○	○	○	◍	◍	○	○	●	○			○	◍
BBCU	Black-billed Cuckoo/Coulicou à bec noir	Spring							○	○	○	●	●	●	◍	○	○	●	○		○	○
BBCU	Black-billed Cuckoo/Coulicou à bec noir	Fall					○		●	○	○	●	●	●	○	○	●	●			○	○
EASO	Eastern Screech-Owl/Petit-duc maculé	Spring										○			○	○	○					
EASO	Eastern Screech-Owl/Petit-duc maculé	Fall									○	○	○	○	○	○	◍	○				
GHOW	Great Horned Owl/Grand-duc d'Amérique	Spring			○		○	○	○		○	○	◍	○	○	◍	◍	○	○			◍

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GHOW	Great Horned Owl/Grand-duc d'Amérique	Fall	🔵	🔵	○		🔵		🔵	○	○	○	○	○	○	🔵	🔵	○				🔵
SNOW	Snowy Owl/Harfang des neiges	Spring									○											○
SNOW	Snowy Owl/Harfang des neiges	Fall										○		○						○		
NHOW	Northern Hawk Owl/Chouette épervière	Fall					○		○	○										○		
NOPO	Northern Pygmy-Owl/Chevêchette naine	Fall	○	○	○																	
BDOW	Barred Owl/Chouette rayée	Spring			○																	
BDOW	Barred Owl/Chouette rayée	Fall	🔵	○	○		○			○								○				○
GGOW	Great Gray Owl/Chouette lapone	Spring								○	○											
GGOW	Great Gray Owl/Chouette lapone	Fall		○			○			○										○		
LEOW	Long-eared Owl/Hibou moyen-duc	Spring			○		○	○	○	○		○	○	○		○	○					
LEOW	Long-eared Owl/Hibou moyen-duc	Fall					○	○	○	○		○		○		○	○	○			○	○
SEOW	Short-eared Owl/Hibou des marais	Spring			○		○		○		○		○					○				
SEOW	Short-eared Owl/Hibou des marais	Fall	○		○		○		○	○		○		○				○		○	○	
BOOW	Boreal Owl/Nyctale de Tengmalm	Fall		○						○												
NSWO	Northern Saw-whet Owl/Petite Nyctale	Spring			○		○			○	○	○	○			○	○	○				○
NSWO	Northern Saw-whet Owl/Petite Nyctale	Fall	○	○	○		🔵			🔵	○	🔵		🔵	○	○	🔵	🔵		○	○	○
CONI	Common Nighthawk/Engoulevent d'Amérique	Spring			○		○	○	○	○	○	🔵	○	○	○	○	○	○	○		○	○
CONI	Common Nighthawk/Engoulevent d'Amérique	Fall	🔵	🔵	○		○	○	○	●	○	🔵	🔵	🔵	○	○	○	○		○	○	○
CWWI	Chuck-will's-widow/Engoulevent de Caroline	Spring										○	○	○								
WPWI	Whip-poor-will/Engoulevent bois-pourri	Spring							○	○	○	○	○	○	○	○	○	○	○			○
WPWI	Whip-poor-will/Engoulevent bois-pourri	Fall							○	○	○	○	○	○			○	○				
BLSW	Black Swift/Martinet sombre	Fall	○	○																		
CHSW	Chimney Swift/Martinet ramoneur	Spring							○	○	○	🔵	🔵	🔵	🔵	○	○	○	○		○	○
CHSW	Chimney Swift/Martinet ramoneur	Fall							○	○	○	🔵	🔵	🔵	○	○	○	○		○	○	○
VASW	Vaux's Swift/Martinet de Vaux	Fall	🔵	○																		
RTHU	Ruby-throated Hummingbird/Colibri à gorge rubis	Spring			○		○	○	●	●	🔵	●	●	●	🔵	●	●	●	●		○	○
RTHU	Ruby-throated Hummingbird/Colibri à gorge rubis	Fall			○		🔵	○	●	●	🔵	●	●	●	🔵	●	●	●		🔵	○	🔵
ANHU	Anna's Hummingbird/Colibri d'Anna	Fall	○																			
CAHU	Calliope Hummingbird/Colibri calliope	Fall		🔵																		
RUHU	Rufous Hummingbird/Colibri roux	Spring	○		○																	
RUHU	Rufous Hummingbird/Colibri roux	Fall	●	🔵								○										
BEKI	Belted Kingfisher/Martin-pêcheur d'Amérique	Spring			○			○	○	○	🔵	🔵	🔵	🔵	🔵	🔵	🔵	🔵	🔵		○	○
BEKI	Belted Kingfisher/Martin-pêcheur d'Amérique	Fall	🔵	🔵	○	○		○	🔵	○	🔵	🔵	🔵	🔵	🔵	○	🔵	🔵		🔵	🔵	●
LEWO	Lewis's Woodpecker/Pic de Lewis	Fall	○																			
RHWO	Red-headed Woodpecker/Pic à tête rouge	Spring							○	○	○	●	●	●	○	○	○	○	○			

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RHWO	Red-headed Woodpecker/Pic à tête rouge	Fall							○	○	○	●	●	●	○	○	○	○			○	○
RBWO	Red-bellied Woodpecker/Pic à ventre roux	Spring								○	○	◍	◍	○	◍	○	◍	○	○		○	
RBWO	Red-bellied Woodpecker/Pic à ventre roux	Fall								○	○	○	○	○	◍	○	◍	○			○	○
YBSA	Yellow-bellied Sapsucker/Pic maculé	Spring			●		○	○	○	○	◍	●	●	●	○	○	●	●	○		○	○
YBSA	Yellow-bellied Sapsucker/Pic maculé	Fall		◍	●	○	○	○	○	●	○	●	◍	●	●	○	○	●		○	●	●
RNSA	Red-naped Sapsucker/Pic à nuque rouge	Fall		○																		
RBSA	Red-breasted Sapsucker/Pic à poitrine rouge	Fall	○	○																		
DOWO	Downy Woodpecker/Pic mineur	Spring	○		○		○	○	◍	◍	○	◍	◍	◍	◍	◍	◍	◍	◍		○	○
DOWO	Downy Woodpecker/Pic mineur	Fall	◍	◍	◍	○	◍	○	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍		◍	○	○
HAWO	Hairy Woodpecker/Pic chevelu	Spring			○		○	○	◍	○	◍	○	○	○	◍	◍	◍	◍	◍		○	○
HAWO	Hairy Woodpecker/Pic chevelu	Fall	◍	◍	◍	○	○	○	◍	◍	◍	○	○	○	◍	◍	◍	◍		◍	○	○
TTWO	American Three-toed Woodpeck/Pic à dos rayé	Spring								○												
TTWO	American Three-toed Woodpeck/Pic à dos rayé	Fall		○	○					○										●		
BBWO	Black-backed Woodpecker/Pic à dos noir	Spring			○					○		○										
BBWO	Black-backed Woodpecker/Pic à dos noir	Fall		○	○					◍	○	○								●		
NOFL	Northern Flicker/Pic flamboyant	Spring	○		●		○	◍	◍	◍	●	●	●	●	◍	◍	●	●	◍		●	●
NOFL	Northern Flicker/Pic flamboyant	Fall	●	◍	◍	○	○	◍	◍	●	●	●	●	●	◍	◍	●	●		●	●	●
PIWO	Pileated Woodpecker/Grand Pic	Spring			◍					○	◍	○		○			○	○	○			
PIWO	Pileated Woodpecker/Grand Pic	Fall	◍	○	◍		○		○	◍	◍				○		○	○		◍		
OSFL	Olive-sided Flycatcher/Moucherolle à côtés olive	Spring	○		○		○	○	○	●	○	○	○	○	○	○	○	○	○		○	○
OSFL	Olive-sided Flycatcher/Moucherolle à côtés olive	Fall	●	◍	○	○	○	○	○	●	○	○	○	○	○	○	○	○		○	○	○
WEWP	Western Wood-Pewee/Pioui de l'Ouest	Spring			○		○	○	○													
WEWP	Western Wood-Pewee/Pioui de l'Ouest	Fall	○	◍	○	●	○	○	○													
EAWP	Eastern Wood-Pewee/Pioui de l'Est	Spring							○	○	●	●	●	●	◍	○	◍	●	◍		○	○
EAWP	Eastern Wood-Pewee/Pioui de l'Est	Fall							◍	○	○	●	●	●	◍	○	◍	●			○	◍
YBFL	Yellow-bellied Flycatcher/Moucherolle à ventre jaun	Spring			○		○	○	○	●	●	●	●	●	○	○	○	●	○		○	○
YBFL	Yellow-bellied Flycatcher/Moucherolle à ventre jaun	Fall		○	○	○	○	○	○	●	○	●	●	●	○	●	●	●		○	○	●
ACFL	Acadian Flycatcher/Moucherolle vert	Spring										○	○	○	○	○	○		○			○
ACFL	Acadian Flycatcher/Moucherolle vert	Fall										○	○	○		○	○					
TRFL	Traills Flycatcher/Moucherolle Traills	Spring	○		◍		●	○	●	●	◍	◍	◍	◍	◍	◍	◍	◍	◍		○	●
TRFL	Traills Flycatcher/Moucherolle Traills	Fall	●	●	◍	●	●	●	●	●	○	◍	◍	◍	◍	◍	◍	◍		○	○	●
LEFL	Least Flycatcher/Moucherolle tchébec	Spring			●		◍	◍	◍	●	●	●	●	●	◍	●	●	●	●		○	○
LEFL	Least Flycatcher/Moucherolle tchébec	Fall	○	◍	●	●	◍	◍	◍	●	◍	●	●	●	◍	●	●	●		◍	○	●
HAFL	Hammond's Flycatcher/Moucherolle de Hammond	Fall	●	●																		
DUFL	Dusky Flycatcher/Moucherolle sombre	Fall	○	●		○																

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WEFL	Western Flycatcher/Moucherolle de l'Ouest	Fall		○		○	○															
PSFL	Pacific-slope Flycatcher/Moucherolle côtier	Spring	○																			
PSFL	Pacific-slope Flycatcher/Moucherolle côtier	Fall	◉	○		○																
EAPH	Eastern Phoebe/Moucherolle phébi	Spring			●		◉	○	●	○	◉	●	●	●	◉	○	●	◉	◉		○	○
EAPH	Eastern Phoebe/Moucherolle phébi	Fall			●	○	◉	○	●	○	○	●	●	●	◉	○	●	●		○	○	◉
SAPH	Say's Phoebe/Moucherolle à ventre roux	Spring			○		○															
SAPH	Say's Phoebe/Moucherolle à ventre roux	Fall	○	○	○									○								○
GCFL	Great Crested Flycatcher/Tyran huppé	Spring						○	○	○	◉	●	●	●	◉	◉	◉	◉	◉			
GCFL	Great Crested Flycatcher/Tyran huppé	Fall				○	○	○	●	○		●	●	●	◉	◉	◉	◉			○	○
WEKI	Western Kingbird/Tyran de l'Ouest	Spring						◉	○	○			○	○								○
WEKI	Western Kingbird/Tyran de l'Ouest	Fall						◉	●	○			○	○			○				○	
EAKI	Eastern Kingbird/Tyran tritri	Spring			○		○	◉	◉	●	◉	◉	◉	◉	◉	◉	●	◉	◉		◉	◉
EAKI	Eastern Kingbird/Tyran tritri	Fall		◉	●	◉	○	◉	◉	●	◉	◉	◉	◉	◉	◉	●	●		○	○	○
LOSH	Loggerhead Shrike/Pie-grièche migratrice	Spring						○		○		○		○			○					
LOSH	Loggerhead Shrike/Pie-grièche migratrice	Fall						○				○	○	○								
NSHR	Northern Shrike/Pie-grièche grise	Spring					○		○		○	○		○			○					
NSHR	Northern Shrike/Pie-grièche grise	Fall	○	○	○		○	○	○	◉	○	○		○	○	○	○	○		●	○	○
WEVI	White-eyed Vireo/Viréo aux yeux blancs	Spring									○	○	○	○	○	○	○	○			○	○
WEVI	White-eyed Vireo/Viréo aux yeux blancs	Fall								○		○	○	○	○	○	○	○			○	○
YTVI	Yellow-throated Vireo/Viréo à gorge jaune	Spring							○		○	○	○	○	◉	○	○	○	○			○
YTVI	Yellow-throated Vireo/Viréo à gorge jaune	Fall							○		○	○	○	○	◉	○	○	○			○	○
BHVI	Solitary Vireo/Viréo à tête bleue	Spring			○		○	○	○	◉	○	●	●	●	○	○	○	●	○		○	●
BHVI	Solitary Vireo/Viréo à tête bleue	Fall		◉	○	○	○	○	◉	●	○	●	●	●	○	●	●	●		◉	●	●
CAVI	Cassin's Vireo/Viréo de Cassin	Fall	●	◉																		
HUVI	Hutton's Vireo/Viréo de Hutton	Fall	◉																			
WAVI	Warbling Vireo/Viréo mélodieux	Spring	○		○		◉	◉	◉	○	○	●	●	●	◉	●	●	●	◉		○	○
WAVI	Warbling Vireo/Viréo mélodieux	Fall	●	●	○	●	◉	◉	◉	○	○	●	●	●	◉	◉	●	◉			○	○
PHVI	Philadelphia Vireo/Viréo de Philadelphie	Spring			○		○	○	○	●	○	●	◉	●	○	○	○	●	○			○
PHVI	Philadelphia Vireo/Viréo de Philadelphie	Fall		○	●	○	○	○	●	●	○	●	◉	◉	●	●	○	●		◉	○	○
REVI	Red-eyed Vireo/Viréo aux yeux rouges	Spring			◉		●	○	◉	●	◉	●	●	●	●	●	●	●	◉		○	●
REVI	Red-eyed Vireo/Viréo aux yeux rouges	Fall	○	◉	◉	○	●	●	●	●	◉	●	●	●	●	●	●	●		◉	●	●
GRAJ	Gray Jay/Mésangeai du Canada	Spring			○					○												
GRAJ	Gray Jay/Mésangeai du Canada	Fall		◉	○					◉										◉		
STJA	Steller's Jay/Geai de Steller	Fall	●	○																		
BLJA	Blue Jay/Geai bleu	Spring			●		○	○	◉	●	●	●	●	●	◉	◉	◉	●	◉		○	○

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BLJA	Blue Jay/Geai bleu	Fall	○	○	⚫	○	○	○	⚫	⚫	⚫	⚫	⚫	⚫	●	●	●	⚫		●	○	○
CLNU	Clark's Nutcracker/Cassenoix d'Amérique	Fall	○																			
BBMA	Black-billed Magpie/Pie d'Amérique	Spring			●		●	○	○			○						○				
BBMA	Black-billed Magpie/Pie d'Amérique	Fall		○	●	○	●	●	●													
AMCR	American Crow/Corneille d'Amérique	Spring			●		●	○	●	●	●	●	●	●	●	●	●	●	●		●	●
AMCR	American Crow/Corneille d'Amérique	Fall		●	●		●	○	○	●	●	●	●	●	●	●	●	●		●	●	●
NOCR	Northwestern Crow/Corneille d'Alaska	Spring	○																			
NOCR	Northwestern Crow/Corneille d'Alaska	Fall	●																			
CORA	Common Raven/Grand Corbeau	Spring	○		●		●	○	○	●	●	○		○				○	●		●	●
CORA	Common Raven/Grand Corbeau	Fall	●	●	●		●	○	●	●	●			○				○		●	●	●
HOLA	Horned Lark/Alouette hausse-col	Spring			○			○	○	○	○	○	○	●	○	○	●	○	○		○	○
HOLA	Horned Lark/Alouette hausse-col	Fall	○	○	○			○	○	⚫	●	○	○	●	○		●	○		⚫	○	○
PUMA	Purple Martin/Hirondelle noire	Spring			○		○	●	●	○	○	●	●	●	●	●	●	○	●			
PUMA	Purple Martin/Hirondelle noire	Fall	⚫				○	●	●			●	●	●		●	●	○				
TRES	Tree Swallow/Hirondelle bicolore	Spring			⚫		●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
TRES	Tree Swallow/Hirondelle bicolore	Fall	○	●	○		●	●	●	●	○	●	●	●	●	●	●	⚫		●	○	●
VGSW	Violet-green Swallow/Hirondelle à face blanche	Spring	○																			
VGSW	Violet-green Swallow/Hirondelle à face blanche	Fall	●	○																		
NRWS	N. Rough-winged Swallow/Hirondelle à ailes hérissées	Spring	○							○	●	●	●	●	●	○	●	●	○			
NRWS	N. Rough-winged Swallow/Hirondelle à ailes hérissées	Fall	⚫	⚫		○		○	○	○	○	●	○	●	●	○	●	○				
BANS	Bank Swallow/Hirondelle de rivage	Spring			○		○	○	●	○	●	●	●	●	⚫	○	⚫	○	●			○
BANS	Bank Swallow/Hirondelle de rivage	Fall	○	⚫	○		○	●	●	○	○	●	●	●	●	●	⚫	●		○	○	○
CLSW	Cliff Swallow/Hirondelle à front blanc	Spring	○		○		○	○	●	○	○	○	●	●	○	○	○	●	●		○	○
CLSW	Cliff Swallow/Hirondelle à front blanc	Fall	⚫	○	○		○	○	●	○	○	●	○	●	○	○	○	●		○	○	
BARS	Barn Swallow/Hirondelle rustique	Spring	○		○		●	●	●	○	●	●	●	●	●	●	●	●	●		●	●
BARS	Barn Swallow/Hirondelle rustique	Fall	⚫	●	●		●	●	●	●	●	●	●	●	●	●	●	⚫		●	○	○
BCCH	Black-capped Chickadee/Mésange à tête noire	Spring			●		●	○	●	⚫	●	●	●	●	●	●	●	●	●			●
BCCH	Black-capped Chickadee/Mésange à tête noire	Fall		●	●	○	●	○	●	⚫	●	●	●	●	●	●	●	●		●	○	●
MOCH	Mountain Chickadee/Mésange de Gambel	Fall		○																		
CBCH	Chestnut-backed Chickadee/Mésange à dos marron	Spring	○																			
CBCH	Chestnut-backed Chickadee/Mésange à dos marron	Fall	●	○																		
BOCH	Boreal Chickadee/Mésange à tête brune	Spring			○		○		○	○		○	○	○				○	○		●	●
BOCH	Boreal Chickadee/Mésange à tête brune	Fall		○	●		○	○	○	●		○						○		●	●	●
ETTI	Tufted Titmouse/Mésange bicolore	Spring										○	○	○	●	○	●	○				
ETTI	Tufted Titmouse/Mésange bicolore	Fall										○		○	●	○	●	○				

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COBU	Common Bushtit/Mésange buissonniere	Fall	◉																			
RBNU	Red-breasted Nuthatch/Sittelle à poitrine rousse	Spring	○		●		○	○	○	●	◉	◉	◉	◉	○	◉	●	◉	○		○	◉
RBNU	Red-breasted Nuthatch/Sittelle à poitrine rousse	Fall	◉	◉	●	○	●	●	●	●	◉	◉	◉	◉	●	◉	●	●		●	◉	◉
WBNU	White-breasted Nuthatch/Sittelle à poitrine blanche	Spring			○		○		○	○	◉	◉	◉	◉	◉	◉	◉	◉	◉		○	○
WBNU	White-breasted Nuthatch/Sittelle à poitrine blanche	Fall			○	○	○	○	◉	○	○	◉	○	◉	◉	◉	◉	●		○	○	○
BRCR	Brown Creeper/Grimpereau brun	Spring	○		○				○	◉	◉	●	●	●	○	●	●	●	○		○	○
BRCR	Brown Creeper/Grimpereau brun	Fall	◉	◉	○	○	○	○	●	●	●	●	◉	●	●	●	●	●		○	●	●
ROWR	Rock Wren/Troglodyte des rochers	Spring			○			○														
CARW	Carolina Wren/Troglodyte de Caroline	Spring										◉	○	○	○	◉	○	○				
CARW	Carolina Wren/Troglodyte de Caroline	Fall							○		○	◉	◉	○	○	◉	◉					
BEWR	Bewick's Wren/Troglodyte de Bewick	Spring								○		○	○	○								
BEWR	Bewick's Wren/Troglodyte de Bewick	Fall	◉																			○
HOWR	House Wren/Troglodyte familier	Spring	○		○		◉	◉	◉	○	○	◉	●	●	◉	◉	◉	◉	◉		○	○
HOWR	House Wren/Troglodyte familier	Fall	◉		○	◉	◉	◉	◉	○	○	◉	◉	●	◉	◉	◉	◉			○	○
WIWR	Winter Wren/Troglodyte mignon	Spring	○		◉				○	◉	●	●	●	●	○	●	●	●	○		●	●
WIWR	Winter Wren/Troglodyte mignon	Fall	●	○	○	○	○	○	○	●	●	●	◉	●	●	●	●	●		◉	●	●
SEWR	Sedge Wren/Troglodyte à bec court	Spring							◉	○		○	○	○		○	○					
SEWR	Sedge Wren/Troglodyte à bec court	Fall					○		◉			○	○	○			○				○	○
MAWR	Marsh Wren/Troglodyte des marais	Spring			○		○		●	○		◉	◉	◉		○	◉	○				
MAWR	Marsh Wren/Troglodyte des marais	Fall	●		○		○	○	●	○	○	◉	◉	◉		○	◉				○	○
GCKI	Golden-crowned Kinglet/Roitelet à couronne dorée	Spring	○		○		○	○	○	◉	◉	●	●	●	●	●	●	●	○		◉	●
GCKI	Golden-crowned Kinglet/Roitelet à couronne dorée	Fall	●	●	●	○	○	○	◉	●	●	●	○	●	●	●	●	●		◉	●	●
RCKI	Ruby-crowned Kinglet/Roitelet à couronne rubis	Spring			●		●	○	●	●	●	●	●	●	●	●	●	●	●		●	●
RCKI	Ruby-crowned Kinglet/Roitelet à couronne rubis	Fall	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		◉	●	●
BGGN	Blue-gray Gnatcatcher/Gobemoucheron gris-bleu	Spring								○	○	●	●	●	◉	○	●	◉	○		○	○
BGGN	Blue-gray Gnatcatcher/Gobemoucheron gris-bleu	Fall	○							○	○	●	●	●	◉	○	●	◉		○	○	○
NOWH	Northern Wheatear/Traquet motteux	Spring																			○	○
NOWH	Northern Wheatear/Traquet motteux	Fall																				○
EABL	Eastern Bluebird/Merlebleu de l'Est	Spring							○	●	●	○	◉	◉	◉	○	○	○	○		○	
EABL	Eastern Bluebird/Merlebleu de l'Est	Fall							○	◉	○	◉	○	○	◉	◉	◉	◉		◉	○	
MOBL	Mountain Bluebird/Merlebleu azuré	Spring			○		○															
MOBL	Mountain Bluebird/Merlebleu azuré	Fall		○			○	○														
TOSO	Townsend's Solitaire/Solitaire de Townsend	Spring			○																	
TOSO	Townsend's Solitaire/Solitaire de Townsend	Fall	○	○		○	○	○		○	○	○								○		
VEER	Veery/Grive fauve	Spring			○		○	○	◉	○	●	●	●	●	○	●	●	●	◉		○	○

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VEER	Veery/Grive fauve	Fall				○	○	○	○	●	○	●	●	●	○	●	●	●		○	○	○
GCTH	Gray-cheeked Thrush/Grive à joues grises	Spring			○		○	○	●	○	○	●	◍	●	○	○	●	●	○		○	○
GCTH	Gray-cheeked Thrush/Grive à joues grises	Fall		○	○	○	○	○	●	●	●	●	●	●	●	●	●	●		○	○	○
BITH	Bicknell's Thrush/Grive de Bicknell	Fall															○	○				
SWTH	Swainson's Thrush/Grive à dos olive	Spring	○		●		●	●	●	●	●	●	●	●	●	●	●	●	○		○	●
SWTH	Swainson's Thrush/Grive à dos olive	Fall	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		○	○	●
HETH	Hermit Thrush/Grive solitaire	Spring			●		●	○	●	◍	●	●	●	●	●	●	●	●	○		○	●
HETH	Hermit Thrush/Grive solitaire	Fall	●	◍	●	○	●	●	●	●	●	●	○	●	●	●	●	●		◍	○	●
WOTH	Wood Thrush/Grive des bois	Spring						○	○	○	◍	●	●	●	◍	●	◍	●	○		○	○
WOTH	Wood Thrush/Grive des bois	Fall									○	●	◍	◍	◍	○	◍	○				○
AMRO	American Robin/Merle d'Amérique	Spring	○		◍		◍	◍	◍	◍	●	●	●	●	◍	◍	◍	◍	◍		◍	◍
AMRO	American Robin/Merle d'Amérique	Fall	●	●	●	●	●	◍	●	◍	◍	●	◍	●	◍	◍	◍	●		●	○	◍
VATH	Varied Thrush/Grive à collier	Spring			○		○															
VATH	Varied Thrush/Grive à collier	Fall	●	◍	○	○	○	○														
GRCA	Gray Catbird/Moqueur chat	Spring			○		○	◍	◍	○	◍	●	●	●	◍	◍	◍	◍	◍		●	●
GRCA	Gray Catbird/Moqueur chat	Fall	○			○	○	◍	◍	○	◍	◍	●	●	◍	◍	◍	◍		○	●	●
NOMO	Northern Mockingbird/Moqueur polyglotte	Spring			○		○	○	○	○	○	○	○	◍	○	○	○	○	○		○	○
NOMO	Northern Mockingbird/Moqueur polyglotte	Fall								○	○	○	○	○	○	○	○	○			○	○
BRTH	Brown Thrasher/Moqueur roux	Spring						◍	◍	○	◍	●	●	●	◍	●	●	◍	◍		○	○
BRTH	Brown Thrasher/Moqueur roux	Fall				○		◍	○	○	○	●	○	●	○	○	●	◍			○	○
EUST	European Starling/Étourneau sansonnet	Spring	○		○		○	○	○	◍	◍	◍	◍	◍	◍	◍	◍	◍	◍		◍	◍
EUST	European Starling/Étourneau sansonnet	Fall	⊙	○		○	○	○	○	○	○	◍	◍	◍	◍	◍	◍	◍		◍	◍	◍
AMPI	American Pipit/Pipit d'Amérique	Spring			●		○	○	○	○	◍	○	○	◍		○	○	○	○		○	○
AMPI	American Pipit/Pipit d'Amérique	Fall	●	●	●		○	○	○	●	●	◍	○	◍	○	○	●	◍		●	●	●
SPPI	Sprague's Pipit/Pipit de Sprague	Spring					○															
SPPI	Sprague's Pipit/Pipit de Sprague	Fall					○	○	○													
BOWA	Bohemian Waxwing/Jaseur boréal	Spring			○					○								○	○			
BOWA	Bohemian Waxwing/Jaseur boréal	Fall		◍		○	○		○	◍		○		○						◍		
CEDW	Cedar Waxwing/Jaseur d'Amérique	Spring	○		◍		●	◍	◍	◍	●	●	●	●	◍	●	◍	●	◍		○	○
CEDW	Cedar Waxwing/Jaseur d'Amérique	Fall	◍	◍	●	◍	●	◍	◍	◍	◍	●	●	●	●	◍	●	●		◍	●	◍
BWWA	Blue-winged Warbler/Paruline à ailes bleues	Spring									○	◍	○	○	◍	○	○	○	○			
BWWA	Blue-winged Warbler/Paruline à ailes bleues	Fall										○	○	○	○	○	○				○	○
GWWA	Golden-winged Warbler/Paruline à ailes dorées	Spring							○	○	○	○	○	○	○	○	○	○	○			
GWWA	Golden-winged Warbler/Paruline à ailes dorées	Fall							○		○	○	○	○	○	○	○	○				○
TEWA	Tennessee Warbler/Paruline obscure	Spring			●		●	●	●	●	◍	●	●	◍	○	○	○	●	○			○

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TEWA	Tennessee Warbler/Paruline obscure	Fall	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		◍	○	○
OCWA	Orange-crowned Warbler/Paruline verdâtre	Spring	○		●		●	●	●	●	●	○	○	○	○	○	○	○	○			○
OCWA	Orange-crowned Warbler/Paruline verdâtre	Fall	●	●	●	●	●	●	●	●	●	◍	○	○	○	●	○	○		○	○	○
NAWA	Nashville Warbler/Paruline à joues grises	Spring					○	○	●	●	●	●	●	●	●	●	●	●	●		○	●
NAWA	Nashville Warbler/Paruline à joues grises	Fall	○		○	○	○	○	●	●	●	●	●	●	●	●	●	●		◍	○	●
NOPA	Northern Parula/Paruline à collier	Spring							○	●	●	○	○	○	○	○	○	●	○		○	●
NOPA	Northern Parula/Paruline à collier	Fall	○						○	●	○	○	○	○	○	○	○	●		○	○	●
YWAR	Yellow Warbler/Paruline jaune	Spring			●		◍	◍	◍	●	◍	◍	●	●	◍	◍	◍	◍	◍		◍	●
YWAR	Yellow Warbler/Paruline jaune	Fall	●	⊙	●	●	◍	◍	◍	●	◍	◍	●	●	◍	◍	◍	◍		○	○	●
CSWA	Chestnut-sided Warbler/Paruline à flancs marron	Spring			○		○	○	●	●	●	●	●	●	●	●	●	●	●		○	●
CSWA	Chestnut-sided Warbler/Paruline à flancs marron	Fall			○	○	○	○	●	●	○	●	●	●	●	●	●	●		○	○	●
MAWA	Magnolia Warbler/Paruline à tête cendrée	Spring			●		○	○	●	●	●	●	●	●	●	●	●	●	●		●	●
MAWA	Magnolia Warbler/Paruline à tête cendrée	Fall		●	●	○	●	●	●	●	●	●	●	●	●	●	●	●		◍	○	●
CMWA	Cape May Warbler/Paruline tigrée	Spring			○		○	○	●	●	◍	●	●	●	○	○	○	○	○			○
CMWA	Cape May Warbler/Paruline tigrée	Fall			○		○	◍	●	●	○	●	●	●	○	●	○	○		○	○	○
BTBW	Black-throated Blue Warbler/Paruline bleue	Spring							○	●	●	●	●	●	○	◍	●	●	○		○	○
BTBW	Black-throated Blue Warbler/Paruline bleue	Fall					○	○	○	●	●	●	●	●	○	●	●	●		○	●	●
YRWA	Yellow-rumped Warbler/Paruline à croupion jaune	Spring			●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	●
YRWA	Yellow-rumped Warbler/Paruline à croupion jaune	Fall	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●
BTYW	Black-throated Gray Warbler/Paruline grise	Fall	●																			
BTNW	Black-throated Green Warbler/Paruline à gorge noire	Spring			○		○	○	○	●	◍	●	●	●	●	●	●	●	●		●	●
BTNW	Black-throated Green Warbler/Paruline à gorge noire	Fall			○	○	○	○	○	●	●	●	●	●	●	●	●	●		◍	●	●
TOWA	Townsend's Warbler/Paruline de Townsend	Fall	●	●		○	○															
BLBW	Blackburnian Warbler/Paruline à gorge orangée	Spring							○	●	●	●	●	●	○	○	○	●	○		○	○
BLBW	Blackburnian Warbler/Paruline à gorge orangée	Fall			○			○	○	●	○	●	●	●	○	○	○	●		○	○	○
PIWA	Pine Warbler/Paruline des pins	Spring								○	●	◍	○	○	○	○	○	○	○		○	○
PIWA	Pine Warbler/Paruline des pins	Fall			○				○	○	◍	○	○	○	○		○	○		○	○	○
PRAW	Prairie Warbler/Paruline des prés	Spring									○	○	○	○			○	○			○	○
PRAW	Prairie Warbler/Paruline des prés	Fall										○	○	○				○			○	◍
PAWA	Palm Warbler/Paruline à couronne rouss	Spring			●		○	○	●	●	●	●	●	●	○	●	●	●	●		○	●
PAWA	Palm Warbler/Paruline à couronne rouss	Fall	○		●	○	○	●	●	●	●	●	●	●	◍	●	●	●		◍	●	●
BBWA	Bay-breasted Warbler/Paruline à poitrine baie	Spring			○		○	○	○	●	●	●	◍	●	○	○	○	●	○		○	○
BBWA	Bay-breasted Warbler/Paruline à poitrine baie	Fall			○	○	○	○	●	●	○	●	●	●	○	○	●	●		○	○	○
BLPW	Blackpoll Warbler/Paruline rayée	Spring			○		●	●	●	○	●	●	●	●	●	◍	○	●	●		●	●
BLPW	Blackpoll Warbler/Paruline rayée	Fall	○	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		○	●	●

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CERW	Cerulean Warbler/Paruline azurée	Spring										○	○	○	○		○	○				○
CERW	Cerulean Warbler/Paruline azurée	Fall											○		○							
BAWW	Black-and-white Warbler/Paruline noir et blanc	Spring			●		○	○	●	●	●	●	●	●	○	●	●	●	◉		◉	●
BAWW	Black-and-white Warbler/Paruline noir et blanc	Fall		○	◉	○	○	●	●	●	◉	●	●	●	●	●	●	●		○	◉	●
AMRE	American Redstart/Paruline flamboyante	Spring			●		●	○	●	●	◉	●	●	●	●	●	●	●	●		○	●
AMRE	American Redstart/Paruline flamboyante	Fall		◉	◉	●	●	●	●	●	◉	●	●	●	●	●	●	●		◉	◉	●
PROW	Prothonotary Warbler/Paruline orangée	Spring										○	○	○								○
PROW	Prothonotary Warbler/Paruline orangée	Fall										○	○	○			○					○
OVEN	Ovenbird/Paruline couronnée	Spring			◉		○	○	●	●	●	●	●	●	◉	○	●	●	○		○	○
OVEN	Ovenbird/Paruline couronnée	Fall		○	◉	●	●	●	●	●	◉	●	●	●	◉	●	●	●		○	○	●
NOWA	Northern Waterthrush/Paruline des ruisseaux	Spring			●		○	○	●	●	○	●	●	●	○	●	○	●	○		○	○
NOWA	Northern Waterthrush/Paruline des ruisseaux	Fall	○	◉	●	●	●	●	●	●	○	●	●	●	○	●	●	●		○	○	●
LOWA	Louisiana Waterthrush/Paruline hochequeue	Spring										○	○	○			○					
LOWA	Louisiana Waterthrush/Paruline hochequeue	Fall										○	○	○	○							
CONW	Connecticut Warbler/Paruline à gorge grise	Spring			○		○	○	○	○	○	○	○	○	○		○	○				
CONW	Connecticut Warbler/Paruline à gorge grise	Fall			○	○	○	○	○	○	○	○	○	○	○	○	○	○				○
MOWA	Mourning Warbler/Paruline triste	Spring			●		○	○	●	●	●	●	●	●	○	●	●	●	○		○	○
MOWA	Mourning Warbler/Paruline triste	Fall		○	●	○	○	●	●	●	○	●	◉	●	○	●	○	○		○	○	●
MGWA	MacGillivray's Warbler/Paruline des buissons	Spring					○	○														
MGWA	MacGillivray's Warbler/Paruline des buissons	Fall	●	●	○	○	○	○														
COYE	Common Yellowthroat/Paruline masquée	Spring	○		●		●	○	◉	●	◉	●	●	●	◉	◉	◉	◉	◉		◉	●
COYE	Common Yellowthroat/Paruline masquée	Fall	◉	◉	●	○	●	●	◉	●	◉	◉	◉	●	●	●	●	●		◉	◉	●
HOWA	Hooded Warbler/Paruline à capuchon	Spring								○	○	○	○	○	○	○	○	○			○	○
HOWA	Hooded Warbler/Paruline à capuchon	Fall										○	○	○	○		○				○	○
WIWA	Wilson's Warbler/Paruline à calotte noire	Spring	○		●		○	○	●	●	●	●	●	●	●	●	●	●	●		○	○
WIWA	Wilson's Warbler/Paruline à calotte noire	Fall	●	●	●	●	●	●	●	●	○	●	●	●	●	●	●	●		◉	○	●
CAWA	Canada Warbler/Paruline du Canada	Spring			●		○	○	●	●	●	●	●	●	●	●	●	●	○		○	○
CAWA	Canada Warbler/Paruline du Canada	Fall		○	●	○	○	●	●	●	○	●	●	●	○	◉	●	●		○	○	○
YBCH	Yellow-breasted Chat/Paruline polyglotte	Spring						○				○	○	○	○	○	○	○				○
YBCH	Yellow-breasted Chat/Paruline polyglotte	Fall		○								○	○	○		○	○	○		○	○	○
SCTA	Scarlet Tanager/Tangara écarlate	Spring							○	○	○	●	●	●	◉	○	○	●	○		○	○
SCTA	Scarlet Tanager/Tangara écarlate	Fall							○	○	○	●	●	◉	○	○	○	●			○	○
WETA	Western Tanager/Tangara à tête rouge	Spring			●		○			○												○
WETA	Western Tanager/Tangara à tête rouge	Fall	●	◉	●	○	○			○												
SPTO	Spotted Towhee/Tohi tacheté	Spring	○				○	○														

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SPTO	Spotted Towhee/Tohi tacheté	Fall	◉					○														
EATO	Eastern Towhee/Tohi à flancs roux	Spring						○	○	○	○	●	●	●	○	◉	◉	◉	○		○	○
EATO	Eastern Towhee/Tohi à flancs roux	Fall							○		○	●	○	●	○	○	○	◉			○	○
ATSP	American Tree Sparrow/Bruant hudsonien	Spring			●		○		○	○	◉	◉	○	◉	◉	◉	●	◉	◉		○	○
ATSP	American Tree Sparrow/Bruant hudsonien	Fall		●	●	○	●	●	○	●	◉	◉		◉	◉	◉	●	○		◉	○	○
CHSP	Chipping Sparrow/Bruant familier	Spring	○		◉		●	●	●	●	●	●	●	●	◉	◉	●	◉	◉		●	●
CHSP	Chipping Sparrow/Bruant familier	Fall	●	●	●	●	○	●	●	●	◉	●	◉	●	◉	○	○	●		◉	●	●
CCSP	Clay-colored Sparrow/Bruant des plaines	Spring			●		◉	●	●	●	○	○	○	○			○	◉	○			
CCSP	Clay-colored Sparrow/Bruant des plaines	Fall	○	○	◉	●	◉	◉	●	○	○	○		○			○	○		○	○	○
BRSP	Brewer's Sparrow/Bruant de Brewer	Spring								○												
BRSP	Brewer's Sparrow/Bruant de Brewer	Fall		○		○																
FISP	Field Sparrow/Bruant des champs	Spring								○	○	●	●	●	◉	◉	●	◉	◉		○	○
FISP	Field Sparrow/Bruant des champs	Fall								○		●	◉	●	○	◉	◉	◉		○	○	○
VESP	Vesper Sparrow/Bruant vespéral	Spring			○		●	○	○	○	○	○	◉	●	○	○	◉	○	○			
VESP	Vesper Sparrow/Bruant vespéral	Fall	○	○			○	○	○	○	○	○	○	●	○	○	○	○		○	○	○
LASP	Lark Sparrow/Bruant à joues marron	Spring						○	○	○	○			○							○	
LASP	Lark Sparrow/Bruant à joues marron	Fall						○		○			○	○						○	○	○
LARB	Lark Bunting/Bruant noir et blanc	Spring								○			○	○				○				
LARB	Lark Bunting/Bruant noir et blanc	Fall								○		○										
SAVS	Savannah Sparrow/Bruant des prés	Spring			●		◉	○	●	◉	◉	○	●	●	◉	○	◉	◉	●		●	●
SAVS	Savannah Sparrow/Bruant des prés	Fall	●	●	●	○	◉	○	●	●	○	○	○	●	○	○	◉	◉		◉	●	●
GRSP	Grasshopper Sparrow/Bruant sauterelle	Spring								○		○	○	○			○	○			○	
GRSP	Grasshopper Sparrow/Bruant sauterelle	Fall								○		○	○	○	○						○	○
BAIS	Baird's Sparrow/Bruant de Baird	Fall						○														
HESP	Henslow's Sparrow/Bruant de Henslow	Spring										○	○	○								
HESP	Henslow's Sparrow/Bruant de Henslow	Fall											○	○								
LCSP	Le Conte's Sparrow/Bruant de Le Conte	Spring			○		◉	○	○	○		○	○	○								
LCSP	Le Conte's Sparrow/Bruant de Le Conte	Fall			○		○	○	○	○	○	○		○								
NSTS	Nelson's Sharp-tailed Sparro/Bruant de Nelson	Spring			○		○	○	○	○			○	○								○
NSTS	Nelson's Sharp-tailed Sparro/Bruant de Nelson	Fall					◉		○	○				○				○			○	◉
SESP	Seaside Sparrow/Bruant maritime	Fall																			○	
FOSP	Fox Sparrow/Bruant fauve	Spring			○		○	○	○	○	○	●	◉	◉	○	●	●	●	○		○	◉
FOSP	Fox Sparrow/Bruant fauve	Fall	●	○	○	○	○	○	●	○	○	●	○	●	●	●	●	●		◉	○	◉
SOSP	Song Sparrow/Bruant chanteur	Spring	○		◉		●	◉	◉	●	◉	●	●	●	◉	◉	◉	◉	◉		◉	◉
SOSP	Song Sparrow/Bruant chanteur	Fall	◉	●	◉	●	●	◉	◉	●	◉	●	◉	●	◉	◉	◉	◉		◉	◉	◉

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LISP	Lincoln's Sparrow/Bruant de Lincoln	Spring			●		●	●	●	●	●	●	●	●	●	●	●	●	○		○	○
LISP	Lincoln's Sparrow/Bruant de Lincoln	Fall	●	●	●	●	●	●	●	●	●	●	◉	●	●	●	●	◉		◉	●	●
SWSP	Swamp Sparrow/Bruant des marais	Spring			○		○	○	●	●	○	●	●	●	◉	●	◉	●	◉		○	●
SWSP	Swamp Sparrow/Bruant des marais	Fall	○	◉	○	○	○	○	●	●	◉	◉	◉	●	◉	●	◉	●		○	●	●
WTSP	White-throated Sparrow/Bruant à gorge blanche	Spring			◉		●	●	●	●	●	●	●	●	●	●	●	●	◉		●	●
WTSP	White-throated Sparrow/Bruant à gorge blanche	Fall	○	●	◉	●	●	●	●	●	●	●	◉	●	●	●	●	●		◉	●	●
HASP	Harris's Sparrow/Bruant à face noire	Spring			○		○	○	●	○			○	○								
HASP	Harris's Sparrow/Bruant à face noire	Fall		○	○	○	○	●	●	◉				○								
WCSP	White-crowned Sparrow/Bruant à couronne blanche	Spring	○		●		○	●	◉	●	●	●	●	●	●	●	●	●	◉		●	●
WCSP	White-crowned Sparrow/Bruant à couronne blanche	Fall	◉	●	●	●	○	●	○	●	●	●	○	●	●	●	●	●		●	●	●
GCSP	Golden-crowned Sparrow/Bruant à couronne dorée	Fall	●	○																		
DEJU	Dark-eyed Junco/Junco ardoisé	Spring	○		●		●	○	●	◉	●	●	●	●	●	◉	●	●	◉		○	●
DEJU	Dark-eyed Junco/Junco ardoisé	Fall	●	◉	●	◉	●	●	●	●	●	●	○	●	●	◉	●	●		●	●	●
LALO	Lapland Longspur/Bruant lapon	Spring			○		○	○	○	○	○	○		○		○	◉					
LALO	Lapland Longspur/Bruant lapon	Fall	○	◉	●		○	◉	○	●	○	○		○			○			○	○	○
SMLO	Smith's Longspur/Bruant de Smith	Spring			○																	
SMLO	Smith's Longspur/Bruant de Smith	Fall												○								
SNBU	Snow Bunting/Bruant des neiges	Spring			○		○		○	○	○	○					○					
SNBU	Snow Bunting/Bruant des neiges	Fall		○	○		○			●	○	○		◉	○	○	○	○		◉	○	○
NOCA	Northern Cardinal/Cardinal rouge	Spring								○	○	◉	◉	◉	◉	◉	◉	◉	◉			○
NOCA	Northern Cardinal/Cardinal rouge	Fall							○	○	◉	◉	○	◉	◉	◉	◉	○			○	○
RBGR	Rose-breasted Grosbeak/Cardinal à poitrine rose	Spring			●		○	○	●	●	●	●	●	●	◉	●	●	●	●		●	●
RBGR	Rose-breasted Grosbeak/Cardinal à poitrine rose	Fall	○	○	●	○	○	◉	●	●	○	●	●	●	◉	●	◉	●		○	○	○
BHGR	Black-headed Grosbeak/Cardinal à tête noire	Spring																			○	
BHGR	Black-headed Grosbeak/Cardinal à tête noire	Fall	●																			
LAZB	Lazuli Bunting/Passerin azuré	Spring			○		○					○						○				
INBU	Indigo Bunting/Passerin indigo	Spring							○	●	◉	●	●	●	◉	○	◉	●	○		○	○
INBU	Indigo Bunting/Passerin indigo	Fall							○	○	○	◉	◉	●	◉	○	◉	○		○	○	◉
DICK	Dickcissel/Dickcissel d'Amérique	Spring								○			○	○				○				○
DICK	Dickcissel/Dickcissel d'Amérique	Fall								○	○	○		○				○		○	○	○
BOBO	Bobolink/Goglu des prés	Spring					○	○	◉	○	◉	◉	◉	◉	◉	◉	◉	◉	◉		○	○
BOBO	Bobolink/Goglu des prés	Fall					○	○	○	○	○	◉	◉	◉	◉	○	◉	○		○	◉	◉
RWBL	Red-winged Blackbird/Carouge à épaulettes	Spring	○		●		◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉		◉	○
RWBL	Red-winged Blackbird/Carouge à épaulettes	Fall	●	◉	●	○	◉	○	◉	◉	○	◉	◉	◉	●	◉	◉	◉		○	○	○
EAME	Eastern Meadowlark/Sturnelle des prés	Spring								○	○	◉	◉	◉	◉	○	◉	◉	◉		○	

Species Code	Species Name (English/French)	Season	RPBO	MNO	LSLBO	IBS	BBO	LMBO	DMBO	TCBO	BPBO	LPBO_OC	LPBO_BW	LPBO_TIP	HBO_RUTH	HBO_ROCK	HBO_SELK	PEPtBO	IPBO	OOT	ABO_SI	ABO_BP
EAME	Eastern Meadowlark/Sturnelle des prés	Fall										◉	○	◉	○	○	◉	○			○	○
WEME	Western Meadowlark/Sturnelle de l'Ouest	Spring			○		○	◉	○	○	○	○		○								
WEME	Western Meadowlark/Sturnelle de l'Ouest	Fall	○				○	○	○	○												
YHBL	Yellow-headed Blackbird/Carouge à tête jaune	Spring			○		◉	○	◉	○		○	○	○								
YHBL	Yellow-headed Blackbird/Carouge à tête jaune	Fall	○		○		○	◉	◉	○		○		○							○	
RUBL	Rusty Blackbird/Quiscale rouilleux	Spring			○		○		○	○	○	◉	◉	◉	○	●	○	●	○		○	
RUBL	Rusty Blackbird/Quiscale rouilleux	Fall	○	◉	○		○	○	○	●	○	◉	○	◉	●	◉	◉	◉		●	○	○
BRBL	Brewer's Blackbird/Quiscale de Brewer	Spring			○		○	◉	○	○	○	○		○								
BRBL	Brewer's Blackbird/Quiscale de Brewer	Fall	○	○	○		○	◉	○	○		○		○								
COGR	Common Grackle/Quiscale bronzé	Spring			●		○	◉	◉	◉	●	◉	◉	◉	◉	◉	◉	◉	◉		◉	◉
COGR	Common Grackle/Quiscale bronzé	Fall		○	●	○	○	◉	◉	●	○	◉	◉	◉	●	◉	◉	●		●	○	○
BHCO	Brown-headed Cowbird/Vacher à tête brune	Spring	○		●		◉	◉	◉	◉	●	◉	◉	◉	◉	◉	◉	◉	◉		○	○
BHCO	Brown-headed Cowbird/Vacher à tête brune	Fall	●	○	○	○	◉	◉	◉	○	○	◉	◉	◉	○	◉	◉	◉		○	○	○
OROR	Orchard Oriole/Oriole des vergers	Spring						○	○		○	○	○	○	◉	○	◉	○	○		○	○
OROR	Orchard Oriole/Oriole des vergers	Fall						○	◉		○	○	○	○	○	○	○					○
BUOR	Bullock's Oriole/Oriole de Bullock	Fall	○																			
BAOR	Baltimore Oriole/Oriole de Baltimore	Spring			○		●	●	◉	○	●	●	●	●	◉	●	◉	●	◉		●	●
BAOR	Baltimore Oriole/Oriole de Baltimore	Fall			○	◉	●	●	◉	○	○	●	●	●	◉	●	◉	●		○	○	●
PIGR	Pine Grosbeak/Durbec des sapins	Spring			○		○			○								○			○	
PIGR	Pine Grosbeak/Durbec des sapins	Fall		○			○			◉	○	○		○				○		●	○	○
PUFI	Purple Finch/Roselin pourpré	Spring	○		●		◉	○	○	●	◉	◉	◉	◉	○	○	○	●	◉		○	○
PUFI	Purple Finch/Roselin pourpré	Fall	●	◉	●	○	○	○	◉	●	◉	◉	○	◉	◉	◉	●	●		●	●	◉
HOFI	House Finch/Roselin familier	Spring	○						○	○	○	◉	◉	◉	◉	◉	◉	◉	○			○
HOFI	House Finch/Roselin familier	Fall	◉					○	○		○	◉	◉	◉	◉	◉	◉	◉		○	○	
RECR	Red Crossbill/Bec-croisé des sapins	Spring								○		○	○				○					○
RECR	Red Crossbill/Bec-croisé des sapins	Fall	◉	◉	○		○	○		◉	○	○	○	○			○			●	○	○
WWCR	White-winged Crossbill/Bec-croisé bifascié	Spring			○					○		○		○			○	○			◉	◉
WWCR	White-winged Crossbill/Bec-croisé bifascié	Fall	○	◉	◉				○	●	○	○	○	○		○	○	○		●	◉	◉
CORE	Common Redpoll/Sizerin flammé	Spring			○		○		○	○	○	○		○		○	○	○	○			
CORE	Common Redpoll/Sizerin flammé	Fall		○	○		○			◉	○	○		○		○	○	○		●	○	○
HORE	Hoary Redpoll/Sizerin blanchâtre	Spring			○																	
HORE	Hoary Redpoll/Sizerin blanchâtre	Fall								○										○		
PISI	Pine Siskin/Tarin des pins	Spring			●		○	○	◉	●	●	◉	○	◉	○	○	○	●	○		○	○
PISI	Pine Siskin/Tarin des pins	Fall	●	◉	●	○	◉	●	◉	●	●	◉	○	◉	○	○	●	●		●	○	◉
AMGO	American Goldfinch/Chardonneret jaune	Spring	○		○		◉	●	◉	●	●	◉	◉	◉	◉	◉	◉	●	◉		●	◉

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AMGO	American Goldfinch/Chardonneret jaune	Fall	● (teal)		○	○	● (teal)	● (teal)	● (teal)	●	● (teal)	● (teal)	● (teal)	● (teal)	● (teal)	● (teal)	● (teal)	●		● (teal)	●	● (teal)
EVGR	Evening Grosbeak/Gros-bec errant	Spring			●		○		○	●	● (teal)	○	○	○	○		○	○	○		○	○
EVGR	Evening Grosbeak/Gros-bec errant	Fall	●	● (teal)	●		○		○	●	○	● (teal)	○	○	○	○	○	○		●	○	○
HOSP	House Sparrow/Moineau domestique	Spring			○		○	● (teal)	○	○	○	● (teal)	○	● (teal)	● (teal)	● (teal)	● (teal)	○	○			
HOSP	House Sparrow/Moineau domestique	Fall	○	○		○	○	● (teal)	○	○	○	● (teal)	○	● (teal)	○	○	● (teal)	○		○	○	○