BIRD POPULATIONS

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PATTERNS OF SEASONAL ABUNDANCE AND DIVERSITY IN THE WATERBIRD COMMUNITY OF NAL LAKE BIRD SANCTUARY, GUJARAT, INDIA[1]

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Abstract. We studied the waterbird community of Nal Lake Bird Sanctuary (NLBS), Gujarat State, India, a proposed Ramsar Site and Wetland of International Importance, to determine site-specific seasonal variation in abundance and diversity. The study was conducted at eight selected sites in NLBS from March 2004 to February 2005. Data were gathered monthly to ensure quantification of seasonal changes in diversity and density. Overall, 109 waterbird species belonging to 64 genera and 18 families were documented, including 42 year-round residents and 67 seasonally present or migratory species. Among these, 8 species were considered to be abundant, 51 common, and 50 rare. Overall waterbird density was highest where resident species such as Grey Heron (*Ardea cinerea*), Little Egret (*Egretta garzetta*), Median Egret (*Mesophoyx intermedia*), Red-wattled Lapwing (*Vanellus indicus*) and Black-winged Stilt (*Himantopus himantopus*) were present; some migratory species such as Greater Flamingo (*Phoenicopterus ruber*), Graylag Goose (*Anser anser*), Common Coot (*Fulica atra*) and Whiskered Tern (*Chlidonias hybridus*) contributed to areas of high density. Diversity was high where profuse growth of emergent aquatic vegetation and low human disturbance was evident; it was low at sites that experience high levels of pollution and tourism. The abundance and composition of the waterbird assemblage was affected by the interplay of several factors, including site-specific presence of certain species,

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habitat fragmentation and the presence of core refugial habitats. Recommendations for management and research are made to ensure the effective conservation of waterbird populations and their habitats in this region.

Key words: Nal Lake Bird Sanctuary, Gujarat, India, species diversity, waterbird community, waterbird management.

PATRONES DE ABUNDANCIA Y DIVERSIDAD ESTACIONAL EN LA COMUNIDAD DE AVES ACUÁTICAS DEL SANTUARIO DE AVES DEL LAGO NAL, GUJARAT, INDIA

Resumen. Estudiamos la comunidad de aves acuáticas del Santuario de Aves del Lago Nal (Nal Lake Bird Sanctuary, NLBS), Gujarat State, India, un lugar propuesto como Sitio Ramsar y Humedal de Importancia Internacional, para determinar la variación estacional local en abundancia y diversidad. El estudio fue llevado a cabo en ocho sitios del NLBS entre marzo de 2004 y febrero de 2005. Los datos fueron colectados mensualmente para asegurar la cuantificación de cambios estacionales. En conjunto, documentamos la presencia de 109 especies acuáticas pertenecientes a 64 géneros y 18 familias, incluyendo 42 residentes permanentes y 67 especies estacionales o migratorias. Entre estas, 8 especies fueron consideradas abundantes, 51 comunes, y 50 raras. La densidad general de aves acuáticas fue mayor donde especies residentes como *Ardea cinerea, Egretta garzetta, Mesophoyx intermedia, Vanellus indicus*, e *Himantopus himantopus* estaban presentes; algunas especies migratorias como el flamenco *Phoenicopterus ruber, Anser anser, Fulica atra* y *Chlidonias hybridus* contribuyeron también en áreas de alta densidad. La diversidad fue alta donde eran evidentes la profusión de vegetación acuática emergente y la baja perturbación humana; fue baja en lugares que experimentan altos niveles de polución y turismo. La abundacia y composición de la comunidad de aves acuáticas se vieron afectadas por la interacción de diversos factores, entre ellos la presencia local de ciertas especies, la fragmentación del hábitat y la presencia de zonas de hábitats relictuales. Aportamos recomendaciones para el manejo y la investigación a fin de asegurar la conservación efectiva de las poblaciones de aves acuáticas y sus hábitats en esta región.

Palabras clave: comunidad de aves acuáticas, manejo de aves acuáticas, diversidad de especies, Nal Lake Bird Sanctuary, Gujarat, India

INTRODUCTION

The conservation of wetlands has become a frequent topic among wildlife managers. Wetlands are important conservation sites due to their rich biodiversity, they are among the most productive ecosystems in the world, and they harbor many globally threatened species (Casado and Montes 1995, Green 1996, Petrie 1998, Getzner 2002). Diverse wetland complexes are of greatest value in providing habitat for wetland bird species (Miller 2003).

Over 90% of Earth's wetlands have been lost during the past 150 years (Kempka et al. 1991), along with increased habitat fragmentation within those that remain (Van Vessem et al. 1997).

The major problem is agricultural expansion and urban development (Shuford et al. 1998; Shine and Klenm 1999). One associated result is the loss of native aquatic seeds consumed by waterbirds (Petrie and Rogers 1996). These historical reductions in water and food availability have forced most waterbirds to migrate towards riverine systems of semi-arid areas and subtropical regions during winter (Raeside 2005).

Current efforts to increase wetland habitats are hampered by a paucity of biological data (Streeter et al. 1993, Shuford et al. 2004). One key type of information involves the factors that affect the abundance of aquatic birds in a given wetland, an abundance that may differ depending on the time of day, season or year in which the bird surveys are conducted (Miller 2003). To address this data gap in India, we coordinated counts of waterbirds at Nal Lake Bird Sanctuary (NLBS) from March 2004 to February 2005, and report here the pattern of seasonal, site-specific variation in species abundance and diversity for this Ramsar Site and Wetland of International Importance (Davis 1994, Frazier 1996, GSFD 2005). Similar studies have been carried out, for example, in such areas as the altiplano wetlands of north-western

Argentina (Colwell and Taft 2000, Caziani et al. 2001), after which we modeled our investigations. We make recommendations for management and future research to ensure effective conservation of waterbirds in this region of India.

MATERIALS AND METHODS

STUDY AREA

Nal Lake Bird Sanctuary is located between 22° 78′ N to 22° 96′ N latitude and 71° 92′ E to 72° 64′ E longitude, amidst the semi-arid lands of Ahmedabad and Surendranagar districts, 65 km from Ahmedabad. Biogeographically, the area falls in the 4-B Gujarat-Rajwara biotic province of the semi-arid biogeographical zone (Rodgers and Panwar 1988). The legal area of the sanctuary is 120.89 km^2. The sanctuary supports more than 300 islets, most of which fringe its western boundary. It receives water mainly from two rivers, Brahmini and Bhogavo, flowing from its northern border (Fig. 1). The entire area experiences three distinct seasons: winter (November to February), summer (March to May), and monsoon (mid-June to mid-October). Average temperature varies from 45° C during summer to 7° C during winter. Annual rainfall ranges from 500 to 600 mm.

The unique geographical location, climate and topography have endowed NLBS with great floral and faunal diversity. This natural shallow lake flourishes with 48 species of phytoplankton, 76 species of zooplankton and 71 flowering plants, including more than 30 species of aquatic macrophytes. The lake fauna includes >20 species of fish, 11 species of herpetofauna, 216 species of birds, including 160 species of waterfowl of both resident and migratory species, and 13 mammalian species including the threatened Indian Wild Ass (*Equus hemionus khur*) and Blackbuck (*Antelope cervicapra*) (GEER 1998).

SITE SELECTION

As NLBS includes an extensive geographical and hydrobiological regime, preliminary visits were made to assess sites that could be consistently surveyed (see Nirmal Kumar and Rita Kumar 2000). The entire area was assessed from all directions by approaching peripheral boundaries by road, walk-ways on banks and by boats. Discussions with knowledgeable local experts were included in the reconnaissance. In total, eight survey sites were selected (15 to 20% of NLBS) so as to cover the longitudinal cross-section of the entire lake ecosystem: Site-1 (upstream of Brahmini River) and Site-2 (Downstream of Brahmini River) fringe the northern boundary of the lake; Site-3 (Bendi Bet) is an unperturbed site; Site-4 (Dharbla Bet) is a tourist spot for recreational activities; Site-5 (Core Zone/*Sanctum sanctorum*), is an 8 km^2 area forming the central portion of the lake; Site-6 represents the south-west border (Mahatal Bet); Site-7 represents the lake's southern limit (Bajot Bet) and Site-8 (Dakthali) occurs at the southeastern periphery of the sanctuary.

SURVEYS

We counted waterbirds by species from March 2004 to February 2005, visiting each site monthly. We surveyed only settled birds present in and around each site, and did not include flying individuals in order to minimize over- or underestimation (Javed and Kaul 2002).

The total surface area of large sites was estimated using width, length and configuration dimensions acquired from 1:50,000 base maps (Raeside 2005). Small site-dimensions were estimated by pacing lengths and widths. In order to derive a consistent measure of waterbird abundance among sites of different sizes, raw abundance values were divided by the total area of the site for a measure of waterbird density (Reynolds et al. 1980). Because of the huge expanse of the study area and varying logistical constraints among sites and habitats, we used a combination of survey methods (Bibby et al. 1992, Miller 2003, Shuford et al. 2004) including sampling of nesting and breeding grounds. Large flocks of birds were estimated by 10's or 100's; if necessary, on occasion we flushed birds to count them in the air (Guadagin et al. 2005).

Sites 3, 4, 6, 7 were covered by walking on the island and sites 1, 2, 5, 8 by canoe. Sites with thick emergent vegetation were walked in order to flush birds into view. However, to avoid unnecessary flushing, binoculars and spotting scopes were used to observe as much as possible from a distance (Buckland et al. 1993). To prevent double counting, all birds flushed from a wetland were watched for ingress and egress.

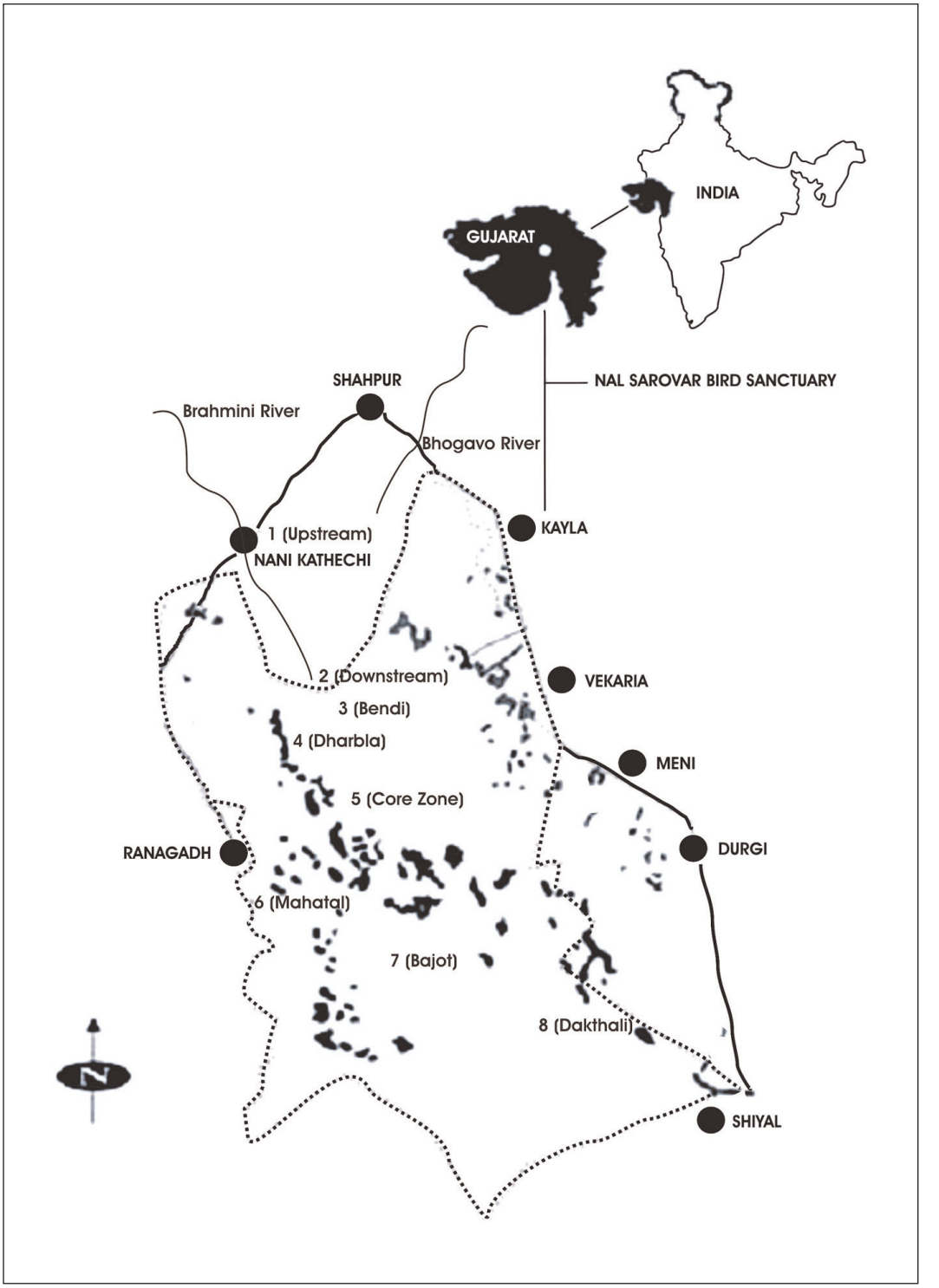

FIGURE 1. Surveyed sites in Nal Lake Bird Sanctuary (NLBS); the numbers preceding various place names are used in other tables and figures in this report.

All wetland birds seen or heard during the first 15 min following arrival were recorded for later analysis. We proceeded to adjacent sites in a direction that avoided the counting of displaced birds; however, the direction around each site was alternated to procure maximum possible species diversity. In total, 10 surveys were conducted in 2004 and 2 in 2005 for all eight sites. Some sites required more time than others. The time needed to complete surveys ranged from 3 to 6 hrs either in the morning or evening (06:00 to 10:00, 16:00 to 18:00 hrs). Some passerines and purely terrestrial birds were not included. The occurrence status of the species was determined as per GEER (1998).

STATISTICAL METHODS

A Station Index Method (SIM) was used in the assessment (see Verner 1985). Therefore, the density of birds (per km^2) was calculated for those recorded within 250 m^2 (in all four directions) of each viewing site.

A comprehensive list of recorded avian species was prepared (Appendix I). All surveys were pooled for analyses (Ludwig and Reynolds 1988). Site-specific total abundance, mean total abundance, total density and mean total density, along with number of species of all eight sites were calculated in order to evaluate how wetland bird abundance differed among sites and seasons (Conover 1980, Ott 1984). Total abundance (number of birds per site) and species richness (number of species per site) were included in the summaries. The unilateral *F*-test compared totals among all eight sites and seasons against overall species richness to check if significant differences existed in the number of species by season.

The 12-months of data were pooled to compare various indices of species diversity, i.e. "concentration of dominance" over the entire community (Odum 1996). These indices included (A) Dominance (Simpson's Index; 1949) and (B) Species Diversity/Species Richness Indices: Odum's (1962), Margalef's (1958), Menhinick's (1964), Brillioun's (1951), Shannon–Weaver (H) (1963), and Evenness Index (Hill 1973) index.

Birds recorded with <100 individuals were considered as rare, those between 100 to 500 individuals as common, and those recorded >500 individuals as abundant (GEER 1998).

We referred to Magurran (1988), Colwell (1997) and other texts for statistical methods, performed using SPSS Version 12.0 (SPSS Inc., Chicago, IL) (Norusis 1993) and PC-ORD Version 4.0 Multivariate Analysis of Ecological Data (MJM Software Design, Gleneden Beach, OR) statistical software.

RESULTS

During the present study, 109 species of waterbirds were documented, represented by 64 genera of 18 families. Of these, 42 species (38.5%) were resident and 67 species (61.5%) were found to be migratory or seasonally resident. Abundant species (8, or 7.3%) included resident waterbirds such as Asian Openbill (*Anastomos oscitans*) and Glossy Ibis (*Plegadis falcinellus*), and migratory birds such as Greater Flamingo (*Phoenicopterus ruber*), Graylag Goose (*Anser anser*), Common Coot (*Fulica atra*), Black-tailed Godwit (*Limosa limosa*), Ruff (*Philomachus pugnax*) and Whiskered Tern (*Chlidonias hybridus*). What we considered to be common birds totalled 51 species (46.8%), while only 50 species (45.9%) were found to be rare (Appendix I).

Community composition varied by season (Fig. 2). The highest number (100%) of families was recorded during summer and winter, followed by 83.3% during the monsoon period. On the basis of genus, the highest number (100%) occurred during winter, followed by summer (79.7%) and monsoon (65.6%); a similar pattern was evident among species: winter (94.5%), followed by summer (72.5%) and monsoon (53.2%). Resident species made their greatest contribution during winter (97.6%), followed by 85.7% each during summer and monsoon. All species considered to be abundant occurred during winter and summer (100% each), followed by 87.5% during monsoon, while peak values of species of common occurrence occurred during winter (98.04%), followed by summer (96.1%) and monsoon (78.4%). Among rare species, 90% were present during winter, followed by summer (44%) and monsoon (22%). Overall, waterbirds were most abundant during summer (67.3%), followed by winter (36.7%) and monsoon (10.4%). The abundance of waterbirds recorded during different seasons at NLBS largely corresponded to their density. The density of waterbirds was

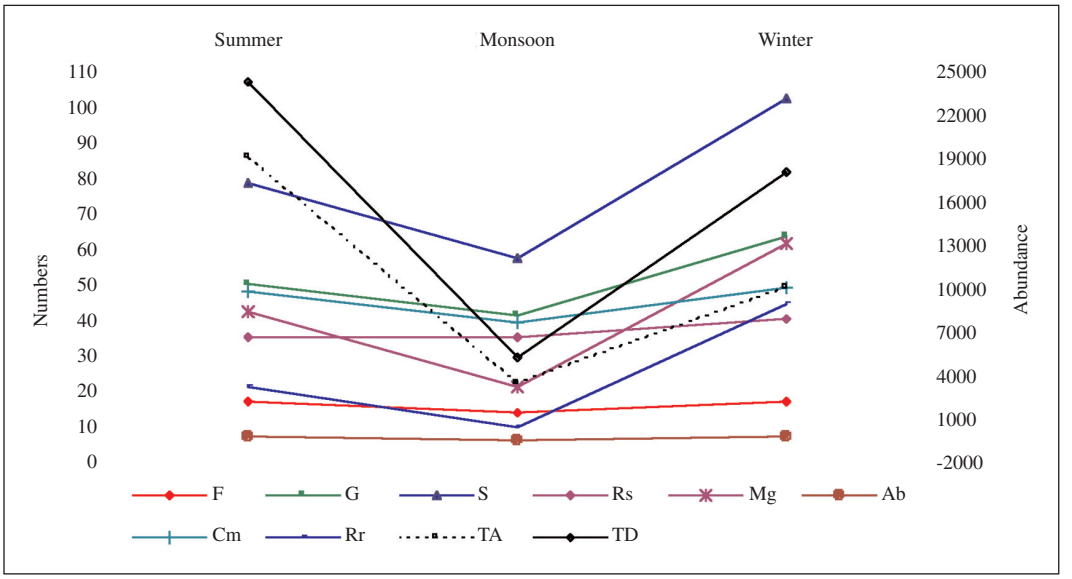

FIGURE 2. Seasonal patterns of overall waterbird abundance at NLBS. F refers to Family, G to Genera, S to Species, Rs to Resident, Mg to Migrant, Ab to Abundant, Cm to Common, Rr to Rare; and TA= Total Abundance, TD = Total Density.

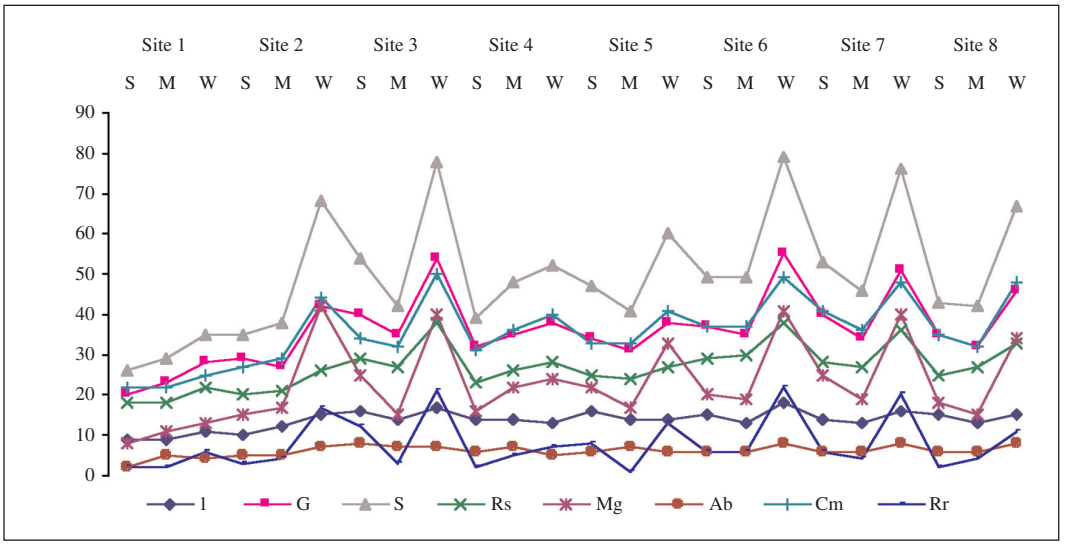

FIGURE 3. Site-specific occurrence of waterbirds at NLBS by season; see Methods for description of Sites and Figure 2 for definition of symbols.

maximum during summer (69.66%), followed by winter (52.0%) and monsoon (15.6%). Similar observations were made by Ericia et al. (2005).

The lowest number of families was recorded at Site 1 (50%) during summer and monsoon, while the highest was documented at Site 6 (100%, all families) during winter (Fig. 3). Among genera, abundance was lowest at Site 1 (31%) during summer and highest at Site 6 (86%) during winter. On the other hand, Site 1 had the lowest number of species (24%) during summer, while Site 6 (72%) had the highest during winter. Only 43% of resident species were recorded at Site 1 during summer, and

almost 90% at Sites 3 and 6 during winter. Low numbers of migratory species were documented at Site 1 (12%) during summer, while almost 63% of migratory species were present at Site 2 during winter. Among abundant species, only 25% were recorded at Site 1 during summer, but sites 3, 6, 7 and 8 were found to support all the abundant species during winter. Only 43% of common species were found at Site 1 during summer, while almost 98% were at Site 3 during winter. As for rare species, Site 5 had only 2%, but Site 6 had 44% during winter. In general, Site 1 harbored the lowest number of waterbirds during summer in contrast to Site 6, which supported highest waterbird populations during winter. Thus the gradient of waterbird numbers among study sites was: site 1 < sites 2, 3, 4, 5, 7 < site 6.

The waterbird populations of NLBS fluctuated among sites in different seasons due to local, environmentally dependent factors (see also Hill et al. 1993; Tables 1, 2). Abundance was low at Site 1 (141 birds) during monsoon and was highest at site 5 (5,601) during summer. Mean abundance per month was 35.2 birds, total density was 191.3 birds/km^2 and mean density per month was 47.83 birds/km^2. By and large, the overall population of waterbirds during monsoon was low due to greater water depth, which favors only diving ducks, e.g. *Tachybaptus, Anas*, etc. The highest waterbird populations were recorded during summer (Masero et al. 2000) owing to low water depth and exposure of shores, banks, muddy islands and mudflats, which increases habitat complexity. The latter factors encourage larger numbers especially of large birds, e.g. *Pelecanus, Ardea, Ardeola, Anastomus, Mycteria, Phoenicopterus, and Grus* spp., as well as small waders, e.g. *Capella, Gallinago, Actitis, Calidris*, and *Tringa* spp. Overall, the total abundance of waterbirds was low (3,675 individuals) during monsoon, and high during summer (19,151), with the mean abundance per month of 919 birds, mean total density of 5,468 birds/km^2 and mean density per month of 1,367 birds/km^2. Considered by site, during monsoon the region supported low numbers at Site 1 and highest numbers at Site 6 (see Table 2).

The unilateral *F*-test on the overall species richness at NLBS in different seasons (separately against all three seasons), indicated significant

TABLE 1. Waterbird abundance and density in different seasons at NLBS.

Sites	TA			MA / Month			TD			MD / Month		
	S	M	W	S	M	W	S	M	W	S	M	W
1	262	141	220	65.5±12.0	35.2±4.27	55.0±5.9	334.2	191.3	1315.0	83.6±9.7	47.8±4.7	328.8±50.3
2	430	289	1693	107.5±14.7	72.2±7.32	423.2±73.2	548.5	414.5	2047.2	137.1±14.2	103.6±9.2	511.8±66.8
3	2478	282	1484	619.5±124.1	70.5±5.81	371.0±36.8	3160.7	428.6	1991.1	790.2±121.1	107.1±8.4	497.8±31.5
4	1763	515	456	440.8±98.9	128.8±10.62	114.0±11.7	2248.7	656.9	1395.4	562.2±84.3	164.2±12.8	348.8±30.3
5	5601	1089	1206	1400.2±392.1	272.2±80.13	301.5±45.8	7144.1	1503.8	1821.4	1786.0±354.9	376.0±79.2	455.4±41.2
6	3608	496	2514	902.0±273.0	124.0±8.30	628.5±74.3	4602.0	1103.3	3091.8	1150.5±251.8	275.8±32.6	773.0±64.1
7	3490	582	1799	872.5±129.2	145.5±13.71	449.8±33.5	4451.5	788.3	2309.9	1112.9±127.7	197.1±15.8	577.5±30.2
8	1519	281	825	379.8±44.5	70.2±5.28	206.2±18.7	1937.5	381.4	4256.8	484.8±44.6	95.3±6.7	1064.1±100.0
Mean	2393.9	459.4	1274.6	598.5±610.8	114.8±80.90	318.7±222.9	3053.4	683.5	2278.5	763.4±89.4	170.9±14.3	569.6±43.5
NLBS	19151	3675	10197	4787.8	918.8	2549.2	24427.3	5468.1	18228.3	6106.8	1367.0	4557.1

TA: Total Abundance; MA: Mean Abundance; TD: Total Density; MD: Mean Density; S: Summer; M: Monsoon; W: Winter; means expressed ± standard error

TABLE 2. Seasonal abundance and density of waterbirds at NLBS by Site.

	Summer			Monsoon			Winter		
Sites	Mean	AD	SD	Mean	AD	SD	Mean	AD	SD
1	6.8	5.4	9.7	2.6	3.4	4.7	10.9	15.3	50.3
2	5.6	7.8	14.2	5.7	6.2	9.2	16.9	22.2	66.8
3	32.6	46.4	121.1	5.9	6.1	8.4	16.5	19.2	31.5
4	23.2	33.4	84.3	9.0	7.7	12.8	11.5	14.9	30.3
5	73.6	115.4	354.9	20.6	27.8	79.2	15.0	19.5	41.2
6	47.4	66.6	251.8	15.1	15.1	32.6	25.6	30.5	64.1
7	45.9	63.4	127.7	10.8	10.7	15.8	19.1	20.3	30.2
8	20.0	26.2	44.6	5.2	5.3	6.7	35.2	43.6	100.0
NLBS	31.5	39.7	89.4	9.4	8.7	14.321	18.8	23.2	51.8

AD: Average Deviation; SD: Standard Deviation

differences in the number of species among three different seasons ($p<0.05$) as follows: summer 4.790, monsoon 1.099, and winter 1.151. Based on this result, it is obvious that the monsoon season supports lowest abundance of waterbirds compared to summer. This might be due to site fidelities, site-specific environmental factors and the amount of anthropogenic interventions (Ericia et al. 2005).

During our study, 16 (14.7%) species were abundant at some time during the year (Figs. 4a, b). These species, *Phoenicopterus ruber, Plegadis falcinellus, Anastomus oscitans, Anser anser, Fulica atra, Chlidonias hybridus, Limosa limosa, Himantopus himantopus, Philomachus pugnax, Phoenicopterus minor, Actitis hypoleucos, Mycteria leucocephala, Threskiornis melanocephalus, Sterna albrifrons, Calidris minuta* and *Mesophoyx intermedia*, occurred widely in the study area (see also Dolman et al. 1995). They contributed almost 7.3% to the total species richness, and 82.1% to the total abundance.

Among all abundant waterbirds, the highest population (5,942 individuals), that of *Phoenicopterus ruber*, was recorded in July (1,869), followed by *P. falcinellus* (5,156) in May, *A. oscitans* (1,524) in February, *A. anser* (1,326) in June, *F. atra*, (1,276) in January, *C. hybridus* (1,163) in March, *L. limosa* (960) in June, *H. himantopus* (871) in March, *P. pugnax* (756) in April, *P. minor* (715) in May, *A. hypoleucos* (705) in March, *M. leucocephala* (636) in June, *T. melanocephalus* (609) in June, *S. albrifrons* (602) in March, *C. minuta* (571) in March and *M. intermedia* (536) in May. All 16 of these species, except *F. atra* (migrant, abundant in winter), were widely present during the post-winter period (February to March) due to low water levels, open mudflats and shallow banks (Atkinson-Willies 1976).

During this study, some waterbirds exhibited a very low frequency of occurrence and low abundance (Burton et al. 2000a, 2000b) (Appendix I). Only 9 species were sighted occasionally and showed sporadic distribution at NLBS: *Ixobrychus flavicollis, Tringa nebulari, Calidris ferruginea, Pelicanus crispus, Larus heuglini, Anas platyrhynchos, Calidris temminckii, Xenus cinereus* and *Ixobrychus sinensis* (Fig. 5). They were scattered in and around NLBS only during some months [frequency (n=1); abundance (N=1)]. Of these, *I. flavicollis* and *L. heuglini* were recorded in November; *T. nebulari* in April; *C. ferruginea, C. temminckii*, and *X. cinereus* in January; *P. crispus* and *A. platyrhynchos* in March; and *I. sinensis* in December. These rare species contributed only 0.8% to the total richness, and only 1.2% to the total abundance.

Overall, the values of various diversity indices varied from 0.10 to 0.63 for NLBS. Site-specific variations were as follows: Odum's index (0.11-Site 4 in winter; 0.99-Site 1 in summer), Margalef's index (0.10-Sites 6, 7, 8; 0.90-Site 2 in winter), Menhinick's Index (0.25-Site 1; 0.78-Site 6 in winter), Brillioun's Index (0.49-Site 1 in monsoon; 0.49-Site 5 in summer), Simpson's Index (0.10-Sites 6,7,8; 0.90-Site 2 in winter), Shannon–Weaver's Index (0.10-Site 4 in winter, Site–8 in monsoon; 0.97-Site 2 in monsoon), and Evenness Index (0.12- Site 1 in summer; 0.89-Site 6 in winter) (Fig. 6). A similar relationship was established by Elmberg et al. (1994) and

Walther and Martin (2001), respectively, with reference to estimation of species diversity and species richness.

DISCUSSION

In our study, counting methods, frequency of counting, and experience of field ornithologists were heterogeneous. Despite the integration of all data into one dataset, caution is still needed when interpreting trends and patterns (Ericia et al. 2005). This is especially true in the case of the effect of differences in monitoring frequencies that might bias the patterns for migrants that pass through the area only briefly or that use the area irregularly as a refuge (Goss-Custard 1991). The number of species observed in the 12-month census tended to reach an asymptote, however, suggesting that efforts recorded the true number of species at NLBS (Appendix I). Species composition differed among areas and months because of habitat differences, seasonal movement patterns, local and regional habitat changes, large-scale population changes and climatic conditions (see also Ericia et al. 2005). However, our results confirmed and indicated the importance of NLBS as a foraging and resting habitat for migratory waterbirds.

SPATIAL PATTERNS

Available habitat surface, the amount and type of food resources (which in turn are affected by water quality, salinity, hydrodynamic regime, sediment, soil texture and moisture), and the configuration of particular sites affected the number and species of waterbirds present (Hill et al. 1993). In the same way, proximity to suitable habitat is essential as high-water roost and additional feeding grounds, also contributing to the maintenance of high densities of foraging waders on mudflats (Masero et al. 2000).

At the scale of an entire freshwater wetland, a clear change in waterbird population was observed along a habitat gradient related to available surface area, habitat heterogeneity and food resources (Goss-Custard et al. 1995). Most waders (benthivores) were present during summer because of the presence of extensive mudflats, cultivated fields in surrounding areas, and a high benthic biomass (see Long and Ralph 2001). In contrast, geese and wigeons (herbivores), teal and gadwall were concentrated mainly during winter due to their migratory habits (see Kushlan 1993). Such groups of waterbirds may be considered as "wetland bioindicators" for an accurate assessment of the health of a particular wetland (Green 1995). In summary, the differences among waterbird populations at selected sites was related to their position along freshwater gradients, habitat type, shape and suitability and human land use in the vicinity (Ericia et al. 2005; Fig. 3, Table 2).

Due to monotonous reed vegetation, lack of inland roosts and available feeding grounds, sites 1 (upstream), 2 (downstrem) and 4 (recreation spot), offered the least interesting foraging and resting habitats for both herbivores and benthivores. On the other hand, large mudflats, exposed muddy islands and open shores at Sites 3, 6 and 7 provided ideal refuge and resting place for high numbers of waders during summer. Along with waders, the most heterogeneous mudflats and muddy banks hosted the most diverse assemblages of large waterbirds, including storks, flamingoes, herons, egrets, spoonbills, and pelicans. These findings agree well with the work of Ericia et al. (2005) in Lower Zeeschelde of the East Atlantic Region and of Demetrio et al. (2005) in fragmented wetlands of southern Brazil.

SEASONALITY

During our study, some species showed very distinct winter and/or migration peaks, but others exhibited a variable seasonal pattern according to winter severity. Varied winter effects were noticed during the study period for ducks like wigeon, Common Teal, pintail and Gargeny. In addition, the higher numbers of waders and large birds at the onset of summer could be related to the low water depth and the availability of exposed islands, which could be refuges (Appendix I). Such open muddy islands might serve as sites of population overflow when numbers are high (Melftofte et al. 1994). Seasonality and response to the above-mentioned factors differed greatly for all sites; sites were important at specific times and/or for different functions among resident as well as migrant species.

In the case of dominant species, our investigation revealed that certain species, such as flamingo, reached peak numbers during one

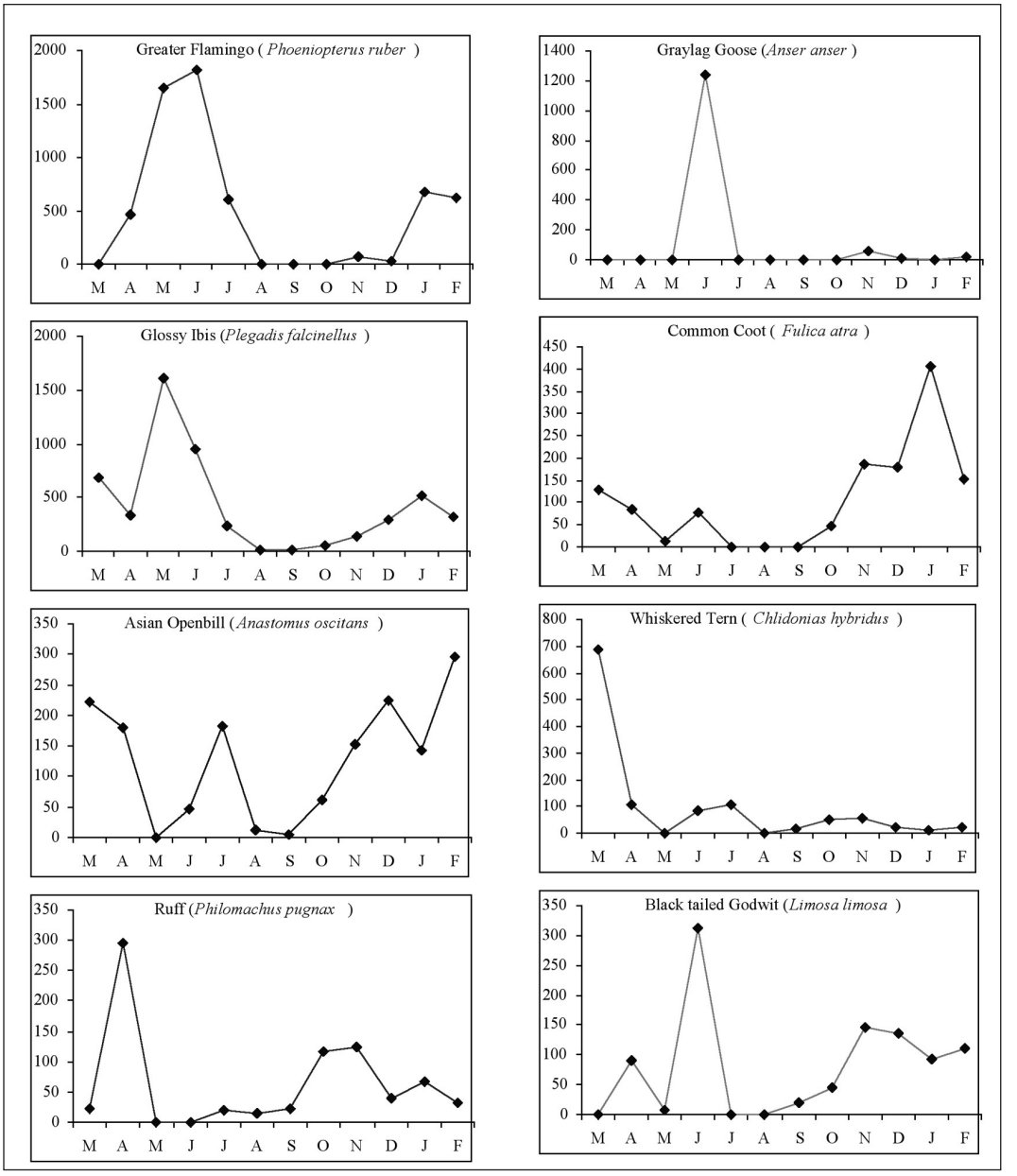

FIGURE 4a. Population flux of dominant waterbirds at NLBS by month.

season (summer) to then diminish gradually in the next season (winter). Similar observations have been made elsewhere, e.g. in the High Andes wetlands of South America (Virginia and Bonaventura 2002), the Tugas Estuary of Portugal (Susana et al. 2003), in the Mississippi Delta (King and Werner 2001), and in the fragmented wetlands of southern Brazil (Demetrio et al. 2005).

FINAL THOUGHTS

Nal Lake Bird Sanctuary, a Wetland of International Importance, has recently been

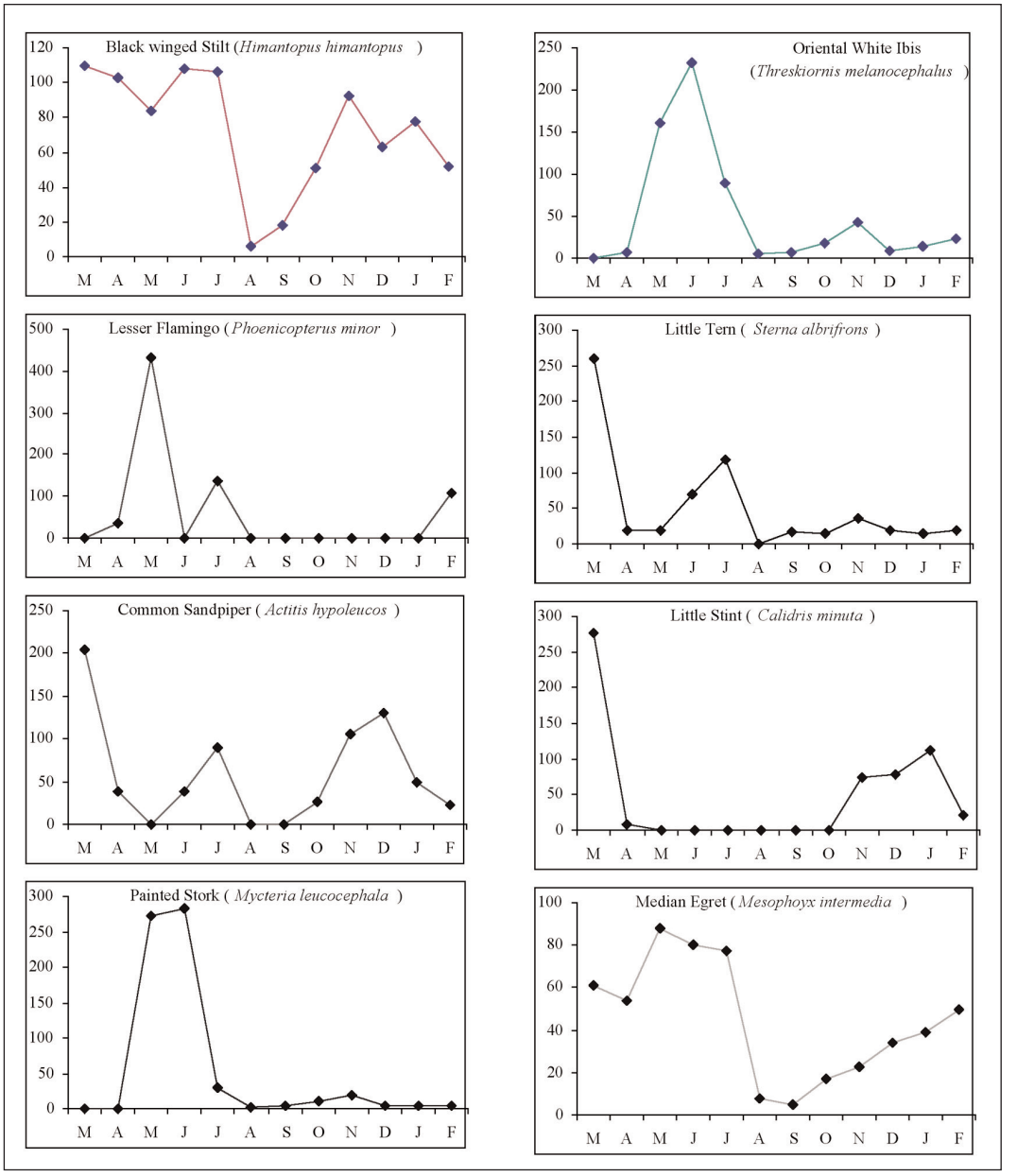

FIGURE 4b. Annual population flux of dominant waterbirds at NLBS by month; the y-axis is average numbers.

proposed as a Ramsar Site on the basis of its internationally important populations of migratory birds, numbering in the millions (GSFD 2004). Our study was carried out in a single annual cycle, a fact that could raise questions about the generality of the patterns found. The patterns exhibited during the present investigation, however, are strong and consistent with other studies in Rio Grande do Sul (see Accordi 2003). The turnover between winter and summer migrants resulted in small seasonal variations in the number of species, but drastic declines during monsoon (Colwell and Codington 1995). In addition, the huge

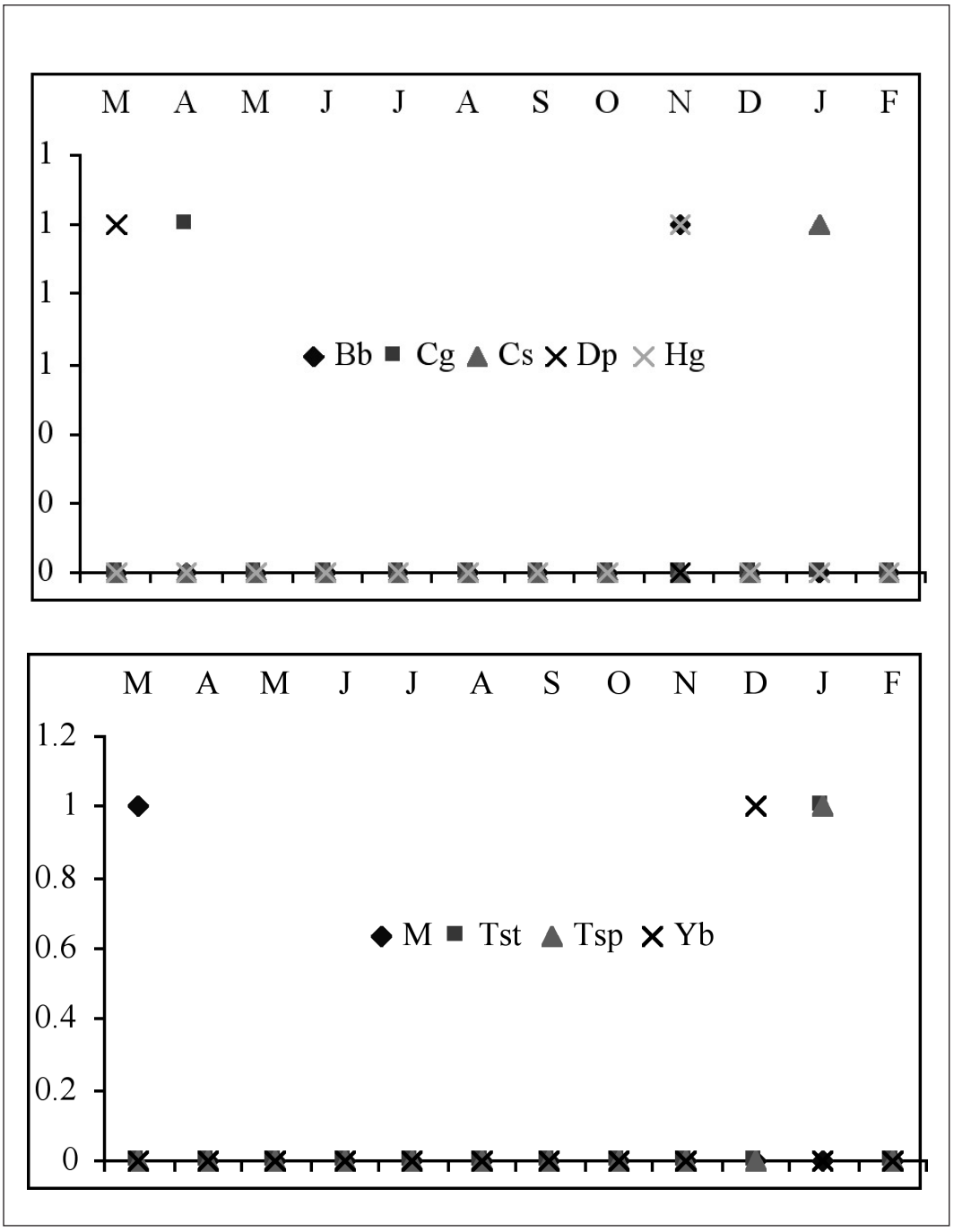

FIGURE 5. Annual population flux of rare waterbirds at NLBS by month; the y-axis is average numbers. Bb: Black Bittern (*Ixobrychus flavicollis*), Cg: Common Greenshank (*Tringa nebularia*), Cs: Curlew Sandpiper (*Calidris ferruginea*), Dp: Dalmatian Pelican (*Pelicanus crispus*), Hg: Heuglin's Gull (*Larus heuglini*), M: Mallard (*Anas platyrhynchos*), Tst: Temminck's Stint (*Calidris temminckii*), Tsp: Terek Sandpiper (*Xenus cinereus*), Yb: Yellow Bittern (*Ixobrychus sinensis*).

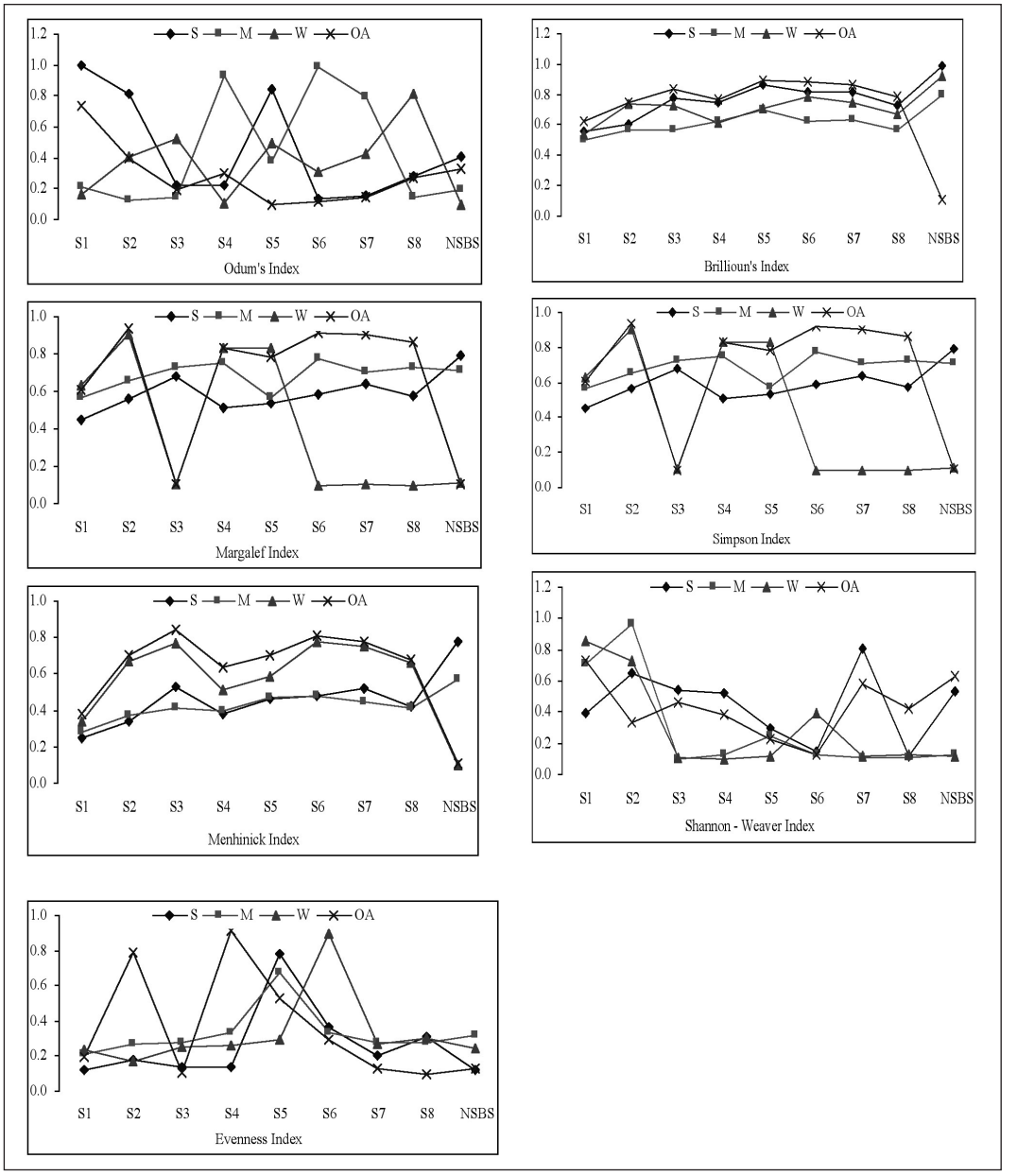

FIGURE 6. The variation in site-specific diversity indices among seasons at NLBS.

wintering aggregations we saw are commonplace in waterbird communities in temperate regions (Kershaw and Cranswick 2003).

Several factors other than area have been associated with the richness and abundance of waterbirds, such as physico-chemical conditions, food resources, vegetation cover and interspersion, and habitat and landscape configuration (Caziani et al. 2001, Stickney et al. 2002). Also contributing are the regional pool of species (Telleria et al. 2003), their particular abundance of range patterns (Murray et al. 1999), the site and landscape structures (especially the area: Fairbairn and Dinsmore

2001), the presence of core refuges (Guillemain et al. 2002), and the influence of the surrounding physiographic matrix (Czech and Parsons 2002). All these factors are probably involved in the species gradients found at NLBS and therefore deserve further attention. Therefore, we suggest that working toward a landscape and trans-boundary perspective is essential for building sound management strategies for waterbird assemblages at NLBS (Erwin 2002).

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APPENDIX I. Aquatic birds found during different seasons at NLBS, Gujarat, India.

				Summer					Monsoon					Winter				
Groups / Common Name	Family / Species	MS	PS	F	A	MA	D	MD	F	A	MA	D	MD	F	A	MA	D	MD
GREBES*	*PODICIPEDIDAE*																	
Great crested grebe	Podiceps cristatus	2	R	0	0	0	0	0	0	0	0	0	0	1	2	1	10	3
Little grebe	Tachybaptus ruficollis	1	C	12	110	28	561	140	17	48	12	245	61	29	118	30	602	151
Pelicans*	Pelecanidae																	
Dalmatian pelican	Pelecanus crispus	2	R	1	1	0	5	1	0	0	0	0	0	0	0	0	0	0
Great white pelican	Pelecanus onocrotalus	2	R	0	0	0	0	0	0	0	0	0	0	4	22	6	112	28
Cormorants#	Phalacrocoracidae																	
Great cormorant	Phalacrocorax carbo	1	R	1	0	0	0	0	1	8	2	41	10	0	0	0	0	0
Indian cormorant	Phalacrocorax fuscicollis	1	C	20	141	35	719	180	22	71	18	362	91	31	194	49	990	247
Little cormorant	Phalacrocorax niger	1	C	26	223	56	1138	284	25	89	22	454	114	32	169	42	862	216
Herons#, Egrets#, Bitterns#	Ardeidae																	
Grey heron	Ardea cinerea	1	C	32	77	19	393	98	24	38	10	194	48	31	61	15	311	78
Purple heron	Ardea purpurea	1	C	31	77	19	393	98	23	45	11	230	57	31	59	15	301	75
Indian pond heron	Ardeola grayii	1	C	30	159	40	811	203	26	78	20	398	99	32	81	20	413	103
Little green heron	Butorides srtiatus	1	R	0	0	0	0	0	2	2	1	10	3	6	6	2	31	8
Black crowned night heron	Nycticorax nycticorax	1	R	1	9	2	46	11	2	7	2	36	9	10	20	5	102	26
Cattle egret	Bubulcus ibis	1	C	23	69	17	352	88	21	42	11	214	54	28	59	15	301	75
Large egret	Casmerodius albus	1	C	28	117	29	546	136	22	28	7	143	36	20	22	6	112	28
Little egret	Egretta garzetta	1	C	32	282	71	1439	360	24	75	19	383	96	31	86	22	439	110
Western reef egret	Egretta gularis	1	R	1	1	0	5	1	0	0	0	0	0	3	3	1	15	4
Median egret	Mesophoyx intermedia	1	C	32	283	71	1444	361	25	107	27	546	136	32	146	37	745	186
Black bittern	Ixobrychus flavicollis	2	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Yellow bittern	Ixobrychus sinensis	1	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Storks#	Ciconiidae																	
Asian openbill	Anastomus oscitans	1	A	11	450	113	2296	574	23	260	65	1327	332	28	814	204	4153	1038
European white stork	Ciconia ciconia	2	R	1	1	0	5	1	0	0	0	0	0	1	1	0	5	1
White necked stork	Ciconia episcopus	1	R	3	5	1	26	6	8	15	4	77	19	14	18	5	92	23
Painted stork	Mycteria leucocephala	1	C	16	554	139	2872	718	21	47	12	240	60	19	35	9	179	45
Ibises#, Spoonbill#	Threskiornithidae																	
Black ibis	Pseudibis papillosa	1	C	9	37	9	189	47	12	37	9	189	47	19	50	13	255	64
Glossy ibis	Pegaldis falcinellus	1	A	26	3571	893	18219	4555	24	306	77	1561	390	32	1279	320	6526	1631
Oriental white ibis	Threskiornis melanocephalus	1	C	17	400	100	2041	510	22	119	30	607	152	30	90	23	459	115
Eurasian spoonbill	Platalea leucorodia	1	C	6	79	20	403	101	2	5	1	26	6	18	47	12	240	60

APPENDIX I. Continued.

Groups / Common Name	Family / Species	MS	PS	Summer					Monsoon					Winter				
				F	A	MA	D	MD	F	A	MA	D	MD	F	A	MA	D	MD
FLAMINGOS#	*PHOENICOPTERIDAE*																	
Lesser flamingo	*Phoenicopterus minor*	2	C	5	469	117	2393	598	3	137	34	699	175	1	109	27	556	139
Greater flamingo	*Phoenicopterus ruber*	2	A	9	3941	98	5201	07 5027	3	609	152	3107	777	17	1392	348	7102	1776
GEESE**, DUCKS*	*ANATIDAE*																	
Gray lag goose	*Anser anser*	2	A	3	1237	309	6311	1578	0	0	0	0	0	5	89	22	454	114
Northern pintail	*Anas acuta*	2	C	1	19	5	97	24	5	22	6	112	28	26	208	52	1061	265
Northern shoveler	*Anas clypeata*	2	C	1	11	3	56	14	5	48	12	245	61	21	114	29	582	145
Common teal	*Anas crecca*	2	C	1	136	34	694	173	0	0	0	0	0	18	124	31	633	158
Eurasian wigeon	*Anas penelope*	2	C	0	0	0	0	0	0	0	0	0	0	24	160	40	816	204
Mallard	*Anas platyrhyncos*	2	R	1	1	0	5	1	0	0	0	0	0	0	0	0	0	0
Spot billed duck	*Anas poecilorhyncha*	1	C	6	68	17	347	87	10	27	7	138	34	16	63	16	321	80
Gargeny	*Anas querquedula*	2	C	5	265	66	1352	338	5	18	5	92	23	23	235	59	1199	300
Gadwall	*Anas strepera*	2	C	2	38	10	194	48	0	0	0	0	0	25	282	71	1439	360
Common pochard	*Aythya ferina*	2	C	3	48	12	245	61	4	21	5	107	27	24	158	40	806	202
Tufted pochard	*Aythya fuligula*	2	R	0	0	0	0	0	0	0	0	0	0	3	9	2	46	11
Ferruginous pochard	*Aythya nyroca*	2	R	0	0	0	0	0	0	0	0	0	0	2	18	5	92	23
Lesser whistling duck	*Dendrocygna javanica*	1	C	1	2	1	10	3	8	118	30	602	151	14	46	12	235	59
Cotton teal	*Nettapus coromandelianus*	1	C	12	75	19	383	96	4	17	4	87	22	25	132	33	673	168
Red crested pochard	*Rhodonessa rufina*	2	R	0	0	0	0	0	0	0	0	0	0	1	2	1	10	3
Comb duck	*Sarkidiornis melantos*	1	C	1	8	2	41	10	7	45	11	230	57	17	118	30	602	151
Ruddy shelduck	*Tadorna ferruginea*	2	R	3	10	3	51	13	0	0	0	0	0	4	34	9	173	43
CRANES#	*GRUIDAE*																	
Sarus crane	*Grus antigone*	1	C	5	77	19	393	98	4	6	2	31	8	7	19	5	97	24
Common crane	*Grus leucogeranus*	2	C	2	153	38	781	195	9	54	14	276	69	13	93	23	474	119
Demoiselle crane	*Grus virgo*	2	C	0	0	0	0	0	9	56	14	286	71	10	195	49	995	249
RAILS#, GALLINULES, COOT**	*RALLIDAE*																	
Brown crake	*Amaurornis akool*	1	R	4	5	1	26	6	1	1	0	5	1	5	5	1	26	6
Baillon's crake	*Porzana pusilla*	2	R	0	0	0	0	0	0	0	0	0	0	4	4	1	20	5
White breasted water hen	*Amaurornis phoenicurus*	1	R	2	2	1	10	3	14	22	6	112	28	15	22	6	112	28
Ruddy breasted crake	*Gallicrex cineria*	1	R	0	0	0	0	0	1	1	0	5	1	2	2	1	10	3
Indian moorhen	*Gallinula chloropus*	1	C	4	26	7	133	33	12	37	9	189	47	13	44	11	224	56
Purple swamphen	*Porphyrio porphyrio*	1	C	23	295	74	1505	376	16	101	25	515	129	21	116	29	592	148
Common coot	*Fulica atra*	2	A	17	305	76	1556	389	6	47	12	240	60	28	924	231	4714	1179

APPENDIX I. Continued.

Groups / Common Name	Family / Species	MS	PS	Summer					Monsoon					Winter				
				F	A	MA	D	MD	F	A	MA	D	MD	F	A	MA	D	MD
JACANAS*	*JACANIDAE*																	
Pheasant tailed jacana	*Hydrophasianus chirurgus*	1	C	11	98	25	515	129	17	55	14	281	70	26	175	44	893	223
Shorebirds - Waders 1#	*Burhinidae*																	
Great thick knee	*Esacus recurvirostris*	1	R	1	1	0	5	1	0	0	0	0	0	2	2	1	10	3
SHOREBIRDS - WADERS 2#	*CHARADRIIDAE*																	
Red wattled lapwing	*Vanellus indicus*	1	C	32	221	55	1128	282	24	118	30	602	151	28	62	16	316	79
White tailed lapwing	*Vanellus leucurus*	2	R	2	6	2	31	8	0	0	0	0	0	6	13	3	66	17
Yellow wattled lapwing	*Vanellus malarbaricus*	1	R	0	0	0	0	0	13	23	6	117	29	8	10	3	51	13
Kentish plover	*Charadrius alexandrinus*	2	R	0	0	0	0	0	0	0	0	0	0	5	8	2	41	10
Little ringed plover	*Charadrius dubius*	2	C	5	168	42	857	214	0	0	0	0	0	8	59	15	301	75
Common ringed plover	*Charadrius hiaticula*	2	R	1	2	1	10	3	0	0	0	0	0	0	0	0	0	0
Greater sand plover	*Charadrius leschenaultii*	2	R	0	0	0	0	0	0	0	0	0	0	1	3	1	15	4
Pacific golden plover	*Pluvialis fulva*	2	R	0	0	0	0	0	0	0	0	0	0	2	12	3	61	15
Black winged stilt	*Himantopus himantopus*	1	C	32	405	101	2066	517	25	181	45	923	231	32	285	71	1454	364
Avocet	*Recurvirostra avosetta*	2	R	1	21	5	107	27	0	0	0	0	0	1	1	0	5	1
SHOREBIRDS - WADERS 3#	*GLAREOLIDAE*																	
Small pratincole	*Glareola lactea*	1	C	4	49	12	250	63	0	0	0	0	0	2	86	22	439	110
Oriental pratincole	*Glareola maldivarum*	1	R	10	57	14	291	73	0	0	0	0	0	2	21	5	107	27
SHOREBIRDS - WADERS 4#	*ROSTRATULIDAE*																	
Pintail snipe	*Capella stenura*	2	R	0	0	0	0	0	0	0	0	0	0	2	5	1	26	6
Common snipe	*Gallinago gallinago*	2	C	4	113	28	577	144	0	0	0	0	0	17	152	38	776	194
Greater painted snipe	*Rostratula benghalensis*	1	R	0	0	0	0	0	1	1	0	5	1	1	1	0	5	1
SHOREBIRDS - WADERS 5#	*SCOLOPACIADAE*																	
Common sandpiper	*Actitis hypoleucos*	2	C	13	282	71	1439	360	12	115	29	587	147	28	308	77	1571	393
Curlew sandpiper	*Calidris ferruginea*	2	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Wood sandpiper	*Tringa glareola*	2	C	12	133	33	679	170	16	110	28	561	140	30	171	43	872	218
Marsh sandpiper	*Tringa stagnatilis*	2	R	0	0	0	0	0	0	0	0	0	0	14	31	8	158	40
Terek sandpiper	*Xenus cinereus*	2	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Little stint	*Calidris minuta*	2	C	5	285	71	1454	364	0	0	0	0	0	28	286	72	1459	365
Temminck's stint	*Calidris temminckii*	2	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Spotted redshank	*Tringa erythropus*	2	C	3	59	15	301	75	0	0	0	0	0	13	45	11	230	57
Common greenshank	*Tringa nebularia*	2	R	2	1	0	5	1	0	0	0	0	0	0	0	0	0	0
Common redshank	*Tringa totanus*	2	R	7	82	21	10	3	0	0	0	0	0	4	5	1	26	6

APPENDIX I. Continued.

Groups / Common Name	Family / Species	MS	PS	Summer					Monsoon					Winter				
				F	A	MA	D	MD	F	A	MA	D	MD	F	A	MA	D	MD
Bar tailed godwit	*Limosa lapponica*	2	R	7	105	26	0	0	0	0	0	0	0	1	3	1	15	4
Black tailed godwit	*Limosa limosa*	2	A	11	411	103	2832	708	14	64	16	327	82	32	485	121	2474	619
Eurasian curlew	*Numenius arquata*	2	R	8	15	4	0	0	1	3	1	15	4	14	26	7	133	33
Whimbrel	*Numenius phaeopus*	2	R	8	22	6	0	0	0	0	0	0	0	3	3	1	15	4
Ruddy turnstone	*Arenaria interpres*	2	R	7	46	12	61	15	0	0	0	0	0	1	1	0	5	1
Dunlin	*Calidris alpina*	2	R	0	0	0	0	0	0	0	0	0	0	1	4	1	20	5
Great knot	*Calidris tenuirostris*	2	C	6	176	44	898	224	0	0	0	0	0	0	0	0	0	0
Ruff	*Philomachus pugnax*	2	A	11	317	79	4801	1200	18	173	43	883	221	20	266	67	1357	339
GULLS#, TERNS#	*LARIDAE*																	
Brown headed gull	*Larus brunnicephalus*	2	C	3	7	2	36	9	0	0	0	0	0	23	200	50	1020	255
Yellow legged gull	*Larus cachinnans*	2	R	0	0	0	0	0	0	0	0	0	0	2	2	1	10	3
Lesser black backed gull	*Larus fuscus*	2	R	1	2	1	10	3	0	0	0	0	0	17	25	6	128	32
Great black backed gull	*Larus marinus*	2	R	1	1	0	5	1	0	0	0	0	0	4	4	1	20	5
Heuglin's gull	*Larus heuglini*	2	R	0	0	0	0	0	0	0	0	0	0	1	1	0	5	1
Black headed gull	*Larus ridibundus*	2	R	1	1	0	5	1	0	0	0	0	0	16	25	6	128	32
Whiskered tern	*Chlidonias hybridus*	2	A	12	880	220	4490	1122	18	174	44	888	222	30	109	27	556	139
White winged black tern	*Chlidonias luecopterus*	2	R	0	0	0	0	0	0	0	0	0	0	1	2	1	10	3
Gull billed tern	*Gelochelidon nilotica*	2	C	4	16	4	82	20	14	29	7	148	37	30	56	14	286	71
Black bellied tern	*Sterna acuticauda*	1	C	9	114	29	117	29	0	0	0	0	0	11	95	24	485	121
Little tern	*Sterna albifrons*	2	C	20	365	91	1862	466	20	148	37	755	189	31	89	22	454	114
River tern	*Sterna aurantia*	1	C	15	33	8	168	42	25	56	14	286	71	32	57	14	291	73
Caspian tern	*Sterna caspia*	2	R	1	2	1	10	3	0	0	0	0	0	1	1	0	5	1
Common tern	*Sterna hirundo*	2	C	10	134	34	684	171	12	22	6	112	28	17	28	7	143	36
WAGTAILS#	*MOTACILLIDAE*																	
White wagtail	*Motacilla alba*	2	C	5	7	2	36	9	16	56	14	286	71	31	88	22	449	112
Grey wagtail	*Motacilla cinerea*	2	R	5	23	6	117	29	9	24	6	122	31	20	38	10	194	48
Citrine wagtail	*Motacilla citreola*	2	C	15	101	25	515	129	16	46	12	235	59	32	80	20	408	102
Yellow wagtail	*Motacilla flava*	2	C	15	130	33	663	166	15	75	19	383	96	32	95	24	485	121

MS - Migratory status; PS - Population status; F - Frequency; A - Abundance; MA - Mean abundance; D - Density; MD - Mean density;
* = Waterbirds; ** = Waterfowl; # = Water-dependant birds

Bird Populations 8:21-25

CHANGES IN THE SEASONAL ABUNDANCE OF GREATER YELLOWLEGS AT TOTTEN INLET, WASHINGTON[1]

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Abstract. The Greater Yellowlegs (*Tringa melanoleuca*) is a relatively common and widespread shorebird along the North American Pacific Flyway. In two distinct study periods, 1980 to 1989 and 1999 to 2007, Greater Yellowlegs at Totten Inlet, Washington, were counted during 563 visits to the site in spring, autumn and winter. Mean abundance of the species declined between the two study periods in all seasons. During the same time periods, Christmas Bird Count data indicated that Greater Yellowlegs abundance in winter increased in British Columbia, Washington, Oregon and California. The escapement of chum salmon (*Oncorhynchus keta*) has increased at Totten Inlet over the last 20 years, and a testable hypothesis is that more abundant salmon has altered the availability of aquatic prey of the Greater Yellowlegs.

Key words: Greater Yellowlegs, local population decline, prey availability, *Tringa melanoleuca*, trophic competition, Washington.

CAMBIOS EN LA ABUNDANCIA ESTACIONAL DEL ARCHIBEBE PATIGUALDO GRANDE EN TOTTEN INLET, WASHINGTON

Resumen. El archibebe patigualdo grande (*Tringa melanoleuca*) es un ave costera relativamente común y ampliamente distribuida a lo largo de la ruta migratoria del Pacífico de Norteamérica. En dos distintos periodos de estudio, 1980 a 1989 y 1999 a 2007, los archibebes patigualdos de Totten Inlet, Washington, fueron contabilizados durante 563 visitas al lugar en primavera, otoño e invierno. La abundancia promedio de la especie declinó entre los los periodos de estudio en todas las estaciones. Durante los mismos periodos, datos del Conteo de Navidad indicaron que la abundancia del archibebe patigualdo en invierno aumentó en British Columbia, Washington, Oregon y California. Las escapadas de salmón chum (*Oncorhynchus keta*) ha aumentado en Totten Inlet durante los últimos 20 años, y una hipótesis testable es que el aumento de los salmones ha alterado la disponibilidad de presas acuáticas del archibebe patigualdo.

Palabras clave: Tringa melanoleuca, archibebe patigualdo grande, declive poblacional local, Washington, disponibilidad de presas, competición trófica.

INTRODUCTION

The Greater Yellowlegs (*Tringa melanoleuca*) is a relatively common and widespread shorebird in the North American Pacific Flyway (Elphick and Tibbitts 1998). Range wide, the status of this species is not well understood, but may be stable (Morrison et al. 2006). During winter it occurs north to coastal portions of Oregon, Washington and southern British Columbia (Elphick and Tibbitts 1998), where it is most

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often found in protected estuaries during winter and migration (Campbell et al. 1990, Contreras 2003, Buchanan 2005). Although the species has a broad distribution in the region, aggregations of ≥20 occur at relatively few sites (e.g., Buchanan 1988). In this paper I describe changes in the abundance of this species at one such site, Totten Inlet, in western Washington.

METHODS

Monitoring of Greater Yellowlegs abundance was conducted at Totten Inlet, a small estuary in southern Puget Sound, Washington. Mud flats at the site extend out from the mouths of two small creeks that enter the inlet adjacent to a small marsh (see Brennan et al. 1985). In the early 1980s this site supported one of the largest winter populations of Greater Yellowlegs in the Pacific Northwest (Buchanan 1988), and among the largest aggregations in Puget Sound during migration (Evenson and Buchanan 1997).

As part of an ongoing shorebird monitoring effort, I counted all Greater Yellowlegs present on every visit I made to the site. I regularly visited Totten Inlet between 1980 and 1988, making a combined 133 visits during spring (March and April), autumn (August through October) and winter (December through February). I visited the site 430 times between 1999 and 2007 during the same seasons. The site was visited during mid- and higher phases of the tide cycle when birds foraged along shorelines and were easily observed and counted.

I evaluated whether changes in Greater Yellowlegs abundance occurred at the site in two ways. First, I determined the high count for each season in each year and compared these mean values from 1980 to 1988 with values from 1999 to 2007 using two-sample t-tests. Next, I calculated the mean value of all counts conducted from each season in each of the two study periods and compared these values also with a two-sample t-test.

Trends or changes in abundance at a single site are difficult to evaluate relative to the range-wide status of a species without additional contextual information. For this reason, I used Christmas Bird Count (CBC) data from the winters of 1980-81 to 1988-89 and 1998-99 to 2006-07 to evaluate whether there had been changes in abundance at CBC locations during the same two periods used in my field effort. I used CBC data from locations that had active count efforts throughout both 9-yr study periods (Appendix 1), from count locations in British Columbia (n = 7), Washington (n = 8) and Oregon (n = 5). Greater Yellowlegs had been identified previously as being common in these locations during winter (Buchanan 1988). In addition, I included 33 sites from California that met the active count criterion. Greater Yellowlegs are conspicuous and therefore easily detected, and use species-rich habitats that are targeted during CBC efforts (B. Tweit, pers. comm.). Consequently, I based subsequent analyses on the total numbers of birds observed and did not correct for observer effort because this would have produced index values that likely would have underestimated the abundance of Greater Yellowlegs. In 3% (n = 29) of the count-years (n = 972) a count was not conducted. In these cases I calculated the mean of the counts both two years before and two years after the missing value and used this estimate for subsequent analysis. I calculated the total number of Greater Yellowlegs observed in the CBCs in each state per year and compared mean values for both study periods with two-sample t-tests.

RESULTS

In all seasons, the abundance of Greater Yellowlegs at Totten Inlet declined significantly between the two 9-yr study periods (Table 1). Declines in mean abundance were greater when all counts were used within each season (reductions by factors of 4.7 to 14.2) compared to seasonal high counts only (reductions by factors of 2.9 to 5.4). The greatest decline (reduction by a factor of 14.2) occurred in all counts from autumn migration.

In contrast to the declines at Totten Inlet, CBC data indicated increases throughout the region. Increases in abundance between 1980-81 – 1988-89 and 1999-2000 – 2006-07 were substantial: British Columbia (factor of 2.4), Washington (factor of 1.9), Oregon (factor of 2.7) and California (factor of 1.5) (Table 2).

DISCUSSION

At least three explanations for the local decline of Greater Yellowlegs abundance at Totten Inlet

TABLE 1. Changes in abundance of seasonal high counts and all seasonal counts of Greater Yellowlegs at Totten Inlet, Washington, between 1980-81 – 1988-89 and 1999-2000 – 2006-07.

	1980-81 – 1988-89			1999-2000 – 2006-07					
Comparison	mean	SE	*n*	mean	SE	*n*	*df*	*t*	*P*
Spring high counts	24.9	2.9	7	8.1	2.4	9	14	4.5	0.0005
Spring all counts	13.5	0.8	44	2.9	0.4	136	178	11.9	<0.0001
Autumn high counts	15.7	1.5	6	2.9	1.1	9	13	7.0	<0.0001
Autumn all counts	8.5	0.5	43	0.6	0.2	168	209	17.4	<0.0001
Winter high counts	15.7	2.0	7	5.5	1.9	8	13	3.7	0.0026
Winter all counts	10.2	0.6	46	1.5	0.3	124	168	14.2	<0.0001

TABLE 2. Changes in abundance of Greater Yellowlegs observed in Christmas Bird Counts conducted in British Columbia (n = 7 count locations), Washington (n = 8), Oregon (n = 5) and California (n = 33) in 1980-81 – 1988-89 and 1999-2000 – 2006-07.

	1980-81 – 1988-89			1999-2000 – 2006-07					
Comparison	mean	SE	*n*	mean	SE	*n*	*df*	*t*	*P*
British Columbia	67.7	7.1	9	160.8	15.6	9	16	5.4	<0.0001
Washington	80.3	9.8	9	149.7	17.2	9	16	3.5	0.003
Oregon	70.7	12.8	9	187.7	18.3	9	16	5.2	<0.0001
California	958.3	56.9	9	1412.1	55.1	9	16	5.7	<0.0001

are possible. The first involves a negative numerical response by Greater Yellowlegs to increasing populations of predators. Predators have the ability to influence aspects of the behavior of their prey (e.g., Dierschke 2003), and it has been suggested that the recent recovery of Peregrine Falcon (*Falco peregrinus*) populations has influenced migration behavior and site use patterns of sandpipers along the Pacific coast of North America (Lank et al. 2003, Ydenberg et al. 2004, Pomeroy 2006). Although the abundance of Peregrine Falcons and Bald Eagles (*Haliaeetus leucocephalus*) has increased at Totten Inlet during this study (J. Buchanan, unpubl. data), I believe it is unlikely this is responsible for the decrease in Greater Yellowlegs abundance. The increased presence of Peregrine Falcons and Bald Eagles has occurred region-wide, and an increased effect of predator presence on yellowlegs should have occurred at a number of other sites, and this is not reflected in the CBC data (Table 2) or my own observations at other sites (J. Buchanan, unpubl. data). Also, declines in Greater Yellowlegs abundance were noted in spring and autumn, seasons when Peregrine Falcons and Bald Eagles were virtually absent from Totten Inlet (J. Buchanan, unpubl. data). This indicates that a factor other than predator presence has influenced the changes, at least in those two seasons.

It is also possible that changes in local conditions, such as increased sedimentation, influenced the decreases in Greater Yellowlegs abundance at Totten Inlet. However, beach substrate has not changed in upper Totten Inlet and changes elsewhere in the inlet are minor over the time period involved as this inlet has experienced far less shoreline development than many other areas in Puget Sound (Carrasquero-Verde et al. 2005).

Direct evidence to explain the decreases is lacking and, therefore, I suggest a third possible explanation and present a hypothesis that can be tested to evaluate its potential utility in explaining the changes in Greater Yellowlegs abundance at Totten Inlet. It is related to finding a substantial decrease in abundance of Greater Yellowlegs at Totten Inlet at the same time that increasing trends in the region are indicated by CBC data. Of the eight CBC locations in Washington, none had significant decreases in abundance between the two periods.

I hypothesize that competition for food has increased between yellowlegs and salmon. Over a period from the early 1980s to the early 2000s,

the escapement of chum salmon (*Oncorhynchus keta*) increased dramatically at Totten Inlet in response to changes in fisheries management at the site. Mean escapement between 1997 and 2001 was >10 times higher than mean escapement between 1980 and 1984 (Kyle Adicks, pers. comm.). This increased escapement resulted in large numbers of spawned-out salmon carcasses deposited on the tide flats and shores of upper Totten Inlet. This in turn resulted in increases in nutrient levels on the tide flats (Jauquet et al. 2003). Over this same period, the abundance of Black-bellied Plovers (*Pluvialis squatarola*) increased steadily at the site in all seasons, and it has been hypothesized that the increased nutrients produced a greater amount or quality of prey for the plovers (Buchanan 2006). It was noteworthy that whereas escapement biomass of all salmon species, combined, increased at Totten Inlet, increases were not noted at any other sites in Puget Sound that support plovers, nor were there increases in plover abundance elsewhere (Buchanan 2006). In short, changes in abundance of both the plovers and the salmon are apparently unique to Totten Inlet.

Juvenile chum salmon leave freshwater very soon after hatch and move directly to estuarine areas (Pedersen and Williams 2001). This movement occurs between January and July and subsequent residence in estuaries may last up to three months, a longer period than for most other anadromous salmonids (Pearce et al. 1982, Johnson et al. 1997). In these estuaries, juvenile chum salmon feed on epibenthic harpacticoid copepods, gammarid amphipods and aquatic insect larvae (Emmett et al. 1991, Simenstad and Cordell 2000). Food habits of Greater Yellowlegs are not known for most areas but it is likely that they use some of these food items (Elphick and Tibbitts 1998). I hypothesize that the increase in chum salmon abundance at Totten Inlet has resulted in the annual recruitment of a juvenile population that is sufficiently large to effectively reduce resources that directly or indirectly are suitable for Greater Yellowlegs at this site. This hypothesis could be evaluated by determining the abundance of Greater Yellowlegs and their prey in estuaries before and after fisheries management enhancement efforts are put in place.

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APPENDIX 1. Location of Christmas Bird Counts used in the analyses.

British Columbia

Comox, Deep Bay, Ladner, Nanaimo, Vancouver, Victoria, White Rock

California

Bernicia, Centerville, Contra Costa, Del Norte, Hayward-Fremont, Lancaster, Los Angeles, Los Banos, Malibu, Marin County, Mendocino, Monterrey Peninsula, Morro Bay, Moss Landing, Oakland, Oceanside-Vista-Carlsbad, Orange County (coastal), Palo Alto, Palos Verde, Point Reyes Peninsula, Sacramento, Salton Sea (north), Salton Sea (south), San Bernardino Valley, San Diego, San Fernando Valley, San Jose, Santa Barbara, Santa Rosa, Stockton, Thousand Oaks, Ventura, Western Sonoma County

Oregon

Coos Bay, Eugene, Sauvie Island, Tillamook, Yaquina

Washington

Bellingham, Columbia River Estuary, Grays Harbor, Kitsap Peninsula, Leadbetter Point, Olympia, Padilla Bay, Sequim-Dungeness

BIRD POPULATIONS

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REPORTS OF AVIAN MONIOTORING PROGRAMS

INTRODUCTION TO THE REPORTS

The concept of integrated avian population monitoring (Baillie, S.R. 1990. *Ibis* 132:151-166) originated with researchers at the British Trust for Ornithology (BTO) and formed the basis for their many volunteer-based monitoring programs, the annual reports of which have long been reprinted in these pages. The basic idea of integrated monitoring is that the results from some programs complement and inform the interpretation of results from other programs. In particular, monitoring of primary demographic parameters (i.e., vital rates, such as productivity, survival of adults, survival of young) provides information to explain the demographic causes of the changes in population size documented from monitoring programs that provide count data. In the British model, productivity data from the Nest Records and Constant Effort Sites (CES) programs and survival data from the CES and Ringing programs are used to explain count data derived from the Breeding Bird Survey, Waterways Bird Survey, and Waterways Breeding Bird Survey. In the North American model, productivity and survival data from MAPS (Monitoring Avian Productivity and Survivorship) are used to explain data from the North American Breeding Bird Survey (BBS).

Readers of the reports published or reprinted herein are well aware that the bird populations being monitored by these programs change dramatically from year-to-year and over longer time periods, both at relatively smaller (Britain) and larger (United States and southern Canada) spatial scales, and that these annual changes and longer-term trends vary dramatically from region to region. It is this spatial and temporal variation in population trends that provides the template for determining proximate demographic causes of population change. Indeed, one of the greatest strengths of demographic monitoring programs, such as MAPS and the network of CES programs that now extend over most of Europe, is that they provide spatially explicit data on bird populations over truly large scales. Yet our ability to harness this spatial information has heretofore been hindered by lack of appropriate analytical techniques. Recently, however, a collaboration of researchers at the USGS Patuxent Wildlife Research Center and The Institute for Bird Populations are making great strides in developing analytical methods that can provide visualizations of spatial patterns in demographic rates across entire species' ranges, including areas where there are few demographic monitoring stations. Because demographic monitoring data, whether from mist nets or nest records, is always more expensive to obtain than count data, it will always be relatively more sparse compared to count data. Therefore, major advances in our ability to make robust inferences regarding demographic causes of population trends will occur with the creation of joint spatial models through which count data, such as that provided by either the North American or British BBS, can be directly linked with demographic data from MAPS or the CES programs. This is the analytical "grail" that researchers in this field are currently seeking.

The best models in the world, however, are of little use without the monitoring data with which to populate them. Cleary, maintaining

these long-term, large-scale programs is critical, but it is not an easy task in a world of increasingly more limited resources and increasingly greater demand for those resources. And yet, it is exactly this situation that creates the necessity to gather and model these data. We do know that, in general, significantly more species or populations of birds are decreasing than increasing. For the most part, however, we do not know with certainty the extent to which these declines are being driven by processes operating during the breeding *versus* non-breeding season, or, for migratory species, on the breeding *versus* wintering range. Moreover, we do not know with any degree of confidence the extent to which these declines are ultimately being driven by habitat degradation and destruction, or by weather factors and climate change, or, as is most likely, by the interaction between both habitat and climate change. Because rates of both are predicted to increase over the short term at least, there is a great urgency to gather and model truly integrated avian population monitoring data.

A bright spot in all this is that birds are very charismatic organisms and there seems to be an ever increasing number of persons willing to voluntarily contribute the relatively easy-to-collect count data. Without some amount of accompanying demographic data, however, the count data alone will be inadequate to allow determination of the causes of population changes and the formulation of management and conservation strategies to reverse declines. Thus, each of us engaged in demographic monitoring are called on to spend some of our limited time and energy in recruiting and training new folks to continue and expand the important work that we are championing. – David F. DeSante

Bird Populations 8:28-45

THE 1999-2003 SUMMARY OF THE NORTH AMERICAN BREEDING BIRD SURVEY[1]

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Abstract. Data from the North American Breeding Bird Survey were used to estimate continental and regional changes in bird populations for the 5-yr period 1999-2003 and the 2-yr period 2002-2003. These short-term changes were placed in the context of population trends estimated over the 1966-2003 interval. During 1999-2003, 41% of all species exhibited positive trends over the entire survey area, while 64% of all species exhibited positive change between 2002-2003. The continental and regional percentages of species with positive trends were also analyzed for 12 species groups having shared life-history traits. Survey-wide for the entire survey period, grassland birds exhibited the lowest percentage of increasing species (14%), with their sharpest declines occurring in the West during 1999-2003 (10% increasing). During 1999-2003, short-distance migrants experienced significant declines in all regions, where numbers of species with increasing trends ranged from 22% - 34%. Most species fared well during the 2002-2003 period, with 64% ($P < 0.05$) increasing survey-wide. This was primarily a result of increases in the Central and Western BBS regions where 21 of 24 species groups exhibited significant increases in the number of species with positive trends.

Key Words: North American Breeding Bird Survey, population trends, roadside surveys, species group analysis.

RESUMEN DEL CONTEO DE AVES REPRODUCTIVAS (BBS) DE NORTEAMÉRICA DESDE 1999 Y 2003

Resumen. Utilizamos datos del Conteo de Aves Reproductivas (BBS) de Norteamérica para estimar cambios en las poblaciones de aves durante los 5 años entre 1999 y 2003 y los 2 años entre 2002 y 2003. Estos cambios a corto plazo fueron situados en el contexto de las tendencias poblacionales estimadas en el intervalo 1966-2003. Durante 1999-2003, el 41% de las especies mostró tendencias positivas en todo el área del conteo, mientras que 64% de las especies mostró tendencias positivas en el periodo 2002-2003. Los porcentajes de especies con tendencias positivas a nivel regional y continental fueron analizados para 12 grupos de especies que comparten características de historia de vida. Utilizando el periodo total de conteo, las aves de pradera mostraron el porcentaje más bajo de especies con tendencias positivas (14%), con los declives mas fuertes detectados en el occidente entre 1999-2003 (10%). Durante 1999-2003, las migratorias de corta distancia sufrieron declives significativos en todas las regiones, donde los números de especies con tendencias positivas oscilaron entre 22% y 34%. A la mayoría de las especies les fue bien entre 2002 y 2003, con un 64% ($P < 0.05$) mostrando tendencias positivas en todo el conteo. Esto se debe principalmente a los aumentos en las regiones Central y Oeste del BBS, donde 21 de los 24 grupos de especies mostraron aumentos significativos en el número de especies con tendencias positivas.

Palabras clave: Conteo de Aves Reproductoras de Norteamérica, tendencias poblacionales, conteos en carreteras, análisis por grupos de especies.

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INTRODUCTION

Initiated in 1966, the North American Breeding Bird Survey (BBS) is the primary source of standardized population data for breeding birds in the U.S. and Canada. For most avian breeding species in North America, it is the only available source of long-term estimates of population trends and relative abundance at large geographic scales. Implemented by the U.S. Fish and Wildlife Service and Canadian Wildlife Service, the BBS is currently coordinated by the U.S. Geological Survey and Canadian Wildlife Service. This summary presents estimates of population trends continent-wide for 421 bird species [plus four species groups: Western/Clark's grebes (*Aechmophorus clarkii/A. occidentalis*), Willow/Alder flycatchers (*Empidonax traillii/E. alnorum*), and Pacific-slope/Cordilleran flycatchers (*Empidonax difficilis/E. alnorum*), Yellow-bellied/Red-naped/Red-breasted sapsuckers (*Sphyrapicus varius/S. nuchalis/S. ruber*)] over the period 1966-2003. Although these four groups currently consist of taxonomically distinct species, their taxonomic status changed after the BBS was initiated and we were unable to adequately discriminate observations made in areas of sympatry within the BBS database to conduct range-wide species-level analyses. The 5-yr trends, 1999-2003, and 2-yr changes, 2002-2003, are discussed within the context of the long-term patterns. Detailed analyses and discussion of population changes for individual species within specific regions, states, provinces, territories, and physiographic strata are beyond the scope of this summary. Also included in this summary are the continental and regional trends for 12 groups of birds sharing similar life-history traits. Analyses of group trends can provide insight into the broad temporal and geographic patterns of population trends, especially when viewed in the context of previous BBS summaries (Pardieck and Sauer 2000, Peterjohn and Sauer 1993, Peterjohn et al. 1994, Peterjohn et al. 1996).

METHODS

The BBS consists of >4400 active survey routes randomly located across the continental United States and Canada [See the North American Breeding Bird Survey web site (www.pwrc.usgs.gov/bbs/) for maps depicting the approximate locations of these routes]. Since 1996 the number of routes surveyed has remained relatively constant around 3000 routes. A total of 2971 routes were sampled in 1999, 2980 in 2000, 2997 in 2001, 2883 in 2002 and 2968 in 2003.

The BBS methodology is described briefly here; see Robbins et al. (1986) for a detailed description. The BBS is a roadside survey program consisting of 39.4-km (24.5 mi) routes, with stops placed at 0.8-km (0.5 mi) intervals for a total of 50 stops. Routes are randomly established on suitable roads and surveyed once per year during the height of the breeding season (June for most of the U.S. and Canada). At each stop, a skilled amateur or professional ornithologist records all birds seen within a 0.4-km (0.25 mi) radius and every bird heard, during a 3-min point count. For each species, the total number of individuals counted at all stops along a route is used as an index of relative abundance.

ESTIMATION OF POPULATION TREND

Population change was estimated using the route-regression procedure (Geissler and Sauer 1990), modified to use estimating equations instead of linear regression analyses (Link and Sauer 1994). These analyses produce a single composite estimate of population change, or trend, presented as mean percent change per year. These trends are weighted means of linear trends for individual routes. Trends were estimated for the entire survey area and for the Eastern, Central, and Western BBS regions (Bystrak 1981). Alaska, northern Canada (territories and northern portion of most provinces), Newfoundland, and northern Mexico were excluded from the analyses because of insufficient data to estimate long-term trends in these areas.

To assist in the trend-estimate evaluation process, we have incorporated a Trend Quality (TQ) score to identify trends that contain certain deficiencies. TQ is a ranked score ranging from 1 - 3, where a one indicates relatively reliable trend. A TQ-value of 3 indicates trend estimates that contain one or more of the following important deficiencies: (a) very low abundance — regional abundance <0.1 birds/route; or (b) sample is based on <5 routes for the long-term analysis or <3 routes for either subinterval (1966-1979 and 1980-1999) [results of these two subintervals are not provided here but are available on the

North American Breeding Bird Survey Results and Analysis web site – http://www.mbr-pwrc.usgs.gov/bbs/bbs.html]; or c) very imprecise results — a 5%/year change would not be detected over the long term (1966-1999). A TQ-value of 2 identifies trend estimates that contain one of the following deficiencies: (a) low abundance — regional abundance is <1.0 bird/route; (b) fewer than 14 routes included in the long-term analysis; c) imprecise results — results are so imprecise that a 3%/yr change would not be detected over the long term (1966-1999), or d) sub-interval trends (1966-1979 and 1980-1999) are significantly different from each other ($P < 0.05$, based on a z-test), suggesting inconsistency in trend over time. A TQ-value of 1 reflects data with at least 14 samples in the long term, of moderate precision, and of moderate abundance on routes. See the BBS Analysis and Summary Website (http://www.mbr-pwrc.usgs.gov/bbs.html) for additional discussion and rationales for these criteria.

SUMMARIES FOR GROUPS OF SPECIES

We estimate the median percentage of species having increasing populations for each region and time period using the hierarchical models described by Sauer and Link (2002). This procedure provides a group estimate of the proportion of species exhibiting positive trends, incorporating the sampling variation of the component estimates. The summaries are conducted for all species and for groups of species with similar life-history traits. Composition of the species groups are described in Peterjohn and Sauer (1993), but have been revised as per the seventh edition of AOU checklist (AOU 1998).

We note several constraints among the comparisons presented. Data from the intervals are not independent, as the subintervals are contained within the longer interval. Consequently, we did not formally test for differences among intervals, and merely note differences among point estimates. All tests address the null hypothesis that the percentage of increasing species does not differ from 50% within an interval. We consider the result to be significant if the 95% Credible Interval (Bayesian Confidence Interval) does not include 50%. Sample sizes and precision of estimates differ among regions and time periods. Readers are cautioned that the underlying species groups in each guild can differ among regions. For more detailed analyses of species-group results for time periods and regions, see Sauer et al. (2004).

RESULTS

Among the 200 species with significant ($P < 0.05$) trends over the entire survey period, 96 were positive and 104 were negative (Table 1, Appendix 1). Among these significant trends, 79 species had TQ = 1, while 111 species had TQ = 2, and 10 species had TQ = 3.

During 1966-2003, 48% of all species exhibited increasing population trends, while regional percentages scarcely differed (Fig. 1A). During 1999-2003, 41% of all species exhibited positive trends ($P < 0.05$) over the entire survey area. Similar significant results occurred in the Western and Eastern BBS regions for all species during this same time period. In contrast, 64% of all species had increasing trends ($P < 0.05$) during 2002-2003 over the entire survey area, while 66% ($P < 0.05$) and 77% ($P < 0.05$) of all species exhibited increases in the Western and Central regions, respectively.

Grassland birds fared comparatively well during 2002-2003 with increasing trends ranging

TABLE 1. Summary of Trend Quality (TQ) values for 1966-2003. Total number of species trends (N) in each category as well as their significance ($P < 0.05$) and direction are presented. The TQ-values are defined as follows: 1 = reliable, 2 = view with caution, 3 = not reliable.

Trend Quality	N	Number of Significant Trends	Number of Significant Increases	Number of Significant Decreases
1	141	79	34	45
2	241	111	53	58
3	43	10	9	1
Total	425	200	96	104

from 47% in the Eastern region to 92% ($P < 0.05$) survey-wide; percentages in the two longer time periods ranged from 10% ($P < 0.05$) in the Western region to 39% in the central region (Fig. 1B). Although grassland birds did poorly during the 1999-2003 and 1966-2003 intervals, the 5-year percentages were greater than the long-term percentages in all regions except the Western (10% vs. 16%). Moreover during 1999-2003, the number of species with increasing trends was indistinguishable from 50% in the Central region.

Survey-wide, more wetland species have increased over the long-term than not (66%, $P < 0.05$), a result that appears to be driven by increases in the Western (66%, $P < 0.05$) and Central (79%, $P < 0.05$) regions (Fig. 1C). Significantly fewer wetland species exhibited increasing trends during 1999-2003 survey-wide (34%), and only 20% ($P < 0.05$) increased in the Central region. Similar to the long-term, wetland birds appear to have fared well during 2002-2003 with all regional percentages >50%, significantly so in the Western region (79%) and survey-wide (68%).

Scrub/successional species continue to fare poorly over the long-term, with significantly <50% of species exhibiting increasing trends in all regions (Fig. 1D). Survey-wide the 1999-2003 result of 35% ($P < 0.05$) is similar to the long-term percentage, and appears to be driven by declines in the Western region (32%, $P < 0.05$) since percentages in the Eastern and Central BBS regions are indistinguishable from 50%. The 2-year time period appeared more favorable for scrub/successional species in the Western and Central regions where 62% ($P < 0.05$) and 82% ($P < 0.05$) exhibited positive trends, respectively. However, in the Eastern region only 34% ($P < 0.05$) of bird species increased during 2002-2003.

During 1966-2003, woodland bird trends were indistinguishable from 50% in all regions except the Eastern region where 57% were positive ($P < 0.05$; Fig. 1E). Significantly more bird species trends increased in the Western and Central regions during 2002-2003, most likely driving the survey-wide increases that were exhibited; only in the Central region were increasing trends distinguishable from 50% during 1999-2003 (74%, $P < 0.05$).

For the two longer time periods, percentages for urban species were <50% in all regions, but only significantly so for 1966-2003 survey-wide (33%; Fig. 1F). During 2002-2003, results were varied for urban birds. In the Western and Central regions 91% ($P < 0.05$) and 100% ($P < 0.05$) of urban species increased, respectively, while during the same 2-year time period only 21% increased in the Eastern region.

Cavity-nesting birds fared relatively well with no significant decreases observed in any time period or region (Fig 1G). This species group did particularly well in the Western region, where significant increases of 65% and 69% were exhibited during 1966-2003 and 2002-2003, respectively. However, the Central region had the greatest number of increasing species during 2002-2003 (83%, $P < 0.05$).

Significantly more open-cup nesting species exhibited population declines than increases in the Eastern BBS region over the long-term (40%, $P < 0.05$; Fig. 1H). This declining pattern continued into the more recent 5-yr period (39%, $P < 0.05$), but is not evident in 2002-2003 (47%). Percentages in the Western region are similar to those in the Eastern region except for a significant increase in positive trends during the 2-yr time period (70%). However, the greatest increases were evident in the Central region during 2002-2003 (82%, $P < 0.05$).

Short-distance migrants fared poorly over the long-term with only 40% ($P < 0.05$) of species exhibiting positive trends survey-wide, a result that appears to be driven by the Western region where only 36% ($P < 0.05$) of species increased (Fig. 1I). Significantly <50% of species exhibited increasing population trends in all regions during 1999-2003, when percentages ranged from 22% to 35% (all $P < 0.05$); species increased during 2002-2003 in the Western (80%, $P < 0.05$) and Central (78%, $P < 0.05$) regions.

During 1966-2003, increases in permanent residents did not differ significantly from 50% in any region (Fig. 1J). Similar results were exhibited during the 5-yr period except in the Central region where 67% ($P < 0.05$) of species showed positive trends. The Central region increases among permanent residents are even more apparent during 2002-2003, when 89% ($P < 0.05$) exhibited increasing trends, a pattern that appears to be driving the significant survey-wide 2-yr trend.

No significant deviations from 50% were detected among Eastern neotropical migrants

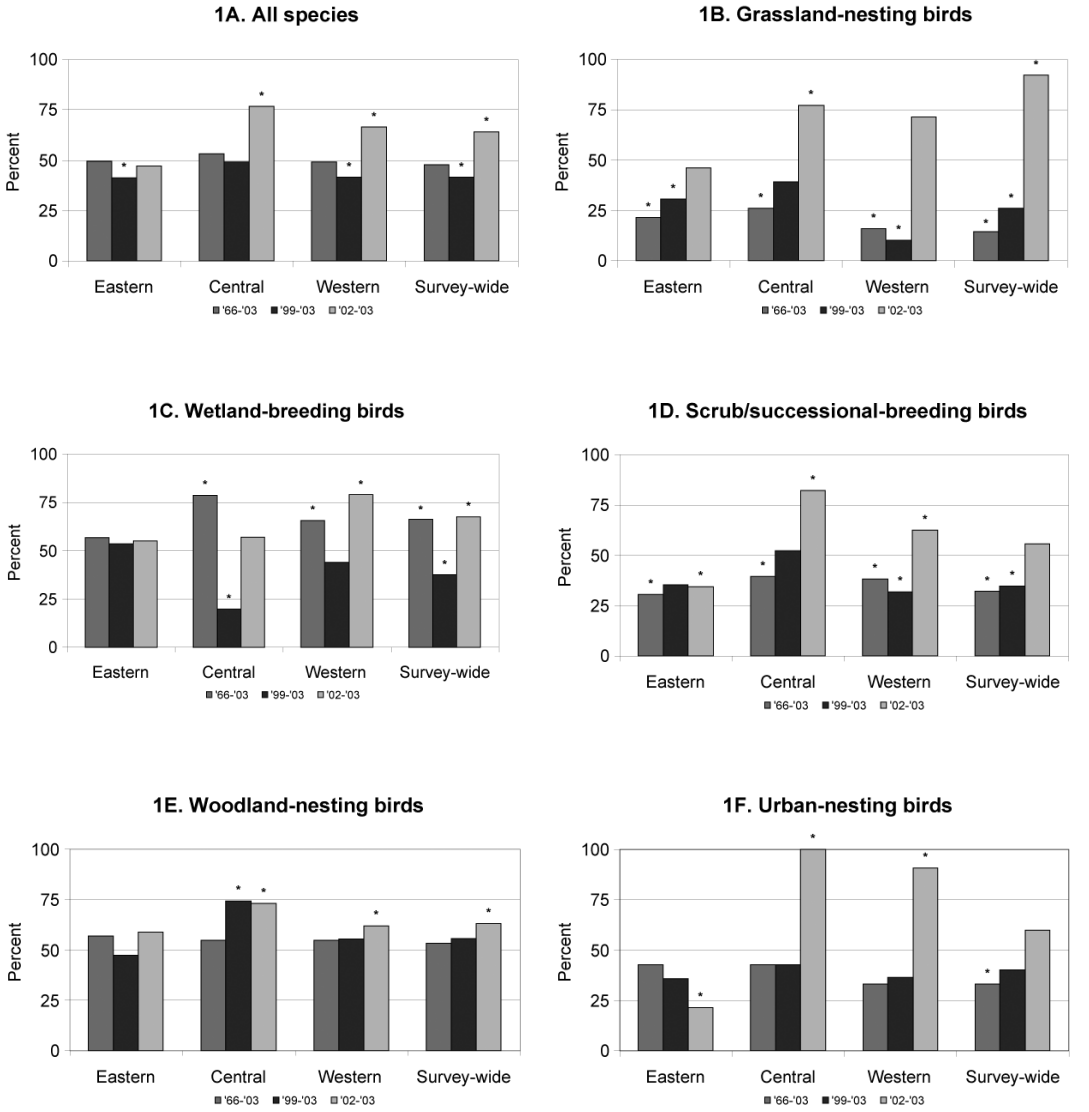
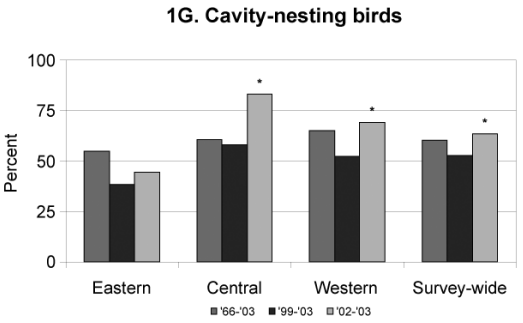
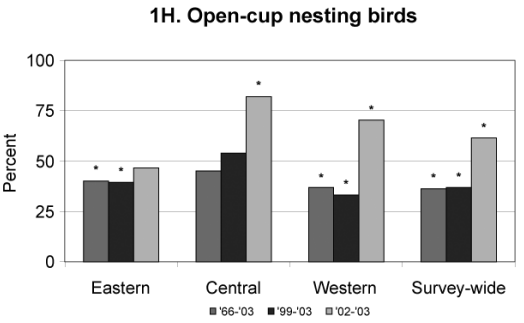
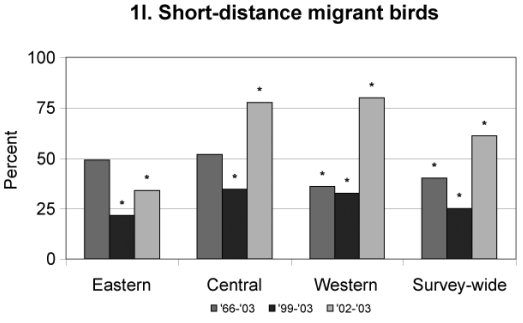
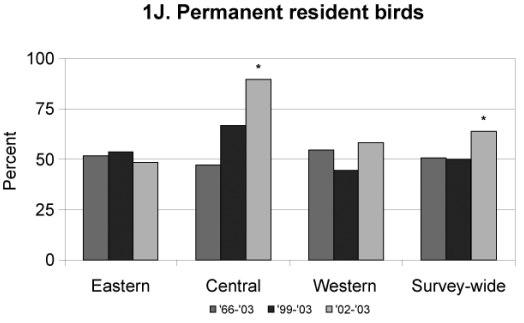


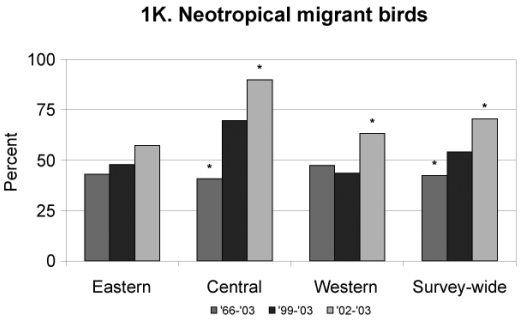
FIGURE 1 (A-M). The percentages of species with increasing populations during 1966-2003, 1999-2003, and 2002-2003, shown by species group. Statistical significance that percentages differ from 50% at the $P < 0.05$ level indicated by *.

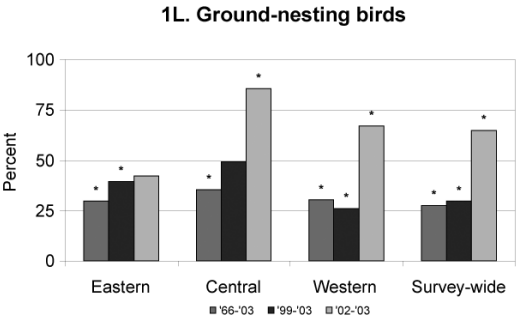












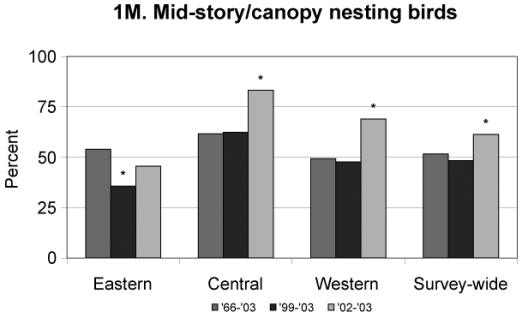


FIGURE 1 (A-M). Continued.

(Fig. 1K) although, survey-wide, more neotropical migrant species had decreasing trends than increasing trends (42%, $P < 0.05$) during 1966-2003, a result seemingly driven by the significant long-term declines in the Central region (41%, $P < 0.05$). Contrary to the long-term results, the 2- and 5-yr percentages are more positive with 70% and 90% (both $P < 0.05$) of species increasing, respectively, in the Central region. Increases are also evident in the Western region during 2002-2003 (63%, $P < 0.05$).

Survey-wide, more ground-nesting species exhibited population declines than increases over the long-term (28%, $P < 0.05$), owing to significant declines in all BBS regions (Fig. 1L). In the East and West, this declining pattern continued into the more recent 5-yr time period, 39% and 26%, respectively (both $P < 0.05$), while in the Central BBS region recent years were more favorable. During 2002-2003, ground-nesting species increased in the Central (86%, $P < 0.05$) and Western (67%, $P < 0.05$) regions, while in the Eastern region the percent increasing was indistinguishable from 50%.

Mid-story and canopy-nesting birds fared relatively well in all regions and time periods, except the Eastern BBS region during 1999-2003 when only 36% ($P < 0.05$) of species were increasing (Fig. 1M). Species in the Central BBS region fared best with significant increases during all time periods ranging from 62% to 83%. In addition, 69% ($P < 0.05$) of species in the Western region experienced increases during 2002-2003, while the longer-term percentages were indistinguishable from 50%.

DISCUSSION

The BBS is not designed to determine causal factors of population changes. Therefore, we were unable to identify specific factors responsible for the various temporal and regional patterns evident in this analysis. Nevertheless, it can be instructive to examine the overall patterns within the context of previous analyses and the long-term trends to determine if general trends are apparent that may provide insight for future research and conservation efforts.

Most species did relatively well during the 2002-2003 period with 64% ($P < 0.05$) increasing survey-wide (Fig. 1A). This was primarily because of increases in the Central and Western BBS regions, where 21 of 24 species groups exhibited significant increases in the number of species with positive trends, while the remaining three groups' percentages did not differ from 50%. These results suggest that conditions favored species in the Central and Western portions of the continent but less so in the Eastern portion during 2002-2003.

The 2002-2003 results are similar to the 1991-1992 Western BBS regional results (Peterjohn et al. 1994) when 9 of 12 species groups exhibited significant increases. As suggested by Peterjohn et al. (1994), El Niño Southern Oscillation (ENSO) may, in part, have driven these results in the West. During ENSO above normal surface water temperatures characterize the eastern Pacific Ocean (Rasmussen and Carpenter 1982, Ropeleweski and Halpert 1986), often leading to extreme weather patterns that have been correlated to land bird population changes (Jaksic and Lazo 1999, Sillett et al. 2000, Nott et al. 2002). ENSO began in 2002 (McPhaden 2004) possibly producing favorable conditions that led to increased numbers of birds detected in the West by 2003. However, other atmospheric phenomena, such as the North Atlantic Oscillation (Nott et al. 2002) and more localized events, are likely influencing bird population changes in North America as well.

As an example of these localized events, the emergence of West Nile virus (WNV) in New York City in 1999 (Nash et al. 2001) and its subsequent spread across North America has been shown to cause avian mortality (Komar et al. 2005; see Kilpatrick et al. 2007 for overview). Moreover, BBS data have been used to correlate observed declines of numerous species with the spread of WNV (LaDeau et al. 2007). Thus, the 2002-2003 declines exhibited in the Eastern BBS region by scrub/successional, short-distance migrant, and urban nesting groups may be related to the presence of WNV in the East. The disease did not become prevalent throughout the West until after 2003 (http://diseasemaps.usgs.gov/2003/us_bird.html). Further research is warranted on the effects of WNV on bird populations at the species level. It is interesting to note that the urban nesting group includes several species, such as Blue Jay (*Cyanocitta cristata*) and House Sparrow (*Passer domesticus*), both of which have high to moderate mortality

rates when exposed to WNV (Komar et al. 2005).

Compared to the previous 5-yr period, 1999-2003 was generally less favorable for most bird species. Survey-wide during 1999-2003, only 41% of all species exhibited increasing trends ($P < 0.05$) as compared to 44% ($P > 0.10$) during 1995-1999. The 1999-2003 declines are driven primarily by losses in the East and West (Fig.1A), although marked declines are also evident for wetland species in the Central BBS region (Fig. 1C).

Among the migration status groups, neotropical migrants and permanent residents fared well during 1999-2003 with no significant declines reported in any region. Moreover, both groups exhibited significant increases during this 5-yr period in the Central BBS region. Short-distance migrants, however, exhibited significantly fewer species with increasing trends (range 22% to 35%) in all BBS regions during 1999-2003. This indicates that conditions for short-distance migrants were considerably poorer during this 5-yr interval in the Eastern and Central regions than in the previous five years. In addition, 1999-2003 percentages are lower than the long-term percentages in all regions.

Despite gains in number of species with increasing trends in every BBS region during 2002-2003, grassland birds continued to fare poorly survey-wide with only 14% ($P < 0.05$) increasing during 1966-2003, and only doing slightly better (26%, $P < 0.05$) in 1999-2003 (Fig. 1B). Thus the declining trend for these species first observed in 1991 (18%; Peterjohn and Sauer 1993) continues a decade later. Moreover, the increases observed in the West during 1995-1999 (49%; Pardieck and Sauer 2000) were overwhelmingly reversed during the next five years when only 10% ($P < 0.05$) of species increased. Grassland birds held their own, statistically speaking, between 1999-2003 (39%, $P > 0.05$) as well as during the previous 5-yr interval (36%, $P > 0.05$) in the Central region. In the East there was a rebound during 1999-2003, with 31% ($P < 0.05$) of species increasing as opposed to 6% in the previous five years.

The sharp decline (26% increasing) observed during 1995-1999 (Pardieck and Sauer 2000) for eastern scrub/successional species is less evident in 1999-2003 (35% increasing), suggesting a more favorable time period for these species in the East. Declines in the 2-yr results suggest this may be a temporary respite. More intriguing is that for the first time since species group's results have been reported, scrub/successional species declined in the West over the long-term as well as during 1999-2005. Hints of this impending decline are apparent in the 1998-1999 results (Pardieck and Sauer 2000).

Eastern neotropical migrants fared relatively well during 1999-2003, when 43% ($P > 0.05$) had increasing trends, offsetting significant declines reported during 1995-1999 (Pardieck and Sauer 2000). Moreover, the 2002-2003 result of 57% ($P > 0.05$) brings this group back in line with a series of relatively positive 2-yr intervals beginning in 1987 (Droege and Sauer 1990, Peterjohn and Sauer 1993, Peterjohn et al. 1994, Peterjohn et al. 1996). Although long-term declines are evident for neotropical migrants in the Central BBS region, both the 5-yr and 2-yr results indicate significant increases in numbers of species with increasing trends. Whether these short-term increases are indicative of a long-term recovery is unclear.

Detailed analyses of regional patterns of population trends within individual species are beyond the scope of this paper. Species-specific trend and relative abundance data, as well as additional information regarding the survey, are available at the USGS Patuxent Wildlife Research Center web page (www.pwrc.usgs.gov).

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APPENDIX 1. Long-term (1966-2003) trends, 5-yr (1999-2003) trends, and 2-yr changes for all species detected on BBS routes, 1966-2003. For the three intervals, we present trends as average % change/yr, statistical significance (*P*) of the changes or trend ($P < 0.05$ is considered significant), and sample size (*n* of routes). For the long-term trends, TQ-values, 95% confidence intervals, and relative abundance (mean number of individuals per BBS route) are also provided. A dash indicates insufficient data to calculate trends. Species names based on AOU (1998).

	1966 - 2003							1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Common Loon	2	2.3	0.00	452	1.5	3.2	0.91	-1.3	0.59	219	10.8	0.47	174
Pied-billed Grebe	2	1.2	0.22	479	-0.7	3.0	0.28	-15.4	0.00	160	19.2	0.15	145
Horned Grebe	2	-3.2	0.03	83	-6.0	-0.4	0.35	-15.8	0.09	22	-0.7	0.97	25
Red-necked Grebe	2	0.8	0.33	75	-0.8	2.3	0.42	7.7	0.26	39	-13.3	0.40	35
Eared Grebe	2	6.8	0.01	130	2.1	11.5	1.04	30.1	0.00	47	95.1	0.14	47
Western/Clark's Grebe	2	1.1	0.02	121	0.2	2.1	0.85	7.9	0.03	53	-7.1	0.84	44
American White Pelican	2	2.9	0.01	172	0.7	5.2	1.93	15.7	0.01	94	6.0	0.66	69
Brown Pelican	1	4.4	0.00	43	2.2	6.6	1.39	-11.3	0.01	24	53.0	0.19	21
Double-crested Cormorant	2	8.8	0.00	467	3.9	13.8	0.72	4.7	0.10	215	27.5	0.18	204
Pelagic Cormorant	3	1.2	0.73	15	-5.6	8.1	0.78	14.1	0.63	3	866.4	0.45	5
Anhinga	2	1.1	0.57	107	-2.7	5.0	0.33	15.6	0.01	42	14.5	0.71	45
American Bittern	2	-1.8	0.02	601	-3.3	-0.3	0.48	-10.1	0.00	191	2.2	0.86	147
Least Bittern	3	-1.7	0.39	39	-5.5	2.1	0.09	9.0	0.58	11	-44.2	0.02	18
Great Blue Heron	2	2.0	0.00	2371	1.4	2.7	0.82	0.7	0.62	1305	-5.9	0.30	1037
Great Egret	1	1.9	0.01	567	0.4	3.4	1.64	2.7	0.36	317	58.1	0.03	269
Snowy Egret	2	4.9	0.00	253	2.4	7.4	0.93	13.7	0.03	101	46.6	0.22	92
Little Blue Heron	1	-2.5	0.03	413	-4.7	-0.2	1.85	-4.8	0.06	181	21.4	0.28	153
Tricolored Heron	1	0.5	0.60	95	-1.5	2.6	1.07	5.7	0.36	40	-3.4	0.92	39
Cattle Egret	2	0.3	0.56	533	-0.7	1.4	13.38	-4.7	0.16	280	13.4	0.36	211
Green Heron	2	-0.9	0.00	1654	-1.4	-0.4	0.71	-3.6	0.05	675	-5.4	0.54	556
Black-crowned Night-Heron	2	4.4	0.03	307	0.5	8.3	0.23	-8.2	0.05	93	73.5	0.00	85
Yellow-crowned Night-Heron	2	-1.4	0.43	175	-4.8	2.0	0.31	-4.2	0.60	33	-5.1	0.80	40
White Ibis	2	4.1	0.02	178	0.6	7.5	5.87	25.2	0.15	97	182.3	0.02	71
Glossy Ibis	3	0.9	0.84	46	-7.3	9.0	0.93	12.8	0.66	14	329.5	0.03	17
White-faced Ibis	3	12.2	0.01	67	3.0	21.4	15.27	10.2	0.60	30	-23.2	0.00	19
Roseate Spoonbill	2	11.0	0.00	29	6.1	15.9	0.79	32.7	0.15	17	689.4	0.02	14
Wood Stork	3	-2.8	0.37	73	-8.8	3.2	1.06	-5.6	0.65	31	288.6	0.22	27
Black Vulture	1	3.0	0.00	620	1.2	4.8	1.82	0.1	0.96	345	29.5	0.06	275
Turkey Vulture	1	1.6	0.00	2132	0.9	2.3	2.49	1.7	0.16	1335	2.7	0.56	1064
Black-bellied Whistling-Duck	2	5.4	0.05	51	0.0	10.8	2.27	-11.6	0.02	30	-25.4	0.03	26
Fulvous Whistling-Duck	3	1.7	0.75	30	-8.5	11.9	1.81	-14.2	0.17	17	100.3	0.45	10
Canada Goose	2	9.6	0.00	1512	6.8	12.4	4.08	5.6	0.14	956	41.6	0.00	734
Mute Swan	3	9.9	0.09	34	-1.0	20.8	0.39	7.8	0.59	15	-8.8	0.41	20
Wood Duck	2	4.6	0.00	1180	3.2	6.0	0.30	0.3	0.92	386	10.5	0.40	390
Gadwall	1	4.7	0.00	434	3.3	6.1	1.89	-4.5	0.16	233	-14.7	0.08	181
American Wigeon	3	17.5	0.25	301	-12.1	47.0	0.85	-7.0	0.03	122	30.9	0.05	101
American Black Duck	2	-0.8	0.51	268	-3.0	1.5	0.27	10.0	0.44	49	144.6	0.22	53
Mallard	2	1.3	0.00	2255	0.5	2.1	5.12	-6.3	0.00	1262	-11.4	0.04	923
Mottled Duck	2	-5.2	0.04	69	-10.1	-0.3	2.31	-1.5	0.77	35	36.6	0.61	30
Blue-winged Teal	1	-0.6	0.29	637	-1.8	0.5	1.74	-2.2	0.45	235	-30.9	0.05	194
Cinnamon Teal	2	-0.8	0.23	242	-2.2	0.5	0.55	-3.8	0.52	75	125.3	0.01	61
Northern Shoveler	1	1.7	0.01	334	0.4	3.1	1.17	-8.9	0.01	147	-6.5	0.74	126
Northern Pintail	1	-2.8	0.00	404	-4.6	-1.1	1.80	-2.9	0.52	121	68.5	0.00	101
Green-winged Teal	3	32.0	0.00	327	23.9	40.1	0.32	-15.2	0.00	98	111.4	0.00	113

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Canvasback	2	-0.9	0.43	131	-3.2	1.3	0.66	9.1	0.08	42	108.9	0.01	44
Redhead	1	2.1	0.04	228	0.1	4.1	1.00	-9.0	0.00	89	-6.4	0.72	63
Ring-necked Duck	2	3.5	0.02	166	0.5	6.5	0.21	-2.1	0.75	62	53.7	0.05	63
Lesser Scaup	1	-0.9	0.29	237	-2.5	0.7	1.85	-12.9	0.00	106	36.4	0.10	79
Bufflehead	2	2.9	0.17	90	-1.3	7.1	0.27	9.2	0.40	38	-7.7	0.77	40
Common Goldeneye	2	1.2	0.56	91	-2.7	5.1	0.18	-6.6	0.33	27	162.6	0.35	28
Barrow's Goldeneye	2	4.4	0.02	49	0.8	8.0	0.31	-8.4	0.53	18	84.7	0.14	21
Hooded Merganser	3	7.2	0.05	108	0.0	14.4	0.03	15.2	0.18	35	105.9	0.14	58
Common Merganser	2	2.0	0.00	369	0.7	3.4	0.24	-0.4	0.92	135	43.6	0.10	142
Red-breasted Merganser	3	-5.8	0.14	19	-12.7	1.2	0.03	--	--	--	--	--	--
Ruddy Duck	2	1.3	0.27	224	-1.0	3.7	0.84	1.1	0.73	103	4.3	0.87	84
Osprey	2	6.5	0.00	425	5.0	7.9	0.18	5.4	0.02	215	15.8	0.20	205
Swallow-tailed Kite	2	3.4	0.01	47	1.1	5.6	0.20	3.7	0.56	27	30.9	0.48	35
White-tailed Kite	2	1.8	0.29	61	-1.5	5.1	0.17	-3.3	0.68	19	-22.5	0.44	14
Mississippi Kite	2	0.0	0.99	183	-2.2	2.2	0.69	1.9	0.66	84	76.8	0.03	84
Bald Eagle	2	6.1	0.00	211	2.2	10.1	0.14	5.7	0.18	103	2.3	0.85	142
Northern Harrier	2	-1.0	0.02	1024	-1.9	-0.1	0.45	-5.4	0.00	382	7.6	0.36	338
Sharp-shinned Hawk	3	4.5	0.06	308	-0.1	9.0	0.02	2.5	0.50	53	21.2	0.19	120
Cooper's Hawk	3	6.7	0.00	528	3.9	9.5	0.04	6.5	0.09	127	-23.5	0.00	253
Northern Goshawk	3	-0.3	0.88	71	-4.1	3.5	0.02	-2.1	0.67	12	46.4	0.22	35
Harris's Hawk	2	-5.6	0.00	43	-8.9	-2.2	0.78	-7.6	0.38	11	113.9	0.10	12
Red-shouldered Hawk	2	2.6	0.00	896	1.5	3.7	0.51	5.2	0.00	461	8.9	0.22	419
Broad-winged Hawk	2	1.8	0.02	744	0.3	3.2	0.13	3.2	0.34	174	5.5	0.75	214
Swainson's Hawk	2	-0.4	0.48	697	-1.5	0.7	0.90	2.8	0.20	334	15.3	0.06	255
Red-tailed Hawk	2	2.6	0.00	2960	2.2	3.0	1.05	-1.0	0.23	1696	1.8	0.63	1316
Ferruginous Hawk	2	2.9	0.01	240	0.8	4.9	0.25	-4.7	0.08	104	22.8	0.21	95
Golden Eagle	2	1.1	0.53	324	-2.2	4.4	0.20	2.5	0.65	99	10.6	0.51	118
Crested Caracara	2	5.4	0.00	58	2.7	8.1	0.99	-3.2	0.65	32	-21.4	0.53	29
American Kestrel	2	-0.5	0.09	2463	-1.0	0.1	0.87	-8.2	0.00	1116	-6.3	0.20	874
Merlin	3	10.6	0.00	128	6.5	14.7	0.05	1.6	0.84	43	-22.5	0.13	56
Peregrine Falcon	3	8.6	0.03	20	3.3	13.9	0.02	--	--	--	53.2	0.20	8
Prairie Falcon	3	1.0	0.56	182	-2.3	4.4	0.09	-5.5	0.44	44	-19.7	0.22	65
Chukar	3	-1.1	0.85	74	-12.6	10.3	0.49	10.8	0.08	34	14.5	0.02	24
Gray Partridge	2	-0.1	0.94	259	-1.8	1.7	0.45	-6.0	0.23	70	33.8	0.17	70
Ring-necked Pheasant	1	-1.0	0.00	1334	-1.5	-0.4	7.14	2.5	0.02	703	20.4	0.00	535
Ruffed Grouse	2	-2.2	0.03	559	-4.3	-0.2	0.33	2.0	0.61	144	-12.5	0.23	157
Sage Grouse	2	0.1	0.97	72	-3.8	4.0	0.77	11.0	0.42	20	246.3	0.20	14
Blue Grouse	2	-2.3	0.00	95	-3.8	-0.8	0.37	13.1	0.25	37	0.7	0.98	44
Sharp-tailed Grouse	2	-1.6	0.17	159	-3.8	0.7	0.56	13.4	0.01	59	12.6	0.68	58
Greater Prairie-Chicken	2	-4.1	0.05	43	-8.0	-0.2	0.73	-2.4	0.80	17	221.2	0.08	15
Wild Turkey	2	13.8	0.00	950	11.3	16.3	0.31	9.4	0.00	576	36.3	0.00	608
Mountain Quail	2	0.9	0.27	142	-0.7	2.4	2.72	10.6	0.00	87	48.0	0.09	67
Scaled Quail	1	-1.5	0.12	153	-3.3	0.4	4.81	-3.1	0.26	79	37.3	0.01	56
California Quail	1	1.0	0.23	328	-0.6	2.7	3.83	8.1	0.00	196	13.8	0.15	145
Gambel's Quail	2	-0.4	0.59	107	-1.8	1.0	6.67	-1.3	0.47	59	28.8	0.02	38
Northern Bobwhite	2	-3.0	0.00	1575	-3.3	-2.7	18.09	-1.8	0.01	945	4.7	0.13	689
Clapper Rail	2	1.0	0.44	47	-1.5	3.6	0.24	4.4	0.28	19	-10.1	0.42	18
King Rail	2	-7.7	0.01	39	-12.6	-2.8	0.22	16.8	0.29	7	-59.3	0.02	10

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Virginia Rail	3	2.2	0.02	99	0.4	4.1	0.03	-23.4	0.00	26	32.7	0.08	43
Sora	2	-0.4	0.51	490	-1.5	0.7	0.85	-21.3	0.00	204	35.6	0.07	172
Purple Gallinule	3	-4.0	0.59	24	-18.1	10.1	0.10	--	--	--	--	--	--
Common Moorhen	2	0.3	0.86	120	-3.1	3.7	0.51	-13.2	0.02	35	91.9	0.25	42
American Coot	1	-0.1	0.90	581	-1.8	1.6	2.15	-15.6	0.00	251	-17.8	0.34	175
Sandhill Crane	1	7.1	0.00	347	4.4	9.8	1.16	4.8	0.11	232	47.4	0.08	192
Killdeer	2	-0.5	0.00	3383	-0.9	-0.2	5.39	-3.9	0.00	2103	1.3	0.63	1530
Mountain Plover	2	-1.9	0.27	43	-5.3	1.4	0.28	-18.8	0.02	15	71.8	0.29	10
Black-necked Stilt	2	0.1	0.96	123	-5.1	5.4	1.82	-3.1	0.81	51	26.8	0.50	53
American Avocet	2	0.7	0.67	230	-2.4	3.8	1.52	-2.5	0.81	80	19.8	0.05	72
Greater Yellowlegs	3	11.7	0.06	20	0.5	22.8	0.28	38.4	0.11	11	211.8	0.29	10
Lesser Yellowlegs	2	-9.3	0.00	32	-13.4	-5.2	0.19	7.9	0.58	5	186.0	0.37	10
Solitary Sandpiper	3	-3.5	0.38	19	-10.8	3.9	0.04	36.1	0.26	8	-1.2	0.98	13
Willet	2	-0.6	0.16	317	-1.5	0.2	1.44	-2.5	0.23	174	-11.6	0.12	124
Spotted Sandpiper	2	-0.6	0.27	985	-1.8	0.5	0.43	1.2	0.51	321	5.4	0.50	304
Upland Sandpiper	2	0.8	0.01	633	0.2	1.5	2.33	0.9	0.60	279	-4.9	0.48	217
Long-billed Curlew	2	-1.8	0.06	250	-3.6	0.1	1.38	4.0	0.14	141	18.0	0.10	108
Marbled Godwit	2	-0.8	0.19	220	-2.1	0.4	2.40	-4.1	0.09	120	2.8	0.80	81
Common Snipe	2	-0.1	0.71	1176	-0.7	0.5	2.34	-4.7	0.00	653	3.4	0.56	444
American Woodcock	3	0.8	0.68	158	-3.0	4.6	0.03	-8.1	0.09	20	-19.2	0.42	35
Wilson's Phalarope	2	0.4	0.63	291	-1.3	2.1	0.95	-2.6	0.54	111	-21.3	0.20	84
Laughing Gull	1	4.0	0.02	129	0.6	7.5	24.51	1.8	0.69	75	26.8	0.43	61
Franklin's Gull	3	8.3	0.19	196	-4.0	20.5	12.17	0.9	0.94	75	106.8	0.17	56
Ring-billed Gull	1	1.8	0.07	690	-0.2	3.8	4.66	7.1	0.18	311	-23.4	0.19	232
California Gull	2	-0.7	0.74	199	-5.0	3.6	3.61	-19.7	0.02	71	-13.5	0.62	54
Herring Gull	1	-3.2	0.00	353	-5.2	-1.3	4.05	10.4	0.22	119	-1.8	0.94	77
Western Gull	2	-0.5	0.85	21	-6.0	4.9	4.33	-7.4	0.13	9	217.7	0.23	8
Glaucous-winged Gull	2	0.2	0.93	40	-4.6	5.1	11.35	-7.4	0.27	15	-41.8	0.03	11
Great Black-backed Gull	1	-2.2	0.05	94	-4.4	0.0	2.35	25.5	0.17	37	-45.8	0.02	24
Gull-billed Tern	3	6.6	0.48	19	-11.1	24.2	0.44	46.5	0.37	10	589.0	0.11	9
Caspian Tern	2	4.4	0.00	89	1.7	7.1	0.16	-2.7	0.18	28	12.3	0.48	34
Royal Tern	2	0.9	0.74	31	-4.5	6.3	0.72	-8.9	0.37	16	24.1	0.35	13
Common Tern	2	-6.2	0.03	114	-11.6	-0.8	0.25	-2.5	0.77	26	-16.5	0.61	22
Forster's Tern	2	0.8	0.31	126	-0.7	2.2	0.33	12.9	0.06	50	10.7	0.52	54
Least Tern	2	-0.8	0.75	63	-5.6	4.1	0.77	-7.9	0.38	22	8.9	0.84	26
Black Tern	2	-1.5	0.30	328	-4.3	1.3	1.81	-4.2	0.39	117	57.7	0.20	94
Black Skimmer	2	-2.3	0.32	33	-6.8	2.2	0.31	-17.5	0.00	11	--	--	--
Rock Dove	2	0.0	0.95	2492	-0.5	0.5	4.86	-1.3	0.35	1373	13.6	0.01	985
Band-tailed Pigeon	1	-2.2	0.01	217	-3.7	-0.6	1.70	-5.4	0.26	112	41.9	0.26	89
Eurasian Collared-Dove	3	37.9	0.00	141	20.9	54.9	0.44	15.0	0.00	134	33.3	0.01	165
White-winged Dove	1	1.1	0.39	128	-1.4	3.5	9.24	3.5	0.35	80	10.5	0.18	70
Mourning Dove	2	-0.2	0.13	3643	-0.4	0.0	27.24	0.7	0.09	2611	7.3	0.00	1848
Inca Dove	2	3.3	0.03	112	0.3	6.3	0.88	-7.6	0.03	72	5.2	0.67	61
Common Ground-Dove	2	-1.2	0.18	220	-3.0	0.5	1.85	1.8	0.42	128	-8.0	0.47	109
Black-billed Cuckoo	2	-1.6	0.00	1181	-2.4	-0.7	0.54	14.6	0.02	295	23.6	0.27	283
Yellow-billed Cuckoo	2	-1.8	0.00	1826	-2.1	-1.5	3.95	1.8	0.04	1014	6.3	0.13	792
Greater Roadrunner	2	0.8	0.41	272	-1.1	2.7	0.54	-7.6	0.16	108	39.9	0.05	104
Groove-billed Ani	3	-3.4	0.66	16	-18.6	11.8	1.10	58.8	0.71	2	353.2	0.29	2

APPENDIX 1. Continued.

	1966 - 2003							1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Barn Owl	3	-2.3	0.48	33	-8.5	3.9	0.03	--	--	--	231.0	0.09	11
Western Screech-Owl	3	-7.2	0.17	18	-16.2	1.8	0.01	--	--	--	-30.4	0.20	7
Eastern Screech-Owl	3	1.9	0.65	121	-6.1	9.9	0.02	--	--	--	21.8	0.54	43
Great Horned Owl	2	-0.1	0.89	1257	-1.1	1.0	0.19	-2.6	0.32	303	28.5	0.03	348
Northern Pygmy-Owl	3	1.6	0.20	61	-0.8	4.0	0.04	45.5	0.02	9	15.7	0.73	25
Burrowing Owl	2	-1.2	0.62	310	-6.0	3.6	0.51	10.9	0.09	85	35.0	0.14	81
Barred Owl	2	2.4	0.00	648	1.0	3.8	0.13	5.6	0.12	192	2.2	0.83	239
Short-eared Owl	2	-4.3	0.01	154	-7.6	-1.1	0.18	-21.7	0.00	24	60.5	0.28	22
Lesser Nighthawk	2	2.4	0.06	132	0.0	4.8	1.86	-0.5	0.90	59	32.7	0.15	47
Common Nighthawk	2	-1.7	0.00	1616	-2.4	-1.1	1.97	0.4	0.71	703	11.9	0.13	573
Common Poorwill	2	1.7	0.42	154	-2.5	6.0	0.13	3.5	0.65	50	76.2	0.03	45
Chuck-will's-widow	1	-1.7	0.00	574	-2.4	-1.0	1.42	-3.2	0.05	285	0.0	1.00	232
Whip-poor-will	2	-2.3	0.00	479	-3.4	-1.2	0.28	-7.9	0.00	126	0.4	0.97	114
Black Swift	3	-7.3	0.11	50	-16.0	1.4	1.31	-18.9	0.09	7	863.9	0.48	9
Chimney Swift	1	-1.5	0.00	2114	-1.9	-1.2	6.15	-0.7	0.39	1310	-4.6	0.29	951
Vaux's Swift	3	3.9	0.38	145	-4.8	12.6	0.47	11.3	0.13	61	167.9	0.35	46
White-throated Swift	2	-1.4	0.39	191	-4.6	1.8	0.89	4.3	0.58	79	6.3	0.64	59
Ruby-throated Hummingbird	2	2.4	0.00	1522	1.7	3.0	0.39	2.6	0.11	779	22.3	0.00	660
Black-chinned Hummingbird	2	1.5	0.05	197	0.0	3.0	0.24	2.5	0.40	92	2.1	0.87	85
Anna's Hummingbird	2	1.7	0.09	143	-0.3	3.7	0.66	2.6	0.63	66	-18.0	0.07	56
Costa's Hummingbird	2	0.4	0.89	52	-4.5	5.2	0.60	-18.0	0.10	12	50.7	0.11	7
Calliope Hummingbird	2	0.2	0.86	107	-2.4	2.9	0.28	6.0	0.34	47	21.0	0.41	44
Broad-tailed Hummingbird	1	-0.4	0.38	187	-1.5	0.6	1.99	-2.2	0.18	126	-18.9	0.00	97
Rufous Hummingbird	1	-2.6	0.00	217	-4.2	-1.0	1.36	-0.6	0.82	105	20.6	0.22	91
Allen's Hummingbird	2	-2.4	0.27	36	-6.5	1.8	0.70	-4.1	0.36	13	-20.6	0.19	12
Belted Kingfisher	2	-1.6	0.00	1985	-2.1	-1.1	0.31	-2.8	0.16	632	-2.4	0.74	621
Lewis's Woodpecker	2	-1.4	0.43	83	-4.8	2.0	0.15	-10.2	0.00	33	2.1	0.86	25
Red-headed Woodpecker	2	-2.6	0.00	1281	-3.3	-2.0	1.63	0.4	0.81	592	13.2	0.04	526
Acorn Woodpecker	1	0.9	0.01	151	0.3	1.6	6.01	2.1	0.51	82	-8.0	0.15	66
Gila Woodpecker	1	-1.4	0.32	34	-4.2	1.4	6.09	-0.3	0.95	22	-25.6	0.02	17
Golden-fronted Woodpecker	1	-1.1	0.26	80	-3.1	0.8	4.32	5.2	0.07	46	29.6	0.01	34
Red-bellied Woodpecker	1	0.7	0.00	1598	0.4	1.1	5.93	3.4	0.00	1180	7.9	0.00	905
Williamson's Sapsucker	2	0.8	0.55	89	-1.8	3.4	0.24	-5.4	0.25	51	53.3	0.06	41
Sapsucker (3 species)	2	0.2	0.58	1098	-0.6	1.1	1.64	0.8	0.62	647	21.4	0.01	508
Yellow-bellied Sapsucker	2	0.1	0.79	678	-0.9	1.2	1.79	-0.5	0.80	402	31.8	0.00	294
Red-naped Sapsucker	2	0.7	0.54	260	-1.5	2.9	0.91	5.1	0.12	158	28.9	0.06	137
Red-breasted Sapsucker	2	-2.0	0.10	176	-4.4	0.4	1.08	-0.5	0.91	81	-6.5	0.80	78
Ladder-backed Woodpecker	2	-1.4	0.04	216	-2.7	-0.1	0.98	3.2	0.16	115	13.4	0.13	98
Nuttall's Woodpecker	1	0.4	0.71	88	-1.6	2.3	1.32	1.8	0.55	38	-21.4	0.01	31
Downy Woodpecker	1	0.0	0.86	2581	-0.3	0.4	1.16	-1.3	0.09	1567	-11.5	0.00	1208
Hairy Woodpecker	2	1.8	0.00	2171	1.0	2.5	0.49	0.9	0.51	965	8.2	0.19	824
Red-cockaded Woodpecker	2	-2.2	0.17	24	-5.3	0.8	0.12	-13.9	0.25	9	426.1	0.47	6
White-headed Woodpecker	2	1.9	0.06	69	0.0	3.7	0.45	4.3	0.47	36	-30.0	0.06	31
Three-toed Woodpecker	3	8.9	0.22	33	-5.0	22.8	0.03	28.5	0.01	15	65.5	0.22	22
Black-backed Woodpecker	3	-0.4	0.82	76	-3.8	3.0	0.07	-11.4	0.00	14	50.3	0.14	18
Northern Flicker	2	-2.1	0.00	3303	-2.4	-1.8	2.75	-3.8	0.00	2103	2.4	0.47	1523
Gilded Flicker	1	-0.9	0.54	28	-3.6	1.9	2.82	-8.9	0.32	14	47.3	0.15	10
Pileated Woodpecker	2	1.9	0.00	1793	1.4	2.4	0.88	1.8	0.11	1050	7.7	0.11	855

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Olive-sided Flycatcher	1	-3.5	0.00	776	-4.3	-2.8	1.22	0.6	0.71	328	5.7	0.47	247
Western Wood-Pewee	1	-1.3	0.00	856	-1.9	-0.7	3.08	1.4	0.27	522	3.9	0.40	396
Eastern Wood-Pewee	1	-1.8	0.00	2061	-2.1	-1.5	3.05	-2.9	0.00	1366	-0.6	0.83	1012
Yellow-bellied Flycatcher	2	2.2	0.01	211	0.6	3.9	1.11	0.2	0.95	101	55.3	0.00	68
Acadian Flycatcher	2	-0.1	0.81	909	-0.5	0.4	1.62	2.1	0.01	547	3.5	0.36	432
Alder Flycatcher	1	0.3	0.29	875	-0.2	0.7	5.51	5.5	0.00	526	-3.8	0.38	364
Willow Flycatcher	1	-0.9	0.04	1193	-1.7	-0.1	1.26	3.5	0.00	637	17.1	0.00	533
Willow/Alder Flycatcher	1	-0.1	0.56	1763	-0.5	0.3	3.82	4.7	0.00	1064	2.8	0.39	791
Least Flycatcher	1	-1.1	0.00	1259	-1.6	-0.7	4.06	-4.2	0.00	726	-7.0	0.03	522
Hammond's Flycatcher	1	1.1	0.18	328	-0.5	2.8	3.51	2.3	0.14	224	6.1	0.27	167
Gray Flycatcher	2	4.8	0.02	131	1.0	8.7	1.38	4.7	0.17	81	3.2	0.81	77
Dusky Flycatcher	2	-1.3	0.03	399	-2.5	-0.1	2.58	0.6	0.76	270	0.0	1.00	210
Pacific-slope/ Cordilleran Flycatcher	1	-0.5	0.34	429	-1.6	0.6	2.94	-2.9	0.00	232	4.5	0.29	197
Black Phoebe	2	2.1	0.00	157	0.7	3.5	0.47	3.2	0.22	77	7.9	0.41	67
Eastern Phoebe	2	1.0	0.00	1940	0.6	1.4	1.90	-6.5	0.00	1314	-29.6	0.00	980
Say's Phoebe	2	1.5	0.05	620	0.0	3.0	0.92	4.7	0.06	308	9.9	0.25	257
Vermilion Flycatcher	2	-2.7	0.24	61	-7.2	1.8	0.74	-0.1	0.97	38	11.7	0.46	30
Ash-throated Flycatcher	2	1.0	0.02	498	0.2	1.8	5.14	1.8	0.09	303	4.6	0.30	229
Great Crested Flycatcher	1	0.0	0.76	2170	-0.3	0.4	3.46	1.7	0.02	1428	13.2	0.00	1084
Brown-crested Flycatcher	1	4.5	0.00	61	3.0	6.1	2.67	6.5	0.10	32	28.8	0.06	27
Couch's Kingbird	3	13.7	0.06	21	0.0	27.4	2.48	4.9	0.28	12	-33.1	0.03	9
Cassin's Kingbird	1	-0.8	0.44	166	-2.8	1.2	1.77	1.7	0.50	77	12.1	0.48	65
Western Kingbird	1	0.4	0.03	1167	0.0	0.9	6.23	6.1	0.00	689	6.2	0.07	515
Eastern Kingbird	1	-1.0	0.00	2704	-1.3	-0.7	4.08	2.1	0.00	1716	5.8	0.03	1272
Scissor-tailed Flycatcher	2	-0.2	0.60	330	-1.0	0.6	11.41	1.6	0.12	217	8.6	0.03	160
Loggerhead Shrike	1	-3.9	0.00	1477	-4.6	-3.2	1.67	-2.4	0.05	615	19.3	0.01	506
White-eyed Vireo	1	0.3	0.14	1090	-0.1	0.7	4.96	-0.1	0.89	698	-5.5	0.04	559
Bell's Vireo	1	-2.9	0.00	280	-4.7	-1.1	1.22	-1.3	0.40	120	-8.5	0.13	103
Gray Vireo	2	1.9	0.31	39	-1.7	5.6	0.40	-4.5	0.12	20	37.6	0.03	16
Yellow-throated Vireo	2	1.1	0.00	1246	0.5	1.8	0.79	2.0	0.09	631	14.9	0.01	513
Plumbeous Vireo	1	0.1	0.92	169	-1.6	1.8	1.07	1.7	0.55	100	10.4	0.28	85
Cassin's Vireo	1	1.0	0.02	343	0.2	1.9	2.14	1.4	0.45	211	5.2	0.61	157
Blue-headed Vireo	2	5.2	0.00	662	3.7	6.7	1.07	-0.1	0.97	384	12.9	0.09	289
Hutton's Vireo	2	0.9	0.24	158	-0.6	2.5	0.89	-3.4	0.31	91	0.2	0.98	78
Warbling Vireo	1	1.2	0.00	2055	0.8	1.7	3.49	0.8	0.29	1303	-3.1	0.24	1002
Philadelphia Vireo	1	3.2	0.01	175	0.8	5.6	1.43	2.0	0.81	68	25.9	0.44	50
Red-eyed Vireo	2	1.3	0.00	2423	0.9	1.7	10.70	1.2	0.02	1592	2.5	0.08	1177
Gray Jay	2	1.0	0.40	390	-1.3	3.2	0.94	1.2	0.71	186	34.6	0.01	142
Steller's Jay	1	0.3	0.36	479	-0.3	0.9	3.23	-0.4	0.71	328	-16.2	0.00	251
Blue Jay	1	-1.1	0.00	2491	-1.4	-0.8	8.53	-1.3	0.01	1779	-6.5	0.00	1270
Green Jay	3	1.4	0.86	15	-14.1	16.9	0.63	41.6	0.34	6	465.4	0.48	6
Western Scrub-Jay	1	0.6	0.03	360	0.1	1.2	3.06	-1.5	0.21	232	-10.5	0.01	176
Pinyon Jay	1	-4.6	0.00	181	-7.0	-2.2	4.75	-5.6	0.31	106	36.8	0.05	80
Clark's Nutcracker	1	2.6	0.00	258	1.1	4.2	1.11	-6.7	0.07	156	32.8	0.15	117
Black-billed Magpie	2	-0.4	0.18	798	-1.0	0.2	6.52	0.6	0.57	516	16.7	0.02	353
Yellow-billed Magpie	1	0.0	0.97	41	-1.4	1.5	10.78	-1.1	0.73	24	25.5	0.18	19
American Crow	1	1.0	0.00	3268	0.7	1.3	20.55	-0.9	0.01	2334	-2.6	0.08	1631

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Northwestern Crow	2	0.9	0.14	37	-0.3	2.1	12.80	0.8	0.90	19	-5.2	0.66	13
Fish Crow	2	1.1	0.07	543	-0.1	2.2	3.28	-5.2	0.00	350	-2.5	0.74	286
Chihuahuan Raven	2	-1.0	0.42	113	-3.3	1.4	3.53	12.1	0.05	55	-20.6	0.25	43
Common Raven	1	2.6	0.00	1675	1.8	3.4	5.38	-0.9	0.38	1135	19.0	0.00	797
Horned Lark	2	-2.2	0.00	2005	-2.6	-1.8	24.44	1.4	0.11	1101	11.8	0.00	826
Purple Martin	2	-0.1	0.74	1688	-0.6	0.4	4.75	-1.9	0.10	848	-1.7	0.78	645
Tree Swallow	2	0.1	0.80	2071	-0.6	0.7	4.48	-4.0	0.00	1338	6.0	0.15	978
Violet-green Swallow	1	0.7	0.33	640	-0.7	2.1	4.24	-3.3	0.17	379	27.6	0.07	293
Northern Rough-winged Swallow	2	-1.0	0.36	2170	-3.1	1.1	1.55	-5.6	0.00	962	20.0	0.18	748
Bank Swallow	1	-0.6	0.52	1116	-2.2	1.1	2.76	1.5	0.57	339	32.9	0.08	288
Cliff Swallow	2	0.7	0.04	1985	0.0	1.4	17.19	-1.2	0.52	1043	-5.3	0.34	777
Cave Swallow	3	17.2	0.08	41	-1.7	36.1	6.60	-12.7	0.02	27	42.5	0.32	26
Barn Swallow	2	-0.9	0.00	3426	-1.2	-0.7	12.54	-4.1	0.00	2356	9.4	0.00	1652
Carolina Chickadee	1	-0.6	0.00	1087	-1.0	-0.2	6.33	0.8	0.36	781	-4.1	0.21	571
Black-capped Chickadee	1	1.4	0.00	1741	1.0	1.8	3.41	1.6	0.07	1165	6.2	0.10	826
Mountain Chickadee	1	-0.7	0.02	450	-1.4	-0.1	3.89	1.6	0.24	313	10.4	0.09	217
Chestnut-backed Chickadee	1	-0.8	0.26	187	-2.1	0.6	4.28	1.7	0.48	111	-8.9	0.39	83
Boreal Chickadee	2	-2.5	0.07	168	-5.2	0.2	0.36	-13.2	0.04	62	-27.4	0.11	42
Oak Titmouse	1	-1.4	0.05	108	-2.9	0.0	4.65	0.7	0.82	51	-20.4	0.00	43
Juniper Titmouse	2	0.1	0.96	100	-4.6	4.9	0.63	0.7	0.88	56	70.5	0.01	52
Tufted Titmouse	2	1.0	0.00	1643	0.7	1.4	8.46	2.9	0.00	1206	8.2	0.00	902
Verdin	2	-5.1	0.02	135	-9.3	-0.8	3.99	-5.8	0.01	67	-17.4	0.08	48
Bushtit	1	-2.0	0.10	288	-4.3	0.4	1.44	0.9	0.78	128	14.5	0.32	108
Red-breasted Nuthatch	1	1.6	0.00	1095	0.9	2.2	2.29	7.3	0.00	677	13.0	0.00	495
White-breasted Nuthatch	2	1.9	0.00	1857	1.3	2.4	0.94	-3.4	0.01	1143	-0.5	0.92	887
Pygmy Nuthatch	1	0.3	0.70	139	-1.4	2.0	1.05	-4.8	0.31	74	19.7	0.39	55
Brown-headed Nuthatch	1	-1.6	0.07	337	-3.4	0.1	1.53	1.2	0.64	175	1.7	0.88	157
Brown Creeper	2	0.4	0.66	578	-1.2	2.0	0.37	1.9	0.42	257	-0.6	0.95	234
Cactus Wren	1	-2.5	0.00	179	-4.0	-0.9	6.34	-11.5	0.00	96	-5.0	0.47	68
Rock Wren	2	-2.3	0.00	621	-3.0	-1.5	1.86	0.9	0.60	294	19.7	0.02	247
Canyon Wren	2	-3.2	0.07	186	-6.7	0.3	0.22	-13.4	0.00	71	10.1	0.60	74
Carolina Wren	2	0.8	0.00	1369	0.5	1.2	9.35	-0.4	0.50	958	1.3	0.55	738
Bewick's Wren	2	0.0	0.94	660	-1.0	0.9	2.51	-1.0	0.46	308	9.0	0.17	241
House Wren	2	0.7	0.00	2322	0.4	1.0	4.94	-3.0	0.00	1528	-0.3	0.89	1110
Winter Wren	2	0.8	0.71	786	-3.4	5.0	7.34	-5.5	0.00	478	-7.8	0.10	331
Sedge Wren	2	2.1	0.00	376	1.1	3.1	1.31	-13.2	0.00	197	-2.7	0.73	154
Marsh Wren	2	2.9	0.00	396	1.4	4.4	0.73	-4.1	0.10	178	25.2	0.08	143
American Dipper	2	-0.3	0.84	103	-3.4	2.7	0.11	0.5	0.94	32	13.8	0.53	37
Golden-crowned Kinglet	2	-0.8	0.27	664	-2.1	0.6	2.39	-6.7	0.00	398	-22.2	0.00	266
Ruby-crowned Kinglet	2	-0.9	0.03	722	-1.6	-0.1	6.48	3.4	0.06	361	-7.8	0.03	267
Blue-gray Gnatcatcher	1	0.7	0.02	1485	0.1	1.3	2.18	3.0	0.00	944	13.9	0.02	763
Black-tailed Gnatcatcher	2	-2.4	0.20	68	-6.1	1.3	1.58	-5.2	0.20	36	-0.7	0.97	24
Eastern Bluebird	2	2.4	0.00	1965	2.0	2.8	3.55	-0.2	0.79	1355	-14.5	0.00	1023
Western Bluebird	1	-1.1	0.16	277	-2.6	0.4	1.28	-1.8	0.50	139	-5.1	0.63	107
Mountain Bluebird	1	1.5	0.01	580	0.3	2.6	2.16	1.2	0.48	332	6.6	0.49	244
Townsend's Solitaire	2	-0.8	0.11	320	-1.7	0.2	0.66	-1.6	0.60	190	-4.7	0.60	160
Veery	2	-1.4	0.00	1055	-1.9	-0.9	4.28	-4.6	0.00	639	5.9	0.31	437
Swainson's Thrush	2	-0.5	0.07	789	-1.0	0.0	15.15	0.2	0.87	460	4.5	0.26	330

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Hermit Thrush	1	1.3	0.00	1093	0.6	2.1	5.04	-1.4	0.20	695	5.7	0.20	490
Wood Thrush	2	-1.8	0.00	1756	-2.2	-1.4	4.88	-4.8	0.00	1126	-3.0	0.33	839
American Robin	1	0.7	0.00	3408	0.5	0.8	26.95	-1.0	0.00	2454	-2.1	0.09	1717
Varied Thrush	2	-0.2	0.59	197	-1.0	0.6	6.11	-5.0	0.02	109	-2.7	0.63	79
Wrentit	1	-1.1	0.23	139	-3.0	0.7	6.04	-1.0	0.54	80	-4.6	0.34	61
Gray Catbird	2	-0.1	0.40	2220	-0.4	0.2	2.63	0.8	0.14	1449	10.9	0.00	1072
Northern Mockingbird	2	-0.6	0.00	2054	-0.8	-0.4	17.25	1.8	0.00	1312	0.0	0.99	1009
Sage Thrasher	1	-0.8	0.07	319	-1.6	0.1	8.55	-5.3	0.00	175	7.3	0.21	122
Brown Thrasher	1	-1.2	0.00	2262	-1.5	-0.9	3.03	-1.1	0.12	1387	9.0	0.01	1039
Long-billed Thrasher	3	12.9	0.00	25	6.6	19.1	0.50	13.8	0.31	13	55.4	0.45	11
Bendire's Thrasher	2	-5.2	0.03	43	-9.8	-0.6	0.37	-5.4	0.63	13	8.3	0.70	11
Curve-billed Thrasher	2	-1.5	0.20	143	-3.7	0.8	1.54	0.6	0.80	76	17.8	0.37	56
California Thrasher	1	-2.7	0.06	76	-5.5	0.1	1.56	-1.5	0.74	28	-11.9	0.41	22
Crissal Thrasher	2	1.6	0.58	47	-3.9	7.0	0.26	-3.9	0.51	22	-46.3	0.04	14
Le Conte's Thrasher	2	-0.2	0.92	38	-4.4	4.0	0.71	-10.3	0.01	9	12.4	0.75	6
European Starling	1	-0.9	0.00	3460	-1.2	-0.7	30.29	-1.3	0.07	2306	9.3	0.02	1615
Sprague's Pipit	1	-4.8	0.00	144	-6.5	-3.0	1.78	-3.3	0.37	60	21.2	0.28	57
Cedar Waxwing	1	1.1	0.00	1974	0.6	1.6	3.83	-0.4	0.66	1331	-13.3	0.00	928
Phainopepla	1	0.1	0.91	120	-2.0	2.3	1.63	-13.0	0.07	47	27.4	0.38	39
Blue-winged Warbler	2	-0.6	0.23	467	-1.6	0.4	0.47	0.3	0.91	186	17.0	0.18	168
Golden-winged Warbler	2	-2.4	0.00	269	-3.9	-0.9	0.39	11.2	0.04	63	-22.5	0.08	63
Tennessee Warbler	2	0.1	0.96	312	-4.6	4.8	5.00	-0.5	0.91	106	-30.9	0.00	62
Orange-crowned Warbler	1	-1.2	0.00	464	-2.0	-0.4	2.64	1.7	0.27	277	-1.0	0.88	229
Nashville Warbler	1	1.6	0.13	789	-0.5	3.7	6.90	1.2	0.31	435	-2.5	0.50	312
Virginia's Warbler	1	-1.0	0.28	90	-2.7	0.8	1.42	-3.3	0.26	68	9.8	0.38	53
Lucy's Warbler	1	-0.5	0.59	41	-2.2	1.3	5.14	5.4	0.17	21	17.6	0.49	17
Northern Parula	1	0.9	0.01	1092	0.2	1.5	1.39	-2.0	0.06	676	7.2	0.06	524
Yellow Warbler	1	0.4	0.00	2536	0.1	0.7	4.33	1.0	0.08	1522	-0.8	0.71	1119
Chestnut-sided Warbler	2	-0.6	0.08	871	-1.2	0.1	6.53	1.6	0.20	511	0.2	0.97	385
Magnolia Warbler	1	1.5	0.00	574	0.6	2.5	5.90	1.9	0.24	330	13.2	0.17	235
Cape May Warbler	2	0.6	0.61	194	-1.6	2.8	0.86	-11.4	0.04	54	-26.8	0.06	52
Black-throated Blue Warbler	2	0.8	0.40	438	-1.1	2.6	1.02	1.0	0.74	229	2.6	0.75	163
Yellow-rumped Warbler	1	0.4	0.14	1182	-0.1	1.0	6.11	0.0	0.96	774	-5.1	0.10	550
Black-throated Gray Warbler	1	0.3	0.77	249	-1.5	2.0	1.44	0.1	0.93	154	-4.4	0.48	126
Black-throated Green Warbler	1	-0.2	0.88	687	-2.2	1.9	2.82	-0.3	0.83	428	-6.4	0.15	305
Townsend's Warbler	2	0.6	0.35	199	-0.7	1.9	5.79	1.4	0.61	119	-4.9	0.53	89
Hermit Warbler	1	0.1	0.96	120	-2.3	2.4	5.73	1.7	0.23	84	3.0	0.67	69
Blackburnian Warbler	1	1.0	0.03	529	0.1	1.8	1.31	1.7	0.33	268	5.0	0.51	185
Yellow-throated Warbler	2	0.8	0.10	478	-0.1	1.8	0.66	3.3	0.04	228	18.6	0.01	213
Grace's Warbler	2	-2.4	0.14	39	-5.5	0.7	1.56	2.9	0.48	27	21.0	0.26	20
Pine Warbler	1	1.0	0.00	921	0.4	1.5	3.38	-5.2	0.00	607	-9.4	0.00	480
Prairie Warbler	2	-2.0	0.00	825	-2.8	-1.3	1.87	-2.7	0.04	426	4.8	0.32	326
Palm Warbler	2	3.9	0.00	68	1.5	6.2	0.11	-9.1	0.01	36	-45.7	0.00	25
Bay-breasted Warbler	2	-2.4	0.15	197	-5.7	0.8	1.80	5.2	0.42	72	19.7	0.32	39
Blackpoll Warbler	3	-2.6	0.60	76	-12.1	6.9	3.06	12.4	0.23	25	-5.2	0.80	14
Cerulean Warbler	2	-4.2	0.00	236	-5.6	-2.9	0.31	9.8	0.01	72	42.9	0.06	70
Black-and-white Warbler	1	-0.3	0.39	1178	-0.9	0.4	1.68	-3.0	0.05	654	3.2	0.48	487
American Redstart	1	-0.5	0.27	1331	-1.5	0.4	3.05	-2.8	0.01	754	-1.5	0.76	552

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Prothonotary Warbler	2	-1.5	0.03	454	-2.7	-0.2	0.95	1.7	0.37	211	-0.3	0.97	180
Worm-eating Warbler	2	0.5	0.45	375	-0.7	1.7	0.34	3.2	0.33	174	-6.2	0.58	152
Swainson's Warbler	3	9.3	0.03	124	0.9	17.7	0.13	8.0	0.14	50	1.9	0.91	43
Ovenbird	2	0.5	0.00	1438	0.2	0.9	6.89	1.8	0.00	931	1.4	0.49	679
Northern Waterthrush	1	-0.1	0.90	602	-1.0	0.9	1.56	0.3	0.87	268	9.7	0.17	212
Louisiana Waterthrush	2	0.8	0.04	559	0.0	1.6	0.24	4.0	0.18	213	4.1	0.68	198
Kentucky Warbler	1	-1.0	0.00	728	-1.7	-0.3	1.33	-0.4	0.80	362	1.6	0.83	293
Connecticut Warbler	2	-1.2	0.24	96	-3.1	0.8	0.42	6.1	0.11	34	79.4	0.09	23
Mourning Warbler	2	-1.1	0.00	566	-1.8	-0.4	4.22	0.8	0.66	281	-10.1	0.04	219
MacGillivray's Warbler	1	-0.5	0.32	456	-1.4	0.5	4.03	-2.6	0.08	305	-9.5	0.02	232
Common Yellowthroat	2	-0.3	0.04	2912	-0.6	0.0	7.36	-2.1	0.00	1998	1.0	0.52	1437
Hooded Warbler	1	0.8	0.37	655	-0.9	2.4	1.72	3.4	0.01	386	9.2	0.09	323
Wilson's Warbler	1	-1.4	0.00	528	-2.4	-0.4	1.55	-6.1	0.01	232	-1.1	0.86	190
Canada Warbler	2	-2.0	0.03	495	-3.8	-0.2	0.89	-3.0	0.41	169	12.5	0.25	126
Yellow-breasted Chat	2	0.0	0.98	1376	-0.5	0.5	3.27	0.8	0.21	793	9.9	0.00	603
Hepatic Tanager	2	4.3	0.14	32	-1.2	9.8	0.66	-7.3	0.15	24	57.9	0.35	19
Summer Tanager	1	0.4	0.28	898	-0.3	1.1	2.75	1.7	0.08	565	-3.0	0.43	457
Scarlet Tanager	2	-0.2	0.41	1313	-0.6	0.2	1.37	-0.9	0.38	746	-1.9	0.62	579
Western Tanager	2	0.9	0.04	669	0.0	1.7	4.31	2.3	0.02	456	3.6	0.30	350
Olive Sparrow	2	2.0	0.06	27	0.1	4.0	1.72	0.6	0.91	18	-14.4	0.25	14
Green-tailed Towhee	1	-0.4	0.43	312	-1.3	0.6	3.19	-2.2	0.11	210	-0.4	0.95	153
Spotted Towhee	1	0.3	0.30	698	-0.3	1.0	4.14	-2.2	0.01	447	-6.2	0.05	347
Eastern Towhee	2	-1.8	0.00	1659	-2.1	-1.4	7.28	-1.1	0.08	1042	-3.3	0.10	784
Canyon Towhee	1	-1.5	0.04	108	-3.0	-0.1	1.61	-7.1	0.01	61	-9.9	0.39	51
California Towhee	1	-0.2	0.67	123	-1.4	0.9	6.64	-2.5	0.15	62	9.8	0.25	48
Abert's Towhee	2	-1.1	0.42	25	-3.7	1.5	0.99	-4.1	0.59	14	50.9	0.49	13
Cassin's Sparrow	1	-2.2	0.00	240	-3.0	-1.4	14.51	-6.0	0.00	141	18.1	0.09	100
Bachman's Sparrow	2	-2.3	0.12	159	-5.2	0.6	0.59	-9.2	0.00	53	-17.9	0.11	50
Rufous-crowned Sparrow	2	-0.7	0.54	116	-3.0	1.6	0.91	-3.0	0.42	57	23.6	0.14	45
Chipping Sparrow	2	-0.2	0.27	2901	-0.4	0.1	7.87	-0.6	0.18	2010	1.1	0.54	1445
Clay-colored Sparrow	2	-1.2	0.00	502	-1.7	-0.6	7.58	-1.1	0.24	310	3.8	0.37	228
Brewer's Sparrow	1	-2.8	0.00	481	-3.9	-1.6	7.91	-4.0	0.00	298	16.9	0.02	211
Field Sparrow	2	-3.1	0.00	1757	-3.4	-2.8	4.82	-3.6	0.00	1093	-3.3	0.18	820
Black-chinned Sparrow	2	-5.1	0.01	56	-8.6	-1.6	0.77	-22.8	0.00	21	-0.4	0.99	13
Vesper Sparrow	1	-1.1	0.00	1658	-1.6	-0.6	8.04	-0.9	0.23	865	3.7	0.18	630
Lark Sparrow	2	-2.9	0.00	1098	-3.8	-1.9	3.97	3.8	0.00	597	4.6	0.34	460
Black-throated Sparrow	1	-4.2	0.00	311	-6.6	-1.9	11.50	-8.3	0.00	166	-11.0	0.09	118
Sage Sparrow	2	0.1	0.97	227	-3.2	3.3	5.45	-7.0	0.01	107	5.9	0.53	87
Lark Bunting	1	-1.3	0.01	367	-2.2	-0.3	33.64	-1.4	0.63	186	72.8	0.00	120
Savannah Sparrow	2	-0.8	0.00	1672	-1.2	-0.4	8.23	-4.1	0.00	1032	-0.1	0.95	740
Grasshopper Sparrow	1	-3.9	0.00	1574	-4.8	-2.9	3.94	-5.7	0.00	740	10.4	0.11	576
Baird's Sparrow	1	-3.5	0.00	135	-5.8	-1.2	1.74	-12.8	0.02	52	7.3	0.56	40
Henslow's Sparrow	2	-8.6	0.00	170	-12.6	-4.6	0.14	-8.5	0.00	39	26.8	0.31	47
Le Conte's Sparrow	2	-0.1	0.95	195	-1.7	1.6	0.67	-17.2	0.00	108	45.1	0.06	71
Nelson's Sharp-tailed Sparrow	2	2.7	0.25	80	-1.9	7.3	0.15	-7.4	0.13	39	2.0	0.94	34
Seaside Sparrow	2	-0.1	0.89	29	-1.4	1.2	0.38	-4.2	0.33	12	-2.7	0.78	13
Fox Sparrow	1	0.8	0.42	229	-1.2	2.9	2.14	-3.3	0.11	137	-6.6	0.44	107

APPENDIX 1. Continued.

		1966 - 2003						1999 - 2003			2002 - 2003		
Species	TQ	Trend	*P*	*n*	(95 % CI)		RA	Trend	*P*	*n*	Trend	*P*	*n*
Song Sparrow	2	-0.6	0.00	2618	-0.8	-0.4	11.05	-1.4	0.00	1822	-1.8	0.17	1274
Lincoln's Sparrow	2	1.8	0.05	479	0.0	3.6	2.44	-1.9	0.24	249	7.8	0.31	173
Swamp Sparrow	1	1.5	0.00	810	0.6	2.3	1.44	0.5	0.71	432	10.6	0.12	312
White-throated Sparrow	1	-0.7	0.00	724	-1.1	-0.3	31.59	-1.7	0.11	428	5.5	0.04	272
White-crowned Sparrow	1	-1.3	0.06	315	-2.7	0.1	2.05	0.2	0.93	191	10.0	0.22	139
Dark-eyed Junco	1	-1.5	0.00	1131	-2.0	-0.9	7.50	-4.4	0.00	704	0.1	0.98	498
McCown's Longspur	2	-2.6	0.23	69	-6.9	1.6	3.76	-10.1	0.00	29	-20.7	0.20	26
Chestnut-collared Longspur	2	-2.6	0.00	154	-3.9	-1.3	9.20	-9.6	0.00	69	19.1	0.07	53
Northern Cardinal	2	0.1	0.23	2030	-0.1	0.3	22.29	1.9	0.00	1508	-2.4	0.04	1105
Pyrrhuloxia	1	-2.0	0.06	97	-4.0	0.0	6.09	-3.5	0.28	60	-13.4	0.15	40
Rose-breasted Grosbeak	2	-0.7	0.02	1288	-1.3	-0.1	2.27	0.5	0.64	763	9.4	0.07	593
Black-headed Grosbeak	2	0.7	0.20	669	-0.4	1.9	2.17	-0.4	0.68	431	7.8	0.07	331
Blue Grosbeak	2	1.0	0.00	1232	0.4	1.6	2.68	1.8	0.02	781	-0.9	0.81	599
Lazuli Bunting	2	0.6	0.35	484	-0.7	1.8	1.16	-1.0	0.58	282	2.0	0.73	221
Indigo Bunting	2	-0.6	0.00	2030	-0.8	-0.4	11.76	-0.5	0.18	1411	0.8	0.57	1038
Painted Bunting	1	-2.0	0.00	346	-3.1	-0.9	5.72	6.6	0.00	211	10.9	0.03	165
Dickcissel	2	-1.2	0.00	922	-1.8	-0.6	15.69	2.5	0.03	575	12.2	0.02	420
Bobolink	2	-1.7	0.00	1232	-2.2	-1.1	5.01	-0.3	0.74	712	1.7	0.65	538
Red-winged Blackbird	2	-1.0	0.00	3581	-1.3	-0.7	52.75	-0.7	0.13	2493	0.4	0.88	1753
Tricolored Blackbird	2	0.4	0.89	50	-5.4	6.2	28.69	9.3	0.37	13	-24.4	0.93	11
Eastern Meadowlark	2	-2.9	0.00	2110	-3.3	-2.5	18.49	-2.2	0.00	1362	0.1	0.96	1004
Western Meadowlark	1	-0.9	0.00	1634	-1.3	-0.5	43.37	-3.0	0.00	963	9.4	0.00	665
Yellow-headed Blackbird	2	1.1	0.09	672	-0.2	2.5	9.55	-7.0	0.00	341	26.2	0.03	256
Rusty Blackbird	3	-9.9	0.02	96	-17.9	-1.9	0.27	31.5	0.01	9	130.0	0.33	6
Brewer's Blackbird	1	-1.3	0.00	1235	-1.9	-0.7	15.77	-1.1	0.28	776	10.1	0.02	529
Common Grackle	1	-1.2	0.00	2765	-1.6	-0.8	31.07	1.5	0.03	1919	0.2	0.94	1351
Boat-tailed Grackle	1	2.3	0.00	118	0.7	3.8	18.29	-3.8	0.26	71	-0.9	0.95	60
Great-tailed Grackle	1	2.7	0.10	283	-0.6	5.9	7.30	-2.5	0.50	157	8.3	0.58	130
Bronzed Cowbird	2	-0.3	0.89	70	-4.2	3.6	1.81	-9.7	0.24	33	0.1	1.00	27
Brown-headed Cowbird	2	-1.2	0.00	3659	-1.4	-0.9	12.74	-1.2	0.05	2469	6.1	0.01	1752
Orchard Oriole	2	-0.8	0.04	1498	-1.6	0.0	2.70	2.3	0.02	872	5.8	0.09	700
Hooded Oriole	2	2.2	0.31	72	-2.0	6.3	0.37	12.9	0.01	26	-25.5	0.01	23
Baltimore Oriole	2	-0.7	0.00	1794	-1.1	-0.4	2.73	0.3	0.77	1097	2.5	0.51	826
Bullock's Oriole	1	-1.0	0.01	724	-1.7	-0.2	1.74	1.5	0.26	397	-5.8	0.25	303
Scott's Oriole	1	1.1	0.26	136	-0.8	3.1	1.49	-3.8	0.10	76	-32.6	0.00	58
Pine Grosbeak	2	-0.3	0.92	94	-5.1	4.6	0.18	-8.1	0.32	28	18.0	0.68	30
Purple Finch	1	-1.6	0.00	960	-2.3	-0.9	2.06	0.7	0.72	484	24.1	0.01	367
Cassin's Finch	1	-2.7	0.00	319	-4.3	-1.0	1.70	-10.1	0.00	165	4.5	0.70	126
House Finch	1	1.5	0.05	2184	0.0	3.0	4.95	-1.7	0.05	1480	-2.3	0.43	1120
Red Crossbill	1	-0.7	0.46	435	-2.4	1.1	1.91	4.5	0.28	217	20.3	0.40	160
White-winged Crossbill	3	4.3	0.44	124	-6.6	15.2	1.98	-5.9	0.78	44	405.4	0.01	27
Pine Siskin	1	-2.1	0.00	846	-3.2	-1.1	5.11	-8.5	0.00	421	28.7	0.12	267
Lesser Goldfinch	1	-0.7	0.38	340	-2.3	0.9	1.84	1.8	0.51	180	1.6	0.84	152
Lawrence's Goldfinch	2	-1.2	0.50	52	-4.6	2.3	0.60	-9.4	0.10	13	7.9	0.85	6
American Goldfinch	2	0.0	0.80	2606	-0.4	0.3	5.67	-0.3	0.64	1774	1.2	0.62	1284
Evening Grosbeak	1	-1.3	0.15	645	-3.0	0.4	3.93	-9.9	0.05	255	25.8	0.06	160
House Sparrow	2	-2.5	0.00	3128	-2.8	-2.2	30.11	1.0	0.33	1960	6.3	0.29	1403

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THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM 2002 AND 2003 REPORT[1]

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Abstract. This report summarizes results of the Monitoring Avian Productivity and Survivorship (MAPS) Program during 2002, when 505 stations were operated, and 2003, when 456 stations were operated. Changes in adult population size and productivity (i.e., reproductive index, defined as young/adult) between 2001 and 2002 and between 2002 and 2003 were derived from constant-effort data from 417 and 349 stations, respectively. Adult population sizes *increased* significantly in 2002 at the program-wide scale and, with varying significance, in each of the seven MAPS regions except the Alaska/Boreal Canada Region. In contrast, productivity in 2002 *decreased* significantly at the program-wide scale and in all regions except the Alaska/Boreal Canada and South-central regions, where it tended to increase. The patterns of changes in both adult population size and productivity in 2003 were nearly exactly reversed from those in 2002, with substantial and generally significant *decreases* in adult population size program-wide and in all regions except the Alaska/Boreal Canada and South-central regions; and a significant *increase* in productivity program-wide and increases of varying significance in five of the seven regions. These generally alternating, out-of-phase patterns in productivity and population size have been characteristic of MAPS data for many years and suggest density-dependent population regulation in which (a) increased productivity in a given year leads to increased population sizes the following year through increased recruitment of young birds, and (b) the increased population sizes suppress productivity through increased competition for food or other resources needed for reproduction. That these patterns of changes have not been consistent in all regions in all years suggests that density-independent factors may also drive changes in productivity and that other factors besides productivity (e.g., survival of young and adult birds) also drive annual changes in adult population size. We used modified Cormack-Jolly-Seber (CJS) mark-recapture analyses, with ad-hoc between- and within-yr transient models, on 12 years (1992-2003) of data pooled from 550 stations operated for at least four consecutive years to estimate program-wide and regional annual adult apparent survival (φ) and recapture probabilities and proportions of residents among newly captured adults for over 180 species. The mean number of stations per region contributing data (79) and mean number of species per region for which survival rates could be estimated (62) were 15% and 5.4% greater, respectively, than the analogous means (68 stations and 59 species) for the previous 10-yr (1992-2001) analyses. The increased number of stations and years of data resulted in continued increases in the precision of survival estimates: the mean number of species per region with CV(φ)<30%, <20%, and <10% increased by 11%, 11%, and 31%, respectively, using 12, rather than 10, years of data. As in previous years, a pattern was detected in which mean regional adult survival rates decreased with increasing latitude; they also were higher for the two western regions, lower for two eastern regions, and lowest for the two central regions. For each of the seven regions, survival estimates for species for which CV(φ)<30% were lower for the 12-yr (1992-2003) than 10-yr (1992-2001) data set, continuing the pattern noted in

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previous reports and suggesting that survival has been decreasing in each region. For all species pooled at the program-wide scale, we used (a) chain indices to estimate a highly significant 12-yr (1992-2003) decline in adult population size of -1.86% per year, and a widely fluctuating temporal pattern in productivity with a decreasing tendency of -1.02% per year; and (b) both time-dependent and linear trend CJS models to estimate a significant 10-yr (1993-2002) decline in adult apparent survival of -0.83% per year. These declines in vital rates will likely increase the difficulty of reversing the population declines in these landbird species. Finally, we found a weak correlation between adult survival from year *t* to year *t*+1 and productivity in year *t*+1, a pattern indicating that some of the same factors driving annual variations in survival might also drive annual variations in productivity, and that these factors may act during the non-breeding season. This is consistent with previous results from MAPS showing that annual variations in productivity of Neotropical migratory species breeding in the Pacific Northwest were driven by late-winter/early-spring weather conditions on their wintering grounds.

Key words: constant-effort mist netting and banding; landbird demographics; MAPS Program; population trends; productivity indices; survival rates.

INFORME SOBRE EL PROGRAMA MONITOREO DE PRODUCTIVIDAD Y SOBREVIVENCIA DE AVES (MAPS) EN 2002 Y 2003

Resumen. Este informe resume los resultados del programa MAPS durante los años 2002-2003, en los que MAPS alcanzó las 505 estaciones en 2002 y 456 en 2003. Obtuvimos los cambios poblacionales en adultos y productividad (es decir, índice de productividad, definido como la proporción de juveniles a adultos) entre 2001 y 2002 y entre 2002 y 2003, a partir de datos de esfuerzo constante de 417 y 349 estaciones respectivamente. Los tamaños poblacionales de adultos aumentaron significativamente en 2002 a escala del programa completo y, con significatividad variable, en cada una de las siete regiones MAPS exceptuando la región Alaska/Canadá boreal. En cambio, la productividad en 2003 descendió significativamente a la escala del programa completo y en todas las regiones excepto en las regiones de Alaska/Canadá boreal y Centro-sur, donde tendió a aumentar. Los patrones de cambio tanto en tamaño poblacional adulto y productividad en 2003 fueron casi exactamente opuestos a los de 2002, con descensos marcados y en general significativos en tamaño poblacional de adultos en todo el programa y en todas las regiones excepto Alaska/Canadá boreal y Centro-sur; un aumento significativo en productividad fue detectado a nivel del programa completo y aumentos de significatividad variable en cinco de las siete regiones. Estos patrones generalmente alternantes y desfasados en productividad y tamaño poblacional han sido característicos en los datos de MAPS durante muchos años y sugieren una regulación poblacional densodependiente en la que (a) el aumento de productividad en un año lleva a un aumento poblacional al año siguiente debido al reclutamiento de jóvenes, y (b) el aumento poblacional reduce la productividad debido al aumento de la competición por alimento y otros recursos necesarios para la reproducción. El hecho de que estos patrones no hayan sido constantes entre regiones y entre años sugiere que factores densoindependientes pueden también causar cambios en productividad y que otros factores aparte de productividad (por ejemplo sobrevivencia de juveniles y adultos) pueden hacer variar los cambios anuales en tamaño poblacional de adultos. Utilizamos análisis de marcaje y recaptura modificados de Cormack-Jolly-Seber (CJS), con modelos transitivos ad-hoc, entre años y por año, en 12 años (1992-2003) de datos recabados de 550 estaciones que operaron al menos cuatro años consecutivos para estimar la sobrevivencia aparente (φ) de adultos a nivel del programa completo y a nivel regional, y probabilidades de recaptura y proporciones de residetes entre nuevos adultos capturados. El número promedio de estaciones por región que contribuyó datos (79) y el número de especies por región para las que se pudo calcular tasas de sobrevivencia (62) fueron 15% y 5.4% mayores, respectivamente, que los promedios análogos (68 estaciones y 50 especies) en los 10 años anteriores (1992-2001). El aumento de estaciones y años de datos resultaron en aumentos

continuados en la precisión de las estimas de sobrevivencia: el número promedio de especies por región con CV(φ) <30%, <20%, y <10% aumentaron un 11%, 11% y 31% respectivamente, utilizando 12 en lugar de 10 años de datos. Como en años anteriores, detectamos un descenso de las tasas de sobrevivencia de adultos con el aumento de la latitud; también fueron más altas para las dos regiones del oeste, más bajas para dos regiones del este, y las más bajas se registraron en las dos regiones centrales. Para cada una de las siete regiones, las estimas de sobrevivencia por especie para las que CV(φ)<30% fueron más bajas en el periodo de 12 años (1992-2003) que en el de 10 años (1992-2001), continuando el patrón ya documentado en informes anteriores y sugiriendo que la sobrevivencia ha descendido en cada región. Para todas las especies agrupadas a escala del programa completo, utilizamos (a) índices en cadena para estimar un declive en tamaño poblacional adulto de -1.85% por año en 12 años (1992-2003) altamente significativo, y un patrón temporal de productividad ampliamente fluctuante con tendencia al descenso del -1.02% por año; y (b) modelos de CJS de tendencias tempodependientes y lineales para estimar el declive de 12 años en sobrevivencia aparente de adultos de -0.83% por año. Estos declives en tasas vitales aumentarán seguramente la dificultad de invertir los declives poblacionales en estas especies de aves terrestres. Por último, encontramos una correlación débil entre sobrevivencia entre los años t y t+1, y productividad en el año t+1, un patrón que indica que algunos de los mismos factores causantes de la variación anual en sobrevivencia podrían también influenciar la variación en productividad, y que estos factores podrían actuar durante la temporada no reproductiva. Esto es consecuente con resultados previos de MAPS, que muestran que la variación anual en productividad de las especies migratorias neárticas-neotropicales que crían en el Noroeste Pacífico se deben a las condiciones meteorológicas de finales de invierno y principios de primavera en las áreas de invernada.

Palabras clave: programa MAPS, redeo y anillamiento de esfuerzo constante, demografía de aves terrestres, tendencias poblacionales, indices de productividad, tasas de sobrevivencia.

INTRODUCTION

The Monitoring Avian Productivity and Survivorship (MAPS) Program is a continent-wide, cooperative network of nearly 500 constant-effort mist-netting stations operated annually during the breeding season (May to August) (DeSante et al. 1995, DeSante and Kaschube 2006). MAPS was patterned to some extent after the British Constant Effort Sites scheme (Baillie et al. 1986, Peach et al. 1996, 1998) and was established by The Institute for Bird Populations (IBP) in 1989 to collect long-term data on the vital rates (primary demographic parameters such as productivity and survivorship) of North American landbirds at multiple spatial scales ranging from station-specific and local-landscape to program-wide. MAPS now provides productivity indices from young/adult ratios of captured birds, and estimates of adult apparent survival, recruitment, and population growth rates from Cormack-Jolly-Seber (CJS) analyses of capture-mark-recapture data on adult birds for over 180 landbird species.

The research goals of MAPS are to describe temporal and spatial patterns in these vital rates, and relationships between these patterns and (a) ecological characteristics and population trends of species, (b) station-specific and landscape-scale habitat characteristics, and (c) spatially-explicit weather variables. The management goals of MAPS are to use these patterns and relationships to (a) determine the proximate demographic cause(s) of population change, (b) formulate management actions and conservation strategies to reverse population declines and maintain stable or increasing populations, and (c) evaluate the effectiveness of the management actions and conservation strategies implemented.

Baillie (1990) was among the first to argue that monitoring vital rates must be a component of any successful integrated avian population monitoring scheme. DeSante (1995), DeSante and Rosenberg (1998), and DeSante et al. (2005) extended these ideas by arguing that effective avian management also must be based on vital rates as well as population sizes and trends. The reasons for this are manifold. First, abundance

metrics and the trends derived from them may not accurately reflect habitat quality (Van Horne 1983) because of source-sink dynamics (Pulliam 1988, Donovan et al. 1995) and evolutionary and ecological traps (Schlaepfer et al. 2002). Second, populations of migratory species could be limited by processes acting at times other than those when abundance is measured, thus further obscuring the link between abundance and habitat quality (Marra et al. 1998). Third and closely related, vital rates provide crucial information about the stage of the life cycle at which population change is being effected (DeSante 1992). This information is particularly important for migratory birds because it can suggest whether management actions should be directed toward a species' breeding grounds, wintering grounds, or both. Fourth, environmental stressors and management actions affect vital rates directly and usually without the time lags that often occur with population size (Temple and Wiens 1989, DeSante and George 1994). And finally, demographic rate estimates can be incorporated into predictive population models to assess potential effects of a variety of land use or climate factors (Noon and Sauer 1992). Thus, demographic monitoring not only complements abundance monitoring, but also has the potential to provide more timely and insightful information for management and conservation applications.

In this report we present results of the MAPS Program during 2002 and 2003 using data from 497 and 444 stations, respectively. For all species with adequate data (and for all species pooled), we compare, in a constant-effort manner, the program-wide and regional indices of adult population size and post-fledging productivity obtained during each of these two years with the analogous indices obtained during the immediately preceding year. Then, using data from 550 stations each operated for four or more consecutive years during the 12-yr period 1992-2003, we present program-wide and regional estimates of time-constant annual adult apparent survival probability, recapture probability, and proportion of residents among newly captured adults, along with estimates of the extent of time-dependence in these parameters. Finally, for all species pooled at the program-wide scale, we use chain indices to estimate 12-yr trends in adult population size and productivity, and both time-dependent and linear-trend CJS models to estimate a 10-yr trend in adult survival rate..

METHODS

The overall design of the MAPS Program and the general field methods are described in DeSante et al. (1996, 1998) and discussed in DeSante et al. (2004). Detailed, standardized methods and instructions for the establishment and operation of MAPS stations are provided by DeSante et al. (2007). Briefly, MAPS stations were established in 20-ha study areas at locations where long-term mist netting was practical and permissible. In general, the locations of MAPS stations were chosen by the station operators (often according to a hypothesis-driven strategy) and not by a probability-based sampling design, although elements of a random sampling strategy were sometimes employed. Operators generally adhered to MAPS site-selection criteria (DeSante et al. 2007), but some aspects of site selection were dictated by logistical concerns.

DATA COLLECTION

Normally, 10 permanent net sites were distributed rather uniformly throughout the central eight ha of each 20-ha study area, but were placed at specific locations where birds could be captured most efficiently. One mist net (typically 12-m length, 30-mm mesh) was erected at each net site and the type and location of all nets were kept constant for the duration of the study. Typically, nets were operated for six hours per day, beginning at local sunrise, for one day per 10-d period, and for six to 10 consecutive 10-d periods beginning between May 1 and June 10 (later at more northerly latitudes and higher altitudes) and continuing through August 8. To facilitate constant-effort comparisons of data, nets were opened, checked, and closed in the same order on all days of operation.

Each bird captured was marked with a uniquely-numbered aluminum leg band provided by the Biological Resources Division of the U.S. Geological Survey or the Canadian Wildlife Service. Band number, capture status, species, age, sex, ageing and sexing criteria (skull pneumaticization, breeding condition, feather wear, molt, molt limits, plumage characteristics), physical condition (mass, wing chord, fat

content) date, time, station, and net number were recorded for all birds captured, including recaptures. The times of opening and closing the nets and beginning each net run were recorded each day so that effort could be calculated for each 10-d period and standardized between years. The breeding (summer residency) status of each species recorded at the station was determined by the station operator using methods similar to those employed in breeding bird atlas projects.

DATA ENTRY AND VERIFICATION

Computer data entry and proofing were conducted by MAPS operators or, in those cases where operators were unable to enter their own data, by John W. Shipman of Zoological Data Processing, Socorro, NM (entry) and by IBP staff biologists (proofing). After computer entry and proofing, MAPS data were run through verification routines that: (1) checked the validity and ranges of all data; (2) screened each banding record by comparing the species, age, and sex determinations to the ageing and sexing criteria used; (3) screened banding data for inconsistent species, age, or sex determinations for all records of each band number; and (4) screened banding, effort, and breeding status data for inconsistencies. These verification routines were conducted by IBP biologists or, increasingly in recent years, by the MAPS operators themselves through the use of MAPSPROG, a user-friendly Visual dBASE data entry/import, verification/editing, and error-tracking program that operates on a Windows platform (Froehlich et al. 2006).

DATA ANALYSES

Methods of data analysis have been described in DeSante and Burton (1994), DeSante et al. (1998), and DeSante and O'Grady (2000); discussed in DeSante et al. (2004); and are briefly summarized here. We divided North America north of Mexico into eight major geographic regions based on biogeographical and meteorological considerations and delineated along lines consistent with physiographic strata established in conjunction with the North American Breeding Bird Survey (BBS; Robbins et al. 1986). These eight MAPS regions are Northwest, Southwest, North-central, South-central, Northeast, Southeast, Alaska, and Boreal Canada (see maps in DeSante et al. 1993a and DeSante and Burton 1994). Because of the small number of station in the two northernmost regions, we pooled data from them into a single Alaska/Boreal Canada region.

Throughout, we use an alpha level of $P < 0.05$ to indicate statistical significance, and $P < 0.01$ to indicate highly significant differences or relationships. In Tables 1-2, we also identify species for which between-year differences were nearly significant at $0.05 < P < 0.10$.

1. *Population Size and Productivity Indices* — The numbers of individual adult birds of each species captured each year, pooled over all stations within each region (and over all regions) that were located within the breeding range of the species, were used as annual regional (or program-wide) indices of adult population size for the species. Similarly, for each species in each region (and over all regions), the pooled numbers of individual young birds divided by the pooled numbers of individual adult birds ("reproductive indices"), were used as annual regional (or program-wide) indices of post-fledging productivity. Reproductive index (young/adult) is more consistent with other commonly-used measures of reproductive success than "productivity index," which is defined as the proportion of young in the catch [young/(young+adult)] and was used in earlier MAPS reports. Data from a given station in a given year were included in population size and productivity analyses if the station was operated for at least five periods that year, of which at least three periods occurred during the earlier and at least two during the later parts of the season [adult and young superperiods, respectively; see DeSante et al. (2007) for definitions].

Year-to-year changes in the numbers of adult and young birds were calculated using net-opening and -closing times and net-run times on a net-by-net and period-by-period basis to exclude captures that occurred in a given net in a given period in one year at a time when that net was not operated in that period in the other year. This allowed captures during the two years to be compared in a rigorous, constant-effort manner. The statistical significance of annual changes in the regional (or program-wide) indices of adult population size and productivity were inferred for each species from confidence intervals

calculated from the standard errors of the mean percentage changes. Changes were considered significant if confidence intervals did not include zero. Formulae for these standard errors and confidence intervals were given in Peach et al. (1996) and were derived from those given in Cochran (1977). We also inferred, by means of binomial tests, the statistical significance of regional (or program-wide) changes in adult population size and productivity indices from the proportion of target species that increased or decreased in each region. We included species in these regional population size and productivity analyses for which adults were captured at two or more stations in the region and for which at least 50 aged individuals were captured at all stations pooled in either of the two years being compared.

We estimated 12-yr (1992-2003) trends for the indices of adult population size and productivity for all species pooled at the program-wide scale by "chaining" the 11 constant-effort (as defined above) year-to-year changes in these annual indices and calculating the slope of the regression of the "chain" indices. For the trend in adult population size, we used an arbitrary starting index of 100 in 1992 and calculated chain indices in each subsequent year by first multiplying the proportional change between the two years times the index of the previous year and then adding that amount to the index of the previous year. Trends in productivity were calculated in an analogous manner, except that we started with the actual reproductive index in 1992 (0.702) and chained the annual proportional changes in the reproductive index over the 12 years.

2. *Survival Rate Estimates* — We calculated maximum-likelihood estimates and standard errors for annual adult apparent survival probabilities (φ) and recapture probabilities (p) for all species in each region for which adequate data were obtained. These survival estimates are termed apparent survival because permanent emigration from the station is not distinguishable from actual mortality. We used Cormack-Jolly-Seber (CJS) capture-mark-recapture analyses (Clobert et al. 1987, Pollock et al. 1990, Lebreton et al. 1992) that incorporated a between-year transient model (Pradel 1997), as well as an ad-hoc length-of-stay within-year transient model (Nott and DeSante 2002, Hines et al. 2003). These transient models also permit estimation of τ (the proportion of residents among those newly captured adults that were not recaptured seven or more days later during their first year of capture), and provide apparent survival rate estimates that are unbiased with respect to transient individuals (Pradel 1997, Hines et al. 2003).

Parameter estimates were calculated from the capture histories of all adult birds captured at all stations in the region at which the species was a usual breeder (i.e., attempted to breed during more than half of the years the station was operated). Data from a given station were included in survivorship analyses if the station was operated for at least four consecutive years during the 12-yr period 1992-2003, and was operated during each of those four or more years for at least three periods during the adult superperiod (see above). Stations within 1 km of each other were merged into a single "super-station" and data from those stations were pooled prior to creating capture histories of individual birds. This prevented individuals whose home range encompassed parts of both stations from being treated as two different individuals. We included species in these survivorship analyses for which an average of at least 2.5 individual adult birds were captured during each of the 12 years 1992-2003 (at least 30 year-unique individuals) from all stations pooled, and for which there were at least two returns (between-year recaptures) from all stations pooled. We considered survival probability to be "better estimated" for species for which: (1) φ was based on at least five returns over the 10 years; (2) τ (the estimate of the proportion of residents among those newly captured adults that were not recaptured seven or more days later during their first year of capture) was <1.00; (3) SE(φ)<0.20; and (4) CV(φ)<30%.

We modeled all eight combinations of time-dependence (and -independence) for each of the three parameters (survival probability - φ, recapture probability - p, proportion of residents - τ) contained in the transient model using TMSURVIV (Hines et al. 2003), a version of the computer program SURVIV (White 1983) modified by J. E. Hines. We used the Akaike Information Criterion ($QAIC_C$) to select appropriate models for each species such that the

selected model was the one with the lowest $QAIC_C$ (Burnham and Anderson 1992). We considered models having $QAIC_C$ values within two $QAIC_C$ units of each other to be equivalent models. $QAIC_C$ was calculated as:

-2(log-likelihood) +2(number of estimable parameters)

with corrections for small sample sizes and overdispersion of data.

We further estimated the relative likelihood of each of the eight models using $QAIC_C$ weights (w_i; Burnham and Anderson 1998). Statistical support for time-dependence in survival and recapture probabilities and in proportion of residents was assessed by summing the w_i for all models in which time-dependence in the parameter of interest occurred. This method of multi-model inference enabled us to use the entire set of eight models to judge the importance of time-dependence, rather than basing conclusions on a single best-fit model. A w_i value > 0.5 indicates strong support for time-dependence in the given parameter, while $0.50 \geq w_i > 0.25$ suggests some support for time-dependence in that parameter.

Finally, in order to gain additional insight into the issues of time-dependence and temporal trend in survival, we used the ad-hoc transient model in Program MARK (White and Burnham 1999) to model *program-wide* survival (φ) and recapture (p) probabilities *for all species pooled* as (a) time-constant, (b) time-dependent, and (c) as a linear function of time. We again used $QAIC_C$ (Burnham and Anderson 1992) and $QAIC_C$ weights (w_i; Burnham and Anderson 1998) to select among the nine possible models.

RESULTS

NUMBER AND DISTRIBUTION OF STATIONS

A total of 505 MAPS stations was operated during 2002, a 1.4% increase over the 498 operated during 2001. Of these, 50 (9.9%) were new in 2002 while 450 were operated during 2001 and five were not operated during 2001 but were operated during several years prior to 2001. A total of 90.4% of the stations in operation in 2001 continued to be operated in 2002. We received data useable for productivity and/or survivorship analyses in time to be included in this report from 497 of the 505 stations that were operated during 2002. A total of 456 MAPS stations was operated during 2003, 49 (9.7%) fewer than were operated during 2002. Of these, 52 (11.4%) were new in 2003 while 400 were in operation during a previous year. A total of only 79.2% of the stations in operation during 2002 continued to be operated during 2003. We received data useable for productivity and/or survivorship analysis in time to be included in this report from 444 of the 456 stations that were operated during 2003. The principal operator, sponsoring organization, location, elevation, and habitat(s) for each station newly established in 2002 or 2003 (or that was established prior to 2002 but not previously reported) are presented in the Appendix. See previous annual reports (DeSante et al. 1993b, 1996, 1998, DeSante and Burton 1994, DeSante and Kaschube 2006, and DeSante and O'Grady 2000) for these data for stations established prior to 2002.

The proportions of stations located in each of the eight MAPS regions were very similar during 2002 (Fig. 1) to analogous proportions in previous years. The proportions during 2003 (Fig. 1) were also virtually identical to those during 2002 for the Boreal Canada, North-central, South-central, and Southwest regions. The proportions during 2003, however, increased somewhat compared to previous years in the Northwest and Northeast regions (that together provided over 50% of the stations in 2003), decreased in the Southeast Region, and dropped to zero in the Alaska Region. The locations of the 857 stations that were operated for one or more years between 1992 and 2003 are mapped in Figure 2.

ADULT POPULATION SIZE AND PRODUCTIVITY

1. *Changes between 2001 and 2002* — Constant-effort data on the numbers of adult and young birds captured and the reproductive index (young/adult) were obtained for 2001 and 2002 from 417 MAPS stations across North America that were operated comparably in both years. The changes between 2001 and 2002 in these numbers and ratios are presented for the entire continent (program-wide) and for each MAPS region in Table 1 for those species that met the productivity selection criteria (see Methods – Data Analysis) and for all species pooled. These included 133 species program-wide, 65 species in

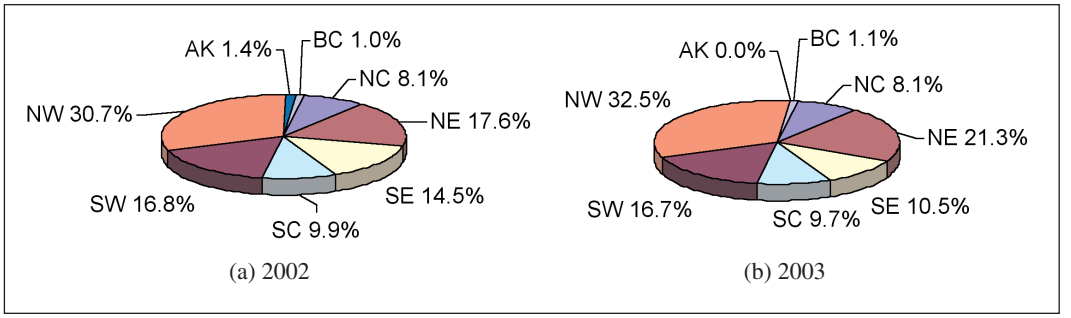

FIGURE 1. Proportion of MAPS stations in each of the seven major geographical regions (NW - Northwest; SW - Southwest; NC - North-central; SC - South-central; NE - Northeast; SE - Southeast; AK/BC - Alaska/Boreal Canada) during (a) 2002 and (b) 2003.

the Northwest, 37 in the Southwest, 24 in the North-central, 23 in the South-central, 40 in the Northeast, 30 in the Southeast, and 8 in the combined Alaska/Boreal Canada region.

(a) *Changes in adult populations* — The index of adult population size for all species pooled (number of adults captured) increased between 2001 and 2002 in all regions except the Alaska/Boreal Canada/ Region (where it decreased by a non-significant 6.0%) by amounts ranging from 1.6% (North-central) to 33.4% (Southwest). The increases for the Southwest and Northwest were highly significant and nearly significant, respectively. The proportion of increasing species was >50% in four regions, equal to 50% in the Alaska/Boreal Canada

FIGURE 2. Locations of the 857 MAPS stations that were operated during one or more years between 1992 and 2003. Some of the larger "individual" squares can represent as many as 11 stations.

TABLE 1. Program-wide and regional changes between 2001 and 2002 in the numbers of adult and young individuals captured and in the reproductive index (young/adult) for 133 species and all species pooled (excluding gallinaceous birds and hummingbirds) at the 417 MAPS stations run comparably during both years. For each species, data were included only from stations within the breeding range of the species. Only species for which adults were captured at two or more stations and for which 50 or more aged individuals were captured in either year are included.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
PROGRAM-WIDE																
Common Ground-Dove	11	80	71	-11.3	25.7	5	37	9	-75.7	23.0 **	11	0.463	0.127	-0.336	0.202	-72.6
Red-bellied Woodpecker	56	39	61	56.4	36.7 *	19	11	12	9.1	40.2	62	0.282	0.197	-0.085	0.116	-30.3
Red-naped Sapsucker	30	59	54	-8.5	13.1	18	18	16	-11.1	25.5	31	0.305	0.296	-0.009	0.102	-2.9
Red-breasted Sapsucker	57	129	134	3.9	12.7	36	85	75	-11.8	20.2	58	0.659	0.560	-0.099	0.137	-15.1
Nuttall's Woodpecker	26	50	53	6.0	18.3	25	47	36	-23.4	18.4	29	0.940	0.679	-0.261	0.228	-27.7
Downy Woodpecker	210	300	316	5.3	9.1	184	294	269	-8.5	8.1	253	0.980	0.851	-0.129	0.126	-13.1
Hairy Woodpecker	143	107	120	12.2	15.0	69	55	37	-32.7	15.2 *	170	0.514	0.308	-0.206	0.107 *	-40.0
Northern Flicker	95	70	81	15.7	19.6	52	33	38	15.2	30.7	117	0.471	0.469	-0.002	0.144	-0.5
Western Wood-Pewee	90	226	254	12.4	10.4	31	39	22	-43.6	15.1 **	92	0.173	0.087	-0.086	0.040 **	-49.8
Eastern Wood-Pewee	75	103	115	11.7	20.2	11	11	8	-27.3	35.7	78	0.107	0.070	-0.037	0.053	-34.9
Acadian Flycatcher	83	415	386	-7.0	6.2	35	29	42	44.8	36.8	86	0.070	0.109	0.039	0.026	55.7
"Traill's" Flycatcher	135	539	525	-2.6	8.1	34	31	29	-6.5	22.6	140	0.058	0.055	-0.002	0.016	-4.0
Least Flycatcher	32	86	62	-27.9	19.3	15	20	7	-65.0	18.5 *	33	0.233	0.113	-0.120	0.073	-51.5
Hammond's Flycatcher	65	133	154	15.8	23.4	32	43	36	-16.3	21.0	71	0.323	0.234	-0.089	0.110	-27.7
Dusky Flycatcher	74	287	370	28.9	16.7 *	22	43	37	-14.0	31.6	77	0.150	0.100	-0.050	0.052	-33.3
"Western" Flycatcher	108	272	448	64.7	19.6 ***	69	138	119	-13.8	13.6	118	0.507	0.266	-0.242	0.107 **	-47.6
Black Phoebe	26	48	26	-45.8	13.4 **	32	100	44	-56.0	11.3 ***	38	2.083	1.692	-0.391	0.870	-18.8
Eastern Phoebe	39	38	47	23.7	25.2	38	40	82	105.0	63.3 *	56	1.053	1.745	0.692	0.509	65.7
Ash-throated Flycatcher	60	176	207	17.6	14.0	12	14	6	-57.1	32.5	60	0.079	0.029	-0.051	0.037	-63.6
Great Crested Flycatcher	59	66	62	-6.1	17.4	3	2	1	-50.0	75.0	60	0.030	0.016	-0.014	0.027	-46.8
White-eyed Vireo	82	436	457	4.8	9.4	61	262	269	2.7	11.8	86	0.601	0.589	-0.012	0.147	-2.0
Bell's Vireo	15	76	74	-2.6	22.5	12	20	17	-15.0	27.3	16	0.263	0.230	-0.033	0.103	-12.7
Cassin's Vireo	44	66	82	24.2	21.7	28	26	27	3.8	38.5	49	0.394	0.329	-0.065	0.141	-16.4
Hutton's Vireo	28	25	29	16.0	34.3	22	27	18	-33.3	17.8	37	1.080	0.621	-0.459	0.410	-42.5
Warbling Vireo	131	541	658	21.6	10.7 **	49	113	44	-61.1	9.2 ***	136	0.209	0.067	-0.142	0.053 ***	-68.0
Red-eyed Vireo	156	581	603	3.8	7.6	50	50	34	-32.0	17.8	158	0.086	0.056	-0.030	0.019	-34.5
Blue Jay	90	123	116	-5.7	12.8	26	30	20	-33.3	23.8	93	0.244	0.172	-0.072	0.082	-29.3
Western Scrub-Jay	35	29	39	34.5	33.5	22	26	17	-34.6	22.9	44	0.897	0.436	-0.461	0.331	-51.4
Tree Swallow	31	45	59	31.1	33.9	5	3	4	33.3	91.3	33	0.067	0.068	0.001	0.061	1.7
Carolina Chickadee	104	202	202	0.0	12.1	85	193	167	-13.5	13.2	113	0.955	0.827	-0.129	0.209	-13.5
Black-capped Chickadee	141	459	473	3.1	8.2	116	439	317	-27.8	7.4 ***	148	0.956	0.670	-0.286	0.137 **	-29.9

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Mountain Chickadee	46	121	152	25.6	19.2	43	114	138	21.1	29.5	51	0.942	0.908	-0.034	0.272	-3.6
Chestnut-backed Chick.	58	166	172	3.6	14.8	42	145	164	13.1	22.8	62	0.874	0.953	0.080	0.327	9.2
Oak Titmouse	22	52	49	-5.8	18.8	18	60	37	-38.3	20.7	24	1.154	0.755	-0.399	0.404	-34.6
Tufted Titmouse	141	348	366	5.2	7.6	134	398	363	-8.8	8.6	151	1.144	0.992	-0.152	0.134	-13.3
Black-crested Titmouse	14	28	31	10.7	33.1	13	44	62	40.9	28.0 *	15	1.571	2.000	0.429	0.648	27.3
Bushtit	78	327	565	72.8	25.8 ***	65	317	279	-12.0	17.2	83	0.969	0.494	-0.476	0.208 **	-49.1
Red-breasted Nuthatch	64	80	93	16.3	21.2	44	67	85	26.9	32.8	74	0.838	0.914	0.077	0.364	9.1
White-breasted Nuthatch	70	64	87	35.9	24.2 *	49	47	37	-21.3	21.2	95	0.734	0.425	-0.309	0.222	-42.1
Brown Creeper	83	95	89	-6.3	12.7	70	96	94	-2.1	16.9	101	1.011	1.056	0.046	0.223	4.5
Carolina Wren	120	475	534	12.4	7.3 *	118	440	518	17.7	10.3 *	136	0.926	0.970	0.044	0.149	4.7
Bewick's Wren	93	368	377	2.4	9.5	90	512	353	-31.1	8.8 ***	100	1.391	0.936	-0.455	0.167 ***	-32.7
House Wren	98	434	449	3.5	8.4	102	412	258	-37.4	9.0 ***	119	0.949	0.575	-0.375	0.137 ***	-39.5
Winter Wren	44	134	89	-33.6	9.3 **	38	87	57	-34.5	17.0 **	56	0.649	0.640	-0.009	0.290	-1.4
Golden-crowned Kinglet	58	155	126	-18.7	11.7	51	334	222	-33.5	14.4 **	72	2.155	1.762	-0.393	0.743	-18.2
Ruby-crowned Kinglet	39	151	124	-17.9	12.5	21	87	62	-28.7	15.2	41	0.576	0.500	-0.076	0.176	-13.2
Blue-gray Gnatcatcher	60	85	102	20.0	16.5	33	60	35	-41.7	15.7 *	65	0.706	0.343	-0.363	0.160 **	-51.4
Eastern Bluebird	33	33	44	33.3	35.4	21	34	38	11.8	50.6	38	1.030	0.864	-0.167	0.395	-16.2
Veery	52	257	286	11.3	9.7	30	44	35	-20.5	18.8	53	0.171	0.122	-0.049	0.036	-28.5
Swainson's Thrush	137	1477	1622	9.8	5.9 *	77	302	257	-14.9	10.9	140	0.205	0.158	-0.046	0.039	-22.5
Hermit Thrush	77	222	236	6.3	9.2	56	102	105	2.9	17.8	87	0.460	0.445	-0.015	0.107	-3.2
Wood Thrush	120	701	859	22.5	7.1 ***	83	197	189	-4.1	12.1	122	0.281	0.220	-0.061	0.044	-21.7
American Robin	241	1062	1052	-0.9	4.5	140	340	341	0.3	10.3	248	0.320	0.324	0.004	0.049	1.2
Varied Thrush	29	55	36	-34.5	19.8	20	34	21	-38.2	17.5	35	0.618	0.583	-0.035	0.313	-5.6
Wrentit	50	469	816	74.0	18.6 ***	52	573	194	-66.1	7.5 ***	52	1.222	0.238	-0.984	0.147 ***	-80.5
Gray Catbird	133	1642	1645	0.2	4.8	89	728	567	-22.1	7.7 **	140	0.443	0.345	-0.099	0.066	-22.3
Northern Mockingbird	23	31	43	38.7	43.0	16	34	12	-64.7	25.5 **	28	1.097	0.279	-0.818	0.657	-74.6
Brown Thrasher	56	83	91	9.6	17.4	33	42	31	-26.2	19.4	61	0.506	0.341	-0.165	0.134	-32.7
California Thrasher	18	27	68	151.9	49.7 ***	13	43	2	-95.3	3.7 ***	18	1.593	0.029	-1.563	0.331 ***	-98.2
Cedar Waxwing	87	429	507	18.2	13.2	14	14	10	-28.6	34.1	88	0.033	0.020	-0.013	0.013	-39.6
Blue-winged Warbler	36	118	118	0.0	11.0	21	28	30	7.1	47.2	38	0.237	0.254	0.017	0.115	7.1
Tennessee Warbler	12	10	23	130.0	100.9 *	5	6	27	350.0	285.3	13	0.600	1.174	0.574	0.758	95.7
Orange-crowned Warbler	79	339	424	25.1	13.7 *	60	251	233	-7.2	19.0	88	0.740	0.550	-0.191	0.179	-25.8
Nashville Warbler	44	128	154	20.3	15.2	38	109	162	48.6	42.4	50	0.852	1.052	0.200	0.381	23.5
Virginia's Warbler	10	45	59	31.1	37.6	6	12	30	150.0	162.7	10	0.267	0.509	0.242	0.164	90.7
Lucy's Warbler	9	50	74	48.0	44.9	8	27	17	-37.0	36.3	9	0.540	0.230	-0.310	0.158 *	-57.5

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Northern Parula	33	73	47	-35.6	9.6 ***	12	9	17	88.9	70.1	37	0.123	0.362	0.238	0.142 *	193.4
Yellow Warbler	150	1529	1620	6.0	5.2	96	452	454	0.4	12.8	157	0.296	0.280	-0.015	0.048	-5.2
Chestnut-sided Warbler	24	45	57	26.7	28.0	13	17	10	-41.2	20.8 *	25	0.378	0.175	-0.202	0.107 *	-53.6
Magnolia Warbler	20	86	85	-1.2	11.7	12	26	30	15.4	52.7	20	0.302	0.353	0.051	0.128	16.7
Yellow-rumped Warbler	104	472	577	22.2	11.5 **	71	319	484	51.7	52.8	112	0.676	0.839	0.163	0.431	24.1
Black-thrtd. Gray Warbler	27	25	37	48.0	47.5	20	21	20	-4.8	34.7	38	0.840	0.541	-0.300	0.396	-35.7
Black-thrtd. Green Warb.	23	63	59	-6.3	11.6	10	13	8	-38.5	38.8	24	0.206	0.136	-0.071	0.107	-34.3
Townsend's Warbler	27	114	113	-0.9	11.3	17	58	68	17.2	39.3	28	0.509	0.602	0.093	0.275	18.3
Hermit Warbler	34	146	152	4.1	16.7	28	72	154	113.9	81.2 *	36	0.493	1.013	0.520	0.333	105.4
Pine Warbler	19	32	40	25.0	28.7	11	18	31	72.2	53.8	22	0.563	0.775	0.213	0.498	37.8
Prairie Warbler	24	100	79	-21.0	15.5	19	36	21	-41.7	16.1 *	26	0.360	0.266	-0.094	0.096	-26.2
Black-and-white Warbler	83	151	163	7.9	15.5	54	98	71	-27.6	15.3	94	0.649	0.436	-0.213	0.129 *	-32.9
American Redstart	84	484	483	-0.2	7.4	39	146	118	-19.2	18.8	88	0.302	0.244	-0.057	0.095	-19.0
Prothonotary Warbler	25	95	112	17.9	20.9	16	27	12	-55.6	20.1 **	30	0.284	0.107	-0.177	0.109	-62.3
Worm-eating Warbler	57	155	132	-14.8	13.2	34	125	78	-37.6	10.6 *	62	0.807	0.591	-0.216	0.301	-26.7
Ovenbird	136	601	573	-4.7	6.0	89	280	268	-4.3	10.4	146	0.466	0.468	0.002	0.086	0.4
Northern Waterthrush	19	85	67	-21.2	18.9	14	36	19	-47.2	8.8 ***	26	0.424	0.284	-0.140	0.165	-33.0
Louisiana Waterthrush	61	98	114	16.3	13.3	38	98	72	-26.5	16.0	66	1.000	0.632	-0.368	0.292	-36.8
Kentucky Warbler	64	309	318	2.9	8.7	50	145	138	-4.8	13.1	69	0.469	0.434	-0.035	0.078	-7.5
MacGillivray's Warbler	122	830	1026	23.6	7.4 ***	86	499	282	-43.5	6.5 ***	130	0.601	0.275	-0.326	0.088 ***	-54.3
Common Yellowthroat	205	1456	1595	9.5	5.2 *	130	809	435	-46.2	9.9 ***	215	0.556	0.273	-0.283	0.080 ***	-50.9
Hooded Warbler	62	207	211	1.9	9.9	36	69	51	-26.1	18.2	67	0.333	0.242	-0.092	0.096	-27.5
Wilson's Warbler	132	865	1065	23.1	17.2	78	482	347	-28.0	8.9 ***	135	0.557	0.326	-0.231	0.126 *	-41.5
Canada Warbler	18	47	34	-27.7	15.2	14	14	14	0.0	40.6	24	0.298	0.412	0.114	0.202	38.2
Yellow-breasted Chat	85	591	589	-0.3	6.0	43	149	119	-20.1	14.0	87	0.252	0.202	-0.050	0.051	-19.9
Summer Tanager	68	121	133	9.9	18.5	19	16	13	-18.8	39.3	71	0.132	0.098	-0.035	0.054	-26.1
Scarlet Tanager	67	83	86	3.6	16.3	19	32	18	-43.8	31.8	69	0.386	0.209	-0.176	0.146	-45.7
Western Tanager	112	283	360	27.2	12.0 **	48	107	116	8.4	31.3	117	0.378	0.322	-0.056	0.124	-14.8
Green-tailed Towhee	22	62	68	9.7	20.5	21	44	48	9.1	24.8	28	0.710	0.706	-0.004	0.289	-0.5
Spotted Towhee	91	551	679	23.2	10.0 **	83	414	307	-25.8	15.0	97	0.751	0.452	-0.299	0.132 **	-39.8
Eastern Towhee	77	135	140	3.7	10.0	44	49	43	-12.2	18.1	84	0.363	0.307	-0.056	0.081	-15.4
California Towhee	33	139	177	27.3	21.3	24	104	4	-96.2	2.2 ***	35	0.748	0.023	-0.726	0.142 ***	-97.0
Rufous-crowned Sparrow	19	37	44	18.9	25.0	18	56	11	-80.4	14.4 **	23	1.514	0.250	-1.264	0.477 ***	-83.5
Chipping Sparrow	83	169	226	33.7	16.5 **	44	75	61	-18.7	16.4	94	0.444	0.270	-0.174	0.106	-39.2
Clay-colored Sparrow	3	50	25	-50.0	3.0 ***	3	18	11	-38.9	8.4	4	0.360	0.440	0.080	0.064	22.2

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Brewer's Sparrow	26	38	66	73.7	53.0 *	20	35	37	5.7	42.8	29	0.921	0.561	-0.360	0.304	-39.1
Field Sparrow	48	182	180	-1.1	10.0	29	105	40	-61.9	10.4 **	48	0.577	0.222	-0.355	0.138 **	-61.5
Lark Sparrow	28	74	58	-21.6	26.0	12	9	18	100.0	71.5 *	28	0.122	0.310	0.189	0.121	155.2
Sage Sparrow	5	22	6	-72.7	21.7 **	2	99	0	-100.0	0.0	5	4.500	0.000	-4.500	1.412 **	-100.0
Savannah Sparrow	12	84	99	17.9	9.4	13	17	19	11.8	38.5	17	0.202	0.192	-0.011	0.154	-5.2
Fox Sparrow	44	128	151	18.0	12.0 *	29	46	34	-26.1	18.7	51	0.359	0.225	-0.134	0.134	-37.3
Song Sparrow	192	2027	2006	-1.0	3.6	186	1822	1424	-21.8	6.2 ***	209	0.899	0.710	-0.189	0.086 **	-21.0
Lincoln's Sparrow	52	279	298	6.8	10.3	45	161	146	-9.3	16.1	59	0.577	0.490	-0.087	0.155	-15.1
Swamp Sparrow	12	46	49	6.5	27.0	6	61	34	-44.3	25.4	12	1.326	0.694	-0.632	0.504	-47.7
White-throated Sparrow	20	82	56	-31.7	8.6 **	16	30	15	-50.0	19.6 *	23	0.366	0.268	-0.098	0.171	-26.8
White-crowned Sparrow	32	117	105	-10.3	14.3	16	117	82	-29.9	16.0	32	1.000	0.781	-0.219	0.463	-21.9
Dark-eyed Junco	106	702	878	25.1	7.0 ***	110	788	691	-12.3	12.5	121	1.123	0.787	-0.336	0.207	-29.9
Northern Cardinal	172	955	1176	23.1	5.8 ***	142	604	504	-16.6	8.0 *	175	0.633	0.429	-0.204	0.078 ***	-32.2
Rose-breasted Grosbeak	44	123	93	-24.4	11.4	20	24	15	-37.5	16.1 *	46	0.195	0.161	-0.034	0.076	-17.3
Black-headed Grosbeak	128	506	526	4.0	8.1	75	190	108	-43.2	10.7 ***	132	0.376	0.205	-0.170	0.082 **	-45.3
Blue Grosbeak	29	53	49	-7.5	15.7	7	9	3	-66.7	39.6	31	0.170	0.061	-0.109	0.090	-63.9
Lazuli Bunting	83	258	256	-0.8	13.4	33	79	53	-32.9	19.9	85	0.306	0.207	-0.099	0.083	-32.4
Indigo Bunting	112	619	600	-3.1	7.0	56	85	62	-27.1	16.8	112	0.137	0.103	-0.034	0.031	-24.7
Painted Bunting	25	288	235	-18.4	19.0	22	86	142	65.1	44.6 *	25	0.299	0.604	0.306	0.105 ***	102.4
Red-winged Blackbird	63	327	260	-20.5	14.4	18	18	27	50.0	55.3	64	0.055	0.104	0.049	0.042	88.7
Common Grackle	45	104	101	-2.9	23.8	14	24	12	-50.0	25.9 *	46	0.231	0.119	-0.112	0.114	-48.5
Brown-headed Cowbird	167	312	316	1.3	9.7	52	44	23	-47.7	14.9 **	184	0.141	0.073	-0.068	0.031 **	-48.4
Orchard Oriole	19	52	63	21.2	41.9	11	31	12	-61.3	14.1 ***	19	0.596	0.191	-0.406	0.135 ***	-68.0
Bullock's Oriole	66	195	189	-3.1	14.0	35	58	48	-17.2	38.7	70	0.297	0.254	-0.044	0.112	-14.6
Baltimore Oriole	43	109	91	-16.5	13.0	17	30	49	63.3	89.3	48	0.275	0.539	0.263	0.258	95.6
Purple Finch	64	402	262	-34.8	10.5 ***	43	186	123	-33.9	13.5 *	68	0.463	0.470	0.007	0.113	1.5
Cassin's Finch	33	52	38	-26.9	21.4	16	15	12	-20.0	47.0	37	0.289	0.316	0.027	0.142	9.5
House Finch	61	178	267	50.0	29.3 *	49	223	246	10.3	33.8	68	1.253	0.921	-0.332	0.469	-26.5
Pine Siskin	59	222	146	-34.2	15.0 *	31	100	101	1.0	38.8	62	0.451	0.692	0.241	0.343	53.6
Lesser Goldfinch	57	296	219	-26.0	13.2	35	200	76	-62.0	22.0 ***	60	0.676	0.347	-0.329	0.387	-48.6
American Goldfinch	133	916	940	2.6	6.2	15	17	14	-17.6	50.0	133	0.019	0.015	-0.004	0.011	-19.8
Evening Grosbeak	17	54	77	42.6	35.0	5	5	4	-20.0	88.8	19	0.093	0.052	-0.041	0.072	-43.9
All species pooled	**417**	**37187**	**40261**	**8.3**	**1.8 *** **	**415**	**19154**	**15432**	**-19.4**	**3.2 *** **	**417**	**0.515**	**0.383**	**-0.132**	**0.026 *** **	**-25.6**
	Number increasing: 84/133 (63%)***					Number decreasing 96/133 (72%)***					Number decreasing: 104/133 (78%)***					

TABLE 1. Continued.

Species	ADULTS n[a]	2001	2002	%chg.	SE[b]	YOUNG n[c]	2001	2002	%chg.	SE[d]	REPRODUCTIVE INDEX n[e]	2001	2002	change	SE[f]	%chg.
NORTHWEST MAPS REGION																
Red-naped Sapsucker	30	59	54	-8.5	13.1	18	18	16	-11.1	25.5	31	0.305	0.296	-0.009	0.102	-2.9
Red-breasted Sapsucker	57	129	134	3.9	12.7	36	85	75	-11.8	20.2	58	0.659	0.560	-0.099	0.137	-15.1
Downy Woodpecker	52	69	53	-23.2	12.8	37	30	44	46.7	35.3	64	0.435	0.830	0.395	0.202 *	90.9
Hairy Woodpecker	60	47	45	-4.3	17.0	35	29	19	-34.5	21.7	75	0.617	0.422	-0.195	0.192	-31.6
Western Wood-Pewee	64	189	189	0.0	9.5	28	37	20	-45.9	14.9 **	66	0.196	0.106	-0.090	0.046 *	-45.9
"Traill's" Flycatcher	78	329	287	-12.8	9.6	18	12	17	41.7	47.9	81	0.037	0.059	0.023	0.019	62.4
Hammond's Flycatcher	60	130	136	4.6	19.0	32	43	36	-16.3	21.0	66	0.331	0.265	-0.066	0.116	-20.0
Dusky Flycatcher	65	275	312	13.5	14.1	20	41	34	-17.1	32.3	68	0.149	0.109	-0.040	0.055	-26.9
"Western" Flycatcher	72	192	202	5.2	13.7	50	94	73	-22.3	15.3	80	0.490	0.361	-0.128	0.130	-26.2
Cassin's Vireo	42	66	80	21.2	21.3	27	25	27	8.0	40.6	47	0.379	0.338	-0.041	0.142	-10.9
Warbling Vireo	99	479	528	10.2	9.2	36	89	30	-66.3	9.5 **	100	0.186	0.057	-0.129	0.057 **	-69.4
Black-capped Chickadee	54	147	185	25.9	13.7 **	49	189	134	-29.1	12.0 *	59	1.286	0.724	-0.561	0.240 **	-43.7
Mountain Chickadee	44	118	152	28.8	19.7	42	113	137	21.2	29.8	49	0.958	0.901	-0.056	0.276	-5.9
Chestnut-backed Chick.	51	145	157	8.3	16.5	35	84	93	10.7	28.8	55	0.579	0.592	0.013	0.196	2.3
Bushtit	33	61	68	11.5	29.3	26	103	113	9.7	33.7	37	1.689	1.662	-0.027	0.578	-1.6
Red-breasted Nuthatch	55	75	89	18.7	22.4	39	62	84	35.5	35.3	61	0.827	0.944	0.117	0.382	14.2
Brown Creeper	63	81	80	-1.2	14.1	59	83	91	9.6	19.9	74	1.025	1.138	0.113	0.244	11.0
Bewick's Wren	27	61	56	-8.2	16.8	26	95	73	-23.2	14.6	31	1.557	1.304	-0.254	0.392	-16.3
House Wren	26	68	114	67.6	29.3 **	35	92	70	-23.9	15.2	38	1.353	0.614	-0.739	0.327 **	-54.6
Winter Wren	35	129	82	-36.4	9.1 ***	35	83	57	-31.3	17.3 **	44	0.643	0.695	0.052	0.306	8.0
Golden-crowned Kinglet	49	146	108	-26.0	11.2 *	44	320	219	-31.6	14.9 *	61	2.192	2.028	-0.164	0.826	-7.5
Ruby-crowned Kinglet	29	114	104	-8.8	15.4	16	69	51	-26.1	18.1	31	0.605	0.490	-0.115	0.213	-19.0
Swainson's Thrush	97	1275	1277	0.2	4.7	54	235	204	-13.2	13.7	98	0.184	0.160	-0.025	0.040	-13.3
Hermit Thrush	42	90	101	12.2	15.0	30	45	59	31.1	31.8	47	0.500	0.584	0.084	0.209	16.8
American Robin	119	619	571	-7.8	5.3	72	160	149	-6.9	13.4	121	0.259	0.261	0.003	0.054	1.0
Varied Thrush	24	42	25	-40.5	22.9	17	30	18	-40.0	15.3 **	30	0.714	0.720	0.006	0.411	0.8
Wrentit	21	77	90	16.9	23.2	23	140	76	-45.7	12.0 **	23	1.818	0.844	-0.974	0.323 ***	-53.6
Gray Catbird	16	157	137	-12.7	10.3	10	37	20	-45.9	19.8	16	0.236	0.146	-0.090	0.083	-38.1
Cedar Waxwing	40	209	264	26.3	15.0 *	5	5	7	40.0	80.7	40	0.024	0.027	0.003	0.020	10.8
Orange-crowned Warbler	48	169	205	21.3	13.6 *	34	78	124	59.0	34.1 **	55	0.462	0.605	0.143	0.169	31.1
Nashville Warbler	28	95	121	27.4	19.0 *	30	94	128	36.2	47.0	34	0.989	1.058	0.068	0.445	6.9
Virginia's Warbler	3	28	39	39.3	23.2	2	5	20	300.0	80.0	3	0.179	0.513	0.334	0.224	187.2
Yellow Warbler	76	930	982	5.6	6.3	56	334	318	-4.8	13.8	80	0.359	0.324	-0.035	0.069	-9.8
Yellow-rumped Warbler	73	398	496	24.6	13.2 **	52	288	461	60.1	57.6	78	0.724	0.929	0.206	0.500	28.4

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Townsend's Warbler	25	107	109	1.9	12.0	15	58	64	10.3	37.5	26	0.542	0.587	0.045	0.287	8.3
Hermit Warbler	34	146	152	4.1	16.7	28	72	154	113.9	81.2 *	36	0.493	1.013	0.520	0.333	105.4
American Redstart	12	94	99	5.3	9.2	5	8	12	50.0	68.5	12	0.085	0.121	0.036	0.080	42.4
Northern Waterthrush	8	56	50	-10.7	25.2	4	15	6	-60.0	9.0 ***	8	0.268	0.120	-0.148	0.111	-55.2
MacGillivray's Warbler	103	806	950	17.9	6.4 ***	84	497	280	-43.7	6.5 ***	110	0.617	0.295	-0.322	0.092 ***	-52.2
Common Yellowthroat	45	271	280	3.3	8.4	27	105	130	23.8	11.5	47	0.388	0.464	0.077	0.151	19.8
Wilson's Warbler	108	716	756	5.6	16.3	61	270	169	-37.4	11.1 ***	111	0.377	0.224	-0.154	0.093 *	-40.7
Yellow-breasted Chat	21	140	121	-13.6	8.4	12	42	51	21.4	41.5	22	0.300	0.422	0.122	0.147	40.5
Western Tanager	91	251	314	25.1	12.2 **	44	100	111	11.0	34.0	94	0.398	0.354	-0.045	0.139	-11.3
Green-tailed Towhee	17	59	60	1.7	18.8	20	43	46	7.0	25.2	23	0.729	0.767	0.038	0.323	5.2
Spotted Towhee	48	216	257	19.0	12.1 *	45	166	162	-2.4	10.8	54	0.769	0.630	-0.138	0.181	-18.0
Chipping Sparrow	42	101	138	36.6	20.5 **	24	44	42	-4.5	22.9	50	0.436	0.304	-0.131	0.158	-30.1
Brewer's Sparrow	19	34	56	64.7	54.6	17	30	35	16.7	49.4	22	0.882	0.625	-0.257	0.322	-29.2
Savannah Sparrow	7	78	93	19.2	10.1	7	14	12	-14.3	35.7	8	0.180	0.129	-0.051	0.128	-28.1
Fox Sparrow	41	106	128	20.8	14.7 *	24	39	27	-30.8	20.6	46	0.368	0.211	-0.157	0.149	-42.7
Song Sparrow	106	1176	1105	-6.0	4.6	110	1022	917	-10.3	6.4	119	0.869	0.830	-0.039	0.104	-4.5
Lincoln's Sparrow	47	269	282	4.8	10.3	40	155	142	-8.4	16.7	51	0.576	0.504	-0.073	0.162	-12.6
White-crowned Sparrow	24	81	82	1.2	19.0	11	30	29	-3.3	50.8	24	0.370	0.354	-0.017	0.168	-4.5
Dark-eyed Junco	82	637	797	25.1	7.5 ***	86	679	555	-18.3	12.4	91	1.066	0.696	-0.370	0.211 *	-34.7
Black-headed Grosbeak	82	279	303	8.6	10.2	48	133	77	-42.1	12.3 **	84	0.477	0.254	-0.223	0.130 *	-46.7
Lazuli Bunting	59	196	211	7.7	14.5	28	67	53	-20.9	24.3	60	0.342	0.251	-0.091	0.096	-26.5
Red-winged Blackbird	26	183	119	-35.0	18.2	7	9	15	66.7	76.1	27	0.049	0.126	0.077	0.072	156.3
Brown-headed Cowbird	62	141	126	-10.6	12.9	19	20	5	-75.0	13.7 ***	66	0.142	0.040	-0.102	0.042 **	-72.0
Bullock's Oriole	32	112	116	3.6	21.8	21	36	40	11.1	66.1	35	0.321	0.345	0.023	0.170	7.3
Purple Finch	44	363	226	-37.7	10.3 ***	32	162	111	-31.5	15.4	46	0.446	0.491	0.045	0.122	10.1
Cassin's Finch	32	51	38	-25.5	22.1	16	15	12	-20.0	47.0	36	0.294	0.316	0.022	0.144	7.4
House Finch	12	15	42	180.0	89.8 *	11	33	42	27.3	74.0	15	2.200	1.000	-1.200	1.308	-54.5
Pine Siskin	54	209	142	-32.1	15.9	31	100	101	1.0	38.8	57	0.479	0.711	0.233	0.354	48.7
Lesser Goldfinch	21	87	60	-31.0	17.6	10	146	59	-59.6	31.7 *	22	1.678	0.983	-0.695	1.171	-41.4
American Goldfinch	31	207	189	-8.7	11.6	8	13	7	-46.2	44.5	31	0.063	0.037	-0.026	0.048	-41.0
Evening Grosbeak	17	54	77	42.6	35.0	5	5	4	-20.0	88.8	19	0.093	0.052	-0.041	0.072	-43.9
All species pooled	**135**	**14850**	**15484**	**4.3**	**2.6 ***	**135**	**7598**	**6760**	**-11.0**	**5.1 ****	**135**	**0.512**	**0.437**	**-0.075**	**0.045 ***	**-14.7**
	Number increasing: 42/65 (65%)**					Number decreasing: 39/65 (60%)*					Number decreasing: 40/65 (62%)**					
SOUTHWEST MAPS REGION																
Nuttall's Woodpecker	26	50	53	6.0	18.3	25	47	36	-23.4	18.4	29	0.940	0.679	-0.261	0.228	-27.7

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Downy Woodpecker	19	46	35	-23.9	18.7	16	20	28	40.0	44.2	20	0.435	0.800	0.365	0.284	84.0
Western Wood-Pewee	24	26	60	130.8	59.6 ***	3	2	2	0.0	150.0	24	0.077	0.033	-0.044	0.086	-56.7
Dusky Flycatcher	9	12	58	383.3	216.6	2	2	3	50.0	100.0	9	0.167	0.052	-0.115	0.170	-69.0
"Western" Flycatcher	36	80	246	207.5	56.4 ***	19	44	46	4.5	28.9	38	0.550	0.187	-0.363	0.225	-66.0
Black Phoebe	21	43	23	-46.5	14.6 **	24	72	29	-59.7	13.5 ***	30	1.674	1.261	-0.414	0.768	-24.7
Ash-throated Flycatcher	51	160	190	18.8	14.8	11	14	5	-64.3	29.8	51	0.088	0.026	-0.061	0.040	-69.9
Warbling Vireo	18	33	113	242.4	129.7 *	8	21	7	-66.7	15.7 *	21	0.636	0.062	-0.574	0.212 ***	-90.3
Chestnut-backed Chick.	7	21	15	-28.6	21.2	7	61	71	16.4	39.7	7	2.905	4.733	1.829	1.109	63.0
Oak Titmouse	21	51	49	-3.9	19.3	16	51	34	-33.3	24.3	21	1.000	0.694	-0.306	0.368	-30.6
Bushtit	44	266	495	86.1	31.7 ***	39	214	166	-22.4	21.0	45	0.805	0.335	-0.469	0.184 **	-58.3
Bewick's Wren	50	256	262	2.3	12.4	50	370	205	-44.6	9.2 ***	52	1.445	0.782	-0.663	0.191 ***	-45.9
House Wren	32	192	177	-7.8	9.9	30	154	106	-31.2	19.6	33	0.802	0.599	-0.203	0.222	-25.3
Swainson's Thrush	16	117	241	106.0	47.1 ***	9	50	35	-30.0	12.2	16	0.427	0.145	-0.282	0.169	-66.0
American Robin	24	40	51	27.5	38.9	8	6	3	-50.0	39.8	26	0.150	0.059	-0.091	0.068	-60.8
Wrentit	29	392	726	85.2	21.5 ***	29	433	118	-72.7	8.7 ***	29	1.105	0.163	-0.942	0.146 ***	-85.3
California Thrasher	18	27	68	151.9	49.7 ***	13	43	2	-95.3	3.7 ***	18	1.593	0.029	-1.563	0.331 ***	-98.2
Orange-crowned Warbler	25	126	170	34.9	29.7	21	129	59	-54.3	21.0 *	27	1.024	0.347	-0.677	0.298 **	-66.1
Lucy's Warbler	9	50	74	48.0	44.9	8	27	17	-37.0	36.3	9	0.540	0.230	-0.310	0.158 *	-57.5
Yellow Warbler	29	126	203	61.1	28.5 **	11	28	11	-60.7	17.3 *	29	0.222	0.054	-0.168	0.066 **	-75.6
MacGillivray's Warbler	19	24	76	216.7	139.9 *	2	2	2	0.0	200.0	20	0.083	0.026	-0.057	0.067	-68.4
Common Yellowthroat	38	471	566	20.2	12.5 *	30	432	107	-75.2	7.9 **	40	0.917	0.189	-0.728	0.160 ***	-79.4
Wilson's Warbler	13	77	247	220.8	90.4 ***	9	103	94	-8.7	21.8	13	1.338	0.381	-0.957	0.559	-71.5
Yellow-breasted Chat	23	200	236	18.0	12.0	11	42	16	-61.9	14.7 ***	23	0.210	0.068	-0.142	0.049 ***	-67.7
Spotted Towhee	43	335	422	26.0	14.7 **	38	248	145	-41.5	23.3 *	43	0.740	0.344	-0.397	0.181 **	-53.6
California Towhee	31	136	173	27.2	21.7	23	102	3	-97.1	1.9 ***	33	0.750	0.017	-0.733	0.145 ***	-97.7
Rufous-crowned Sparrow	14	33	37	12.1	24.8	15	56	1	-98.2	1.9 ***	18	1.697	0.027	-1.670	0.508 ***	-98.4
Lark Sparrow	14	42	44	4.8	38.0	6	6	8	33.3	60.2	14	0.143	0.182	0.039	0.104	27.3
Sage Sparrow	2	21	2	-90.5	5.9	2	99	0	-100.0	0.0	2	4.714	0.000	-4.714	1.701	-100.0
Song Sparrow	39	547	567	3.7	6.9	37	582	338	-41.9	12.8 **	41	1.064	0.596	-0.468	0.202 **	-44.0
Black-headed Grosbeak	45	215	216	0.5	13.4	26	57	30	-47.4	21.3 *	47	0.265	0.139	-0.126	0.081	-47.6
Lazuli Bunting	24	62	45	-27.4	28.2	5	12	0	-100.0	0.0	25	0.194	0.000	-0.194	0.110 *	-100.0
Brown-headed Cowbird	27	74	75	1.4	23.4	5	6	2	-66.7	37.3	28	0.081	0.027	-0.054	0.061	-67.1
Bullock's Oriole	29	67	58	-13.4	18.7	10	17	6	-64.7	21.2 **	30	0.254	0.103	-0.150	0.125	-59.2
House Finch	37	151	211	39.7	32.8	30	184	198	7.6	38.7	39	1.219	0.938	-0.280	0.548	-23.0
Lesser Goldfinch	34	202	159	-21.3	18.3	25	54	17	-68.5	16.2 **	36	0.267	0.107	-0.160	0.074 **	-60.0

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
American Goldfinch	18	106	146	37.7	24.0	5	2	6	200.0	379.1	18	0.019	0.041	0.022	0.023	117.8
All species pooled	**59**	**5671**	**7565**	**33.4**	**6.8 *****	**58**	**4151**	**2126**	**-48.8**	**7.7 *****	**59**	**0.732**	**0.281**	**-0.451**	**0.075 *****	**-61.6**
	Number increasing: 28/37 (76%)***					Number decreasing: 28/37 (76%)***					Number decreasing: 33/37 (89%)***					
NORTH-CENTRAL MAPS REGION																
Downy Woodpecker	19	31	35	12.9	29.5	19	55	36	-34.5	11.1 **	22	1.774	1.029	-0.746	0.496	-42.0
"Traill's" Flycatcher	11	54	77	42.6	40.1	5	5	4	-20.0	55.1	12	0.093	0.052	-0.041	0.039	-43.9
Red-eyed Vireo	15	44	73	65.9	38.6	3	2	2	0.0	86.6	15	0.046	0.027	-0.018	0.031	-39.7
Black-capped Chickadee	23	80	89	11.3	24.4	19	109	71	-34.9	14.8 *	23	1.363	0.798	-0.565	0.368	-41.4
Tufted Titmouse	9	26	35	34.6	31.5	11	27	23	-14.8	25.6	12	1.039	0.657	-0.381	0.295	-36.7
House Wren	16	89	87	-2.2	18.3	13	98	44	-55.1	9.7 ***	16	1.101	0.506	-0.595	0.278 **	-54.1
Wood Thrush	13	63	63	0.0	11.0	8	18	18	0.0	35.6	13	0.286	0.286	0.000	0.090	0.0
American Robin	21	66	83	25.8	18.7	15	54	46	-14.8	19.4	21	0.818	0.554	-0.264	0.277	-32.3
Gray Catbird	21	362	329	-9.1	9.6	18	185	108	-41.6	7.9 ***	21	0.511	0.328	-0.183	0.143	-35.8
Cedar Waxwing	14	43	55	27.9	61.6	2	1	1	0.0	200.0	15	0.023	0.018	-0.005	0.033	-21.8
Yellow Warbler	11	184	165	-10.3	7.7	8	26	34	30.8	51.4	11	0.141	0.206	0.065	0.080	45.8
American Redstart	14	55	58	5.5	16.4	4	9	5	-44.4	19.4	14	0.164	0.086	-0.077	0.084	-47.3
Ovenbird	16	49	44	-10.2	15.8	5	13	19	46.2	57.6	16	0.265	0.432	0.167	0.202	62.8
Common Yellowthroat	16	210	204	-2.9	10.4	12	107	90	-15.9	10.7	16	0.510	0.441	-0.068	0.107	-13.4
Clay-colored Sparrow	2	50	24	-52.0	1.9	3	18	11	-38.9	8.4	3	0.360	0.458	0.098	0.078	27.3
Field Sparrow	9	59	50	-15.3	13.7	8	43	10	-76.7	13.0 ***	9	0.729	0.200	-0.529	0.164 **	-72.6
Song Sparrow	13	88	83	-5.7	11.6	12	52	47	-9.6	22.8	13	0.591	0.566	-0.025	0.261	-4.2
Swamp Sparrow	4	20	16	-20.0	7.8	1	41	12	-70.7		4	2.050	0.750	-1.300	0.319 **	-63.4
Northern Cardinal	17	52	70	34.6	14.6 ***	14	24	13	-45.8	21.5 *	18	0.462	0.186	-0.276	0.133 *	-59.8
Rose-breasted Grosbeak	16	74	49	-33.8	13.7 *	7	10	7	-30.0	24.6	16	0.135	0.143	0.008	0.103	5.7
Indigo Bunting	16	105	80	-23.8	14.5	8	15	2	-86.7	10.6 ***	16	0.143	0.025	-0.118	0.056 *	-82.5
Red-winged Blackbird	6	43	59	37.2	42.9	3	4	7	75.0	200.5	6	0.093	0.119	0.026	0.092	27.5
Baltimore Oriole	13	60	40	-33.3	16.2	7	24	13	-45.8	23.8	15	0.400	0.325	-0.075	0.184	-18.8
American Goldfinch	15	201	213	6.0	12.0	0	0	0			15	0.000	0.000	0.000		
All species pooled	**24**	**2565**	**2607**	**1.6**	**4.6**	**23**	**1104**	**784**	**-29.0**	**5.2 *****	**24**	**0.430**	**0.301**	**-0.130**	**0.057 ** **	**-30.1**
	Number increasing: 11/24 (46%)					Number decreasing: 17/24 (71%)**					Number decreasing: 17/24 (71%)**					
SOUTH-CENTRAL MAPS REGION																
Common Ground-Dove	7	57	49	-14.0	35.8	3	36	8	-77.8	24.7 *	7	0.632	0.163	-0.468	0.168 **	-74.1
Downy Woodpecker	21	26	43	65.4	44.9 **	20	37	31	-16.2	24.1	25	1.423	0.721	-0.702	0.391 *	-49.3

TABLE 1. Continued.

Species	ADULTS n[a]	2001	2002	%chg.	SE[b]	YOUNG n[c]	2001	2002	%chg.	SE[d]	REPRODUCTIVE INDEX n[e]	2001	2002	change	SE[f]	%chg.
Acadian Flycatcher	12	85	73	-14.1	8.6	5	6	14	133.3	110.4	13	0.071	0.192	0.121	0.052 **	171.7
White-eyed Vireo	27	258	275	6.6	14.3	25	187	208	11.2	13.7	27	0.725	0.756	0.032	0.221	4.4
Bell's Vireo	8	50	34	-32.0	19.3	7	13	13	0.0	33.2	9	0.260	0.382	0.122	0.167	47.1
Red-eyed Vireo	20	64	63	-1.6	18.3	8	5	8	60.0	66.0	20	0.078	0.127	0.049	0.074	62.5
Carolina Chickadee	29	63	64	1.6	23.8	28	62	71	14.5	28.5	33	0.984	1.109	0.125	0.457	12.7
Tufted Titmouse	25	70	82	17.1	18.8	24	72	88	22.2	28.9	25	1.029	1.073	0.045	0.327	4.3
Black-crested Titmouse	14	28	31	10.7	33.1	13	44	62	40.9	28.0 *	15	1.571	2.000	0.429	0.648	27.3
Carolina Wren	29	86	129	50.0	19.8 ***	24	122	197	61.5	18.6 ***	30	1.419	1.527	0.109	0.370	7.6
Bewick's Wren	16	51	59	15.7	25.7	14	47	75	59.6	60.3	17	0.922	1.271	0.350	0.492	37.9
Blue-gray Gnatcatcher	16	37	44	18.9	25.2	12	21	20	-4.8	35.4	19	0.568	0.455	-0.113	0.212	-19.9
Gray Catbird	9	87	69	-20.7	8.3 **	4	41	22	-46.3	17.4	10	0.471	0.319	-0.152	0.092	-32.3
Black-and-white Warbler	15	40	16	-60.0	13.8 **	16	23	22	-4.3	33.3	20	0.575	1.375	0.800	0.500	139.1
Prothonotary Warbler	8	62	67	8.1	18.0	6	10	8	-20.0	58.0	8	0.161	0.119	-0.042	0.112	-26.0
Kentucky Warbler	18	87	84	-3.4	21.2	15	35	40	14.3	29.9	20	0.402	0.476	0.074	0.155	18.4
Common Yellowthroat	13	38	38	0.0	31.2	7	12	9	-25.0	45.5	13	0.316	0.237	-0.079	0.240	-25.0
Yellow-breasted Chat	9	128	131	2.3	9.5	5	37	28	-24.3	20.9	9	0.289	0.214	-0.075	0.078	-26.1
Field Sparrow	15	62	66	6.5	18.6	11	50	20	-60.0	13.8 ***	15	0.807	0.303	-0.503	0.279 *	-62.4
Northern Cardinal	42	299	461	54.2	10.8 ***	41	308	321	4.2	11.5	43	1.030	0.696	-0.334	0.151 **	-32.4
Indigo Bunting	24	213	221	3.8	12.7	16	23	23	0.0	31.8	24	0.108	0.104	-0.004	0.042	-3.6
Painted Bunting	24	274	223	-18.6	19.9	21	82	138	68.3	47.3 *	24	0.299	0.619	0.320	0.110 ***	106.8
Brown-headed Cowbird	26	34	51	50.0	36.0	9	4	5	25.0	88.9	30	0.118	0.098	-0.020	0.073	-16.7
All species pooled	**45**	**2947**	**3038**	**3.1**	**5.8**	**45**	**1514**	**1688**	**11.5**	**11.6**	**45**	**0.514**	**0.556**	**0.042**	**0.077**	**8.2**
	Number increasing: 14/23 (61%)					Number increasing: 12/23 (52%)					Number increasing: 12/23 (52%)					
NORTHEAST MAPS REGION																
Downy Woodpecker	52	67	88	31.3	24.0	48	68	70	2.9	19.5	63	1.015	0.796	-0.220	0.279	-21.6
"Traill's" Flycatcher	18	95	105	10.5	19.0	7	11	5	-54.5	20.2	18	0.116	0.048	-0.068	0.041	-58.9
Eastern Phoebe	21	26	33	26.9	30.3	21	27	51	88.9	81.1	31	1.039	1.546	0.507	0.631	48.8
White-eyed Vireo	12	35	43	22.9	22.0	8	18	8	-55.6	23.4 *	13	0.514	0.186	-0.328	0.202	-63.8
Red-eyed Vireo	53	167	186	11.4	14.8	19	21	13	-38.1	27.8	55	0.126	0.070	-0.056	0.039	-44.4
Blue Jay	29	45	44	-2.2	22.5	8	8	7	-12.5	66.9	30	0.178	0.159	-0.019	0.122	-10.5
Carolina Chickadee	15	35	29	-17.1	34.0	12	19	7	-63.2	20.7 *	16	0.543	0.241	-0.302	0.236	-55.5
Black-capped Chickadee	53	210	178	-15.2	10.4	36	106	76	-28.3	11.3 **	53	0.505	0.427	-0.078	0.133	-15.4
Tufted Titmouse	44	90	67	-25.6	10.3 **	43	110	99	-10.0	18.1	50	1.222	1.478	0.255	0.394	20.9
Carolina Wren	27	97	110	13.4	14.4	24	43	71	65.1	40.8 *	32	0.443	0.646	0.202	0.197	45.6

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
House Wren	14	56	51	-8.9	24.7	19	43	25	-41.9	24.8	21	0.768	0.490	-0.278	0.401	-36.2
Veery	39	186	218	17.2	12.6	21	33	20	-39.4	15.7 **	40	0.177	0.092	-0.086	0.038 **	-48.3
Hermit Thrush	23	87	81	-6.9	12.9	19	34	25	-26.5	22.8	27	0.391	0.309	-0.082	0.119	-21.0
Wood Thrush	46	202	283	40.1	16.8 **	27	57	58	1.8	21.7	47	0.282	0.205	-0.077	0.070	-27.4
American Robin	50	262	282	7.6	9.4	30	72	102	41.7	23.8 *	51	0.275	0.362	0.087	0.086	31.6
Gray Catbird	55	896	985	9.9	7.1	41	402	335	-16.7	10.7	56	0.449	0.340	-0.109	0.089	-24.2
Cedar Waxwing	26	171	165	-3.5	18.9	7	8	2	-75.0	29.4 *	26	0.047	0.012	-0.035	0.022	-74.1
Yellow Warbler	27	257	240	-6.6	10.2	15	52	88	69.2	39.4	28	0.202	0.367	0.164	0.105	81.2
Magnolia Warbler	15	70	71	1.4	11.9	8	17	26	52.9	68.1	15	0.243	0.366	0.123	0.133	50.8
Black-thrtd. Green Warb.	19	58	55	-5.2	10.3	8	11	8	-27.3	50.9	20	0.190	0.146	-0.044	0.116	-23.3
Black-and-white Warbler	36	61	72	18.0	24.9	18	41	26	-36.6	17.6 *	38	0.672	0.361	-0.311	0.162 *	-46.3
American Redstart	37	260	263	1.2	11.6	24	111	87	-21.6	21.9	39	0.427	0.331	-0.096	0.151	-22.5
Worm-eating Warbler	21	74	56	-24.3	20.6	10	91	50	-45.1	10.8 ***	21	1.230	0.893	-0.337	0.643	-27.4
Ovenbird	58	275	245	-10.9	7.5	33	103	73	-29.1	11.9 *	59	0.375	0.298	-0.077	0.094	-20.4
Common Yellowthroat	46	258	300	16.3	9.5 *	27	82	50	-39.0	16.7 *	47	0.318	0.167	-0.151	0.075 **	-47.6
Hooded Warbler	14	76	82	7.9	18.1	12	30	14	-53.3	19.3 *	17	0.395	0.171	-0.224	0.161	-56.7
Scarlet Tanager	26	39	40	2.6	24.8	7	19	10	-47.4	50.2	27	0.487	0.250	-0.237	0.260	-48.7
Eastern Towhee	31	83	75	-9.6	10.1	20	29	27	-6.9	21.2	33	0.349	0.360	0.011	0.109	3.0
Chipping Sparrow	20	45	41	-8.9	17.5	11	21	10	-52.4	22.7 **	22	0.467	0.244	-0.223	0.130 *	-47.7
Song Sparrow	30	200	225	12.5	13.8	25	159	109	-31.4	15.8	31	0.795	0.484	-0.311	0.181 *	-39.1
Swamp Sparrow	8	26	33	26.9	45.3	5	20	22	10.0	59.0	8	0.769	0.667	-0.103	0.445	-13.3
White-throated Sparrow	13	49	32	-34.7	12.2	10	18	13	-27.8	35.2	14	0.367	0.406	0.039	0.254	10.6
Dark-eyed Junco	14	41	44	7.3	16.5	12	71	78	9.9	49.2	15	1.732	1.773	0.041	1.281	2.4
Northern Cardinal	45	162	185	14.2	12.3	31	65	34	-47.7	13.5 ***	46	0.401	0.184	-0.218	0.074 ***	-54.2
Rose-breasted Grosbeak	25	41	36	-12.2	22.3	11	12	8	-33.3	25.7	26	0.293	0.222	-0.071	0.118	-24.1
Indigo Bunting	27	79	71	-10.1	19.9	11	19	11	-42.1	34.4	27	0.241	0.155	-0.086	0.145	-35.6
Red-winged Blackbird	16	54	37	-31.5	13.4 *	3	2	2	0.0	150.0	16	0.037	0.054	0.017	0.062	45.9
Common Grackle	18	44	41	-6.8	27.1	6	6	7	16.7	40.4	18	0.136	0.171	0.034	0.106	25.2
Baltimore Oriole	23	29	41	41.4	39.6 *	7	3	12	300.0	216.0	24	0.103	0.293	0.189	0.152	182.9
American Goldfinch	39	288	266	-7.6	10.3	1	0	1	++++		39	0.000	0.004	0.004	0.003	++++
All species pooled	**73**	**5948**	**6235**	**4.8**	**3.8**	**73**	**2273**	**1885**	**-17.1**	**5.7 *****	**73**	**0.382**	**0.302**	**-0.080**	**0.034 ****	**-20.9**
	Number increasing: 21/40 (52%)					Number decreasing: 27/40 (68%)**					Number decreasing: 27/40 (68%)**					
SOUTHEAST MAPS REGION																
Downy Woodpecker	45	59	61	3.4	20.3	44	84	60	-28.6	13.1 **	57	1.424	0.984	-0.440	0.324	-30.9

TABLE 1. Continued.

Species	ADULTS n[a]	2001	2002	%chg.	SE[b]	YOUNG n[c]	2001	2002	%chg.	SE[d]	REPRODUCTIVE INDEX n[e]	2001	2002	change	SE[f]	%chg.
Acadian Flycatcher	53	305	274	-10.2	7.5	22	19	21	10.5	37.2	53	0.062	0.077	0.014	0.027	23.0
White-eyed Vireo	42	141	139	-1.4	11.8	28	57	53	-7.0	21.5	45	0.404	0.381	-0.023	0.141	-5.7
Red-eyed Vireo	54	268	256	-4.5	10.8	19	21	11	-47.6	25.2	54	0.078	0.043	-0.035	0.028	-45.2
Blue Jay	42	51	39	-23.5	15.9	11	8	9	12.5	66.1	43	0.157	0.231	0.074	0.123	47.1
Carolina Chickadee	60	104	109	4.8	15.1	45	112	89	-20.5	16.5	64	1.077	0.816	-0.260	0.295	-24.2
Tufted Titmouse	63	162	182	12.3	11.9	56	189	153	-19.0	10.1 *	64	1.167	0.841	-0.326	0.165 **	-27.9
Carolina Wren	61	290	290	0.0	9.1	64	261	234	-10.3	11.0	68	0.900	0.807	-0.093	0.174	-10.3
Wood Thrush	55	419	507	21.0	8.3 ***	45	119	110	-7.6	15.9	55	0.284	0.217	-0.067	0.063	-23.6
American Robin	18	60	56	-6.7	19.6	13	45	38	-15.6	38.0	20	0.750	0.679	-0.071	0.456	-9.5
Gray Catbird	31	139	125	-10.1	11.1	16	63	82	30.2	30.4	36	0.453	0.656	0.203	0.326	44.7
Brown Thrasher	26	34	48	41.2	33.7	17	24	14	-41.7	16.8 **	28	0.706	0.292	-0.414	0.211 **	-58.7
Blue-winged Warbler	10	34	33	-2.9	22.0	9	18	16	-11.1	61.5	11	0.529	0.485	-0.045	0.363	-8.4
Northern Parula	16	44	36	-18.2	13.0	7	6	14	133.3	93.7	18	0.136	0.389	0.253	0.184	185.2
Prairie Warbler	17	74	60	-18.9	18.9	15	32	14	-56.3	14.5 **	19	0.432	0.233	-0.199	0.117	-46.0
Black-and-white Warbler	24	33	55	66.7	37.2 **	15	16	19	18.8	52.6	28	0.485	0.346	-0.139	0.215	-28.8
Worm-eating Warbler	28	68	62	-8.8	16.8	20	27	26	-3.7	29.5	32	0.397	0.419	0.022	0.118	5.6
Ovenbird	52	240	255	6.3	11.7	43	153	164	7.2	16.0	56	0.638	0.643	0.006	0.162	0.9
Louisiana Waterthrush	33	56	70	25.0	16.8	24	57	43	-24.6	20.4	38	1.018	0.614	-0.404	0.269	-39.6
Kentucky Warbler	37	194	197	1.5	9.0	30	106	87	-17.9	13.0	38	0.546	0.442	-0.105	0.096	-19.2
Common Yellowthroat	45	207	205	-1.0	10.4	26	70	49	-30.0	14.2	49	0.338	0.239	-0.099	0.078	-29.3
Hooded Warbler	39	102	98	-3.9	8.9	20	29	20	-31.0	22.8	41	0.284	0.204	-0.080	0.099	-28.2
Yellow-breasted Chat	25	101	84	-16.8	9.4	11	23	23	0.0	43.7	26	0.228	0.274	0.046	0.101	20.2
Summer Tanager	36	44	49	11.4	23.9	6	6	1	-83.3	20.2 **	37	0.136	0.020	-0.116	0.074	-85.0
Eastern Towhee	34	41	54	31.7	22.3	20	19	13	-31.6	28.9	38	0.463	0.241	-0.223	0.147	-48.1
Field Sparrow	12	45	41	-8.9	15.7	7	8	7	-12.5	57.7	12	0.178	0.171	-0.007	0.096	-4.0
Northern Cardinal	66	432	451	4.4	8.0	54	202	136	-32.7	13.1 *	66	0.468	0.302	-0.166	0.100 *	-35.5
Indigo Bunting	44	221	228	3.2	12.2	21	28	26	-7.1	36.6	44	0.127	0.114	-0.013	0.049	-10.0
Common Grackle	17	37	42	13.5	42.6	6	17	3	-82.4	14.5 ***	18	0.460	0.071	-0.388	0.272	-84.5
American Goldfinch	20	96	96	0.0	16.6	1	2	0	-100.0		20	0.021	0.000	-0.021	0.023	-100.0
All species pooled	**69**	**4494**	**4663**	**3.8**	**2.5**	**69**	**2008**	**1689**	**-15.9**	**5.0 *** **	**69**	**0.447**	**0.362**	**-0.085**	**0.038 ****	**-18.9**
	Number increasing: 14/30 (47%)					Number decreasing: 23/30 (77%)***					Number decreasing: 23/30 (77%)***					
ALASKA AND BOREAL CANADA MAPS REGIONS																
Ruby-crowned Kinglet	6	33	16	-51.5	14.1	4	17	11	-35.3	31.2	6	0.515	0.688	0.172	0.297	33.5
Swainson's Thrush	9	44	47	6.8	20.0	8	13	13	0.0	49.3	11	0.296	0.277	-0.019	0.115	-6.4

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2001	2002	%chg.	SE[b]	n[c]	2001	2002	%chg.	SE[d]	n[e]	2001	2002	change	SE[f]	%chg.
Orange-crowned Warbler	6	44	49	11.4	39.8	5	44	50	13.6	15.1	6	1.000	1.020	0.020	0.885	2.0
Yellow-rumped Warbler	11	38	42	10.5	33.5	11	22	17	-22.7	40.3	12	0.579	0.405	-0.174	0.188	-30.1
American Redstart	5	43	42	-2.3	29.8	3	10	13	30.0	139.4	5	0.233	0.310	0.077	0.196	33.1
Wilson's Warbler	7	69	58	-15.9	20.6	7	108	83	-23.1	20.7	7	1.565	1.431	-0.134	0.842	-8.6
White-crowned Sparrow	3	33	21	-36.4	12.5	3	84	51	-39.3	16.3	3	2.546	2.429	-0.117	0.887	-4.6
Dark-eyed Junco	5	22	28	27.3	50.5	7	30	45	50.0	92.0	7	1.364	1.607	0.244	1.107	17.9
All species pooled	**12**	**712**	**669**	**-6.0**	**10.8**	**12**	**506**	**500**	**-1.2**	**20.7**	**12**	**0.711**	**0.747**	**0.037**	**0.340**	**5.2**
	Number decreasing: 4/8 (50%)					Number decreasing: 4/8 (50%)					Number increasing: 4/8 (50%)					

[a] Number of stations at which at least one individual adult bird of the species was captured in either year.
[b] Standard error of the percent change in the number of adult birds captured.
[c] Number of stations at which at least one individual young bird of the species was captured in either year.
[d] Standard error of the percent change in the number of young birds captured.
[e] Number of stations at which at least one individual aged bird of the species was captured in either year.
[f] Standard error of the change in the reproductive index.
++++ Percent change undefined because no young were captured during the first year of the comparison.
* $0.05 \leq P < 0.10$; ** $0.01 \leq P < 0.05$; *** $P < 0.01$

Region, and <50% in North-central and Southeast regions; the proportions for the Southwest (76%) and Northwest (65%) regions were highly significantly and significantly >50%, respectively. Summing over these two regions, 16 species had significant increases in numbers of adults and another nine species had nearly significant increases, while only four species showed significant or nearly significant decreases. Summing over the remaining five regions, nine species had significant or nearly significant increases in numbers of adults, while five species showed significant or nearly significant decreases in numbers of adults.

Program-wide, the index for adult population size for all species pooled increased by a highly significant 8.3%. The program-wide proportion of increasing species (63%) was also highly significantly >50%. Program-wide, 13 species had significant increases in numbers of adults and another 11 species had nearly significant increases, while only eight species showed significant or nearly significant decreases.

(b) *Changes in productivity* — Overall, productivity decreased dramatically between 2001 and 2002 in five of the seven regions. The numbers of young birds of all species pooled showed a significant decrease of -11.0% in the Northwest, highly significant decreases ranging from -15.9% and -17.1% in the Southeast and Northeast, respectively, to -29.0% and -48.8% in the North-central and Southwest, respectively, and a non-significant decrease of 1.2% in Alaska/Boreal Canada. The only increase in numbers of young birds of all species pooled was a non-significant increase of 11.5% in the South-central Region. Changes in reproductive index for all species pooled generally paralleled changes in numbers of young with a highly significant -61.6% decrease in the Southwest, significant -30.1%, -20.9%, and -18.9% decreases in the North-Central, Northeast, and Southeast regions, respectively, and a nearly significant -14.7% decrease in the Northwest. Only the South-central and Alaska/Boreal Canada regions saw increases in reproductive index for all species pooled (of 8.2% and 5.2%, respectively) and these were both non-significant. Proportions of species with decreasing numbers of young ranged from 48% (South-central) to 77% (Southeast) for the seven regions and were highly significantly >50% for the Southeast and Southwest regions, significantly >50% for the North-central and Northeast regions, and nearly significantly >50% for the Northwest region. Similarly, proportions of species with decreasing reproductive indices ranged from 48% (South-central) to 89% (Southwest) for the seven regions and were highly significantly >50% for the Southeast and Southwest regions, significantly >50% for the North-central, Northeast, and Northwest regions. Summing over the seven regions, 37 species showed significant regional decreases in numbers of young and another 20 species had nearly significant decreases, while only seven species showed significant or nearly significant increases. Similarly, again summing over the seven regions, 30 species showed significant regional decreases in reproductive index and another 14 species had nearly significant decreases, while only three species showed significant or nearly significant increases.

Program-wide, the number of young for all species pooled decreased by a highly significant -19.4% while the reproductive index for all species pooled decreased by a highly significant -25.6% from 0.515 in 2001 to 0.383 in 2002. The program-wide proportions of species with decreasing numbers of young (72%) and decreasing reproductive indices (78%) were both also highly significantly >50%. Program-wide, 26 species had significant decreases in numbers of young and another 11 species had nearly significant decreases, while no species had a significant increase and only six showed nearly significant increases. Similarly, and again program-wide, 22 species had significant decreases in numbers of young and another five species had nearly significant decreases, while only two species showed significant or nearly significant increases.

2. *Changes between 2002 and 2003* — Constant-effort data on the numbers of adult and young birds captured and the proportion of young in the catch were obtained for 2002 and 2003 from 349 MAPS stations that were operated comparably in both years. The changes between 2002 and 2003 in these numbers and proportions are presented for the entire continent (program-wide) and for each region in Table 2 for those species that met the productivity selection criteria (see Methods – Data Analysis) and for all species pooled. These included 128 species

TABLE 2. Program-wide and regional changes between 2002 and 2003 in the numbers of adult and young individuals captured and in the reproductive index (young/adult) for 128 species and all species pooled (excluding gallinaceous birds and hummingbirds) at the 349 MAPS stations run comparably during both years. For each species, data were included only from stations within the breeding range of the species. Only species for which adults were captured at two or more stations and for which 50 or more aged individuals were captured in either year are included

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
PROGRAM-WIDE																
Common Ground-Dove	10	48	57	18.8	43.8	3	2	12	500.0	755.0	10	0.042	0.211	0.169	0.072 **	405.3
Red-bellied Woodpecker	43	43	28	-34.9	13.9 *	13	9	4	-55.6	27.8	48	0.209	0.143	-0.066	0.101	-31.7
Red-naped Sapsucker	34	53	64	20.8	13.1 *	21	16	43	168.8	63.3 ***	36	0.302	0.672	0.370	0.158 **	122.6
Red-breasted Sapsucker	51	126	137	8.7	12.6	32	73	47	-35.6	16.2 *	52	0.579	0.343	-0.236	0.110 **	-40.8
Nuttall's Woodpecker	23	42	40	-4.8	27.4	21	37	38	2.7	23.3	25	0.881	0.950	0.069	0.403	7.8
Downy Woodpecker	178	241	231	-4.1	10.0	144	253	219	-13.4	8.7	199	1.050	0.948	-0.102	0.152	-9.7
Hairy Woodpecker	118	105	80	-23.8	11.4 *	50	30	31	3.3	26.7	142	0.286	0.388	0.102	0.108	35.6
Northern Flicker	90	81	78	-3.7	16.7	52	42	37	-11.9	22.1	110	0.519	0.474	-0.044	0.147	-8.5
Western Wood-Pewee	91	249	254	2.0	10.9	41	32	47	46.9	36.8	94	0.129	0.185	0.057	0.046	44.0
Eastern Wood-Pewee	55	86	68	-20.9	11.1 *	11	8	15	87.5	111.4	57	0.093	0.221	0.128	0.158	137.1
Acadian Flycatcher	49	206	199	-3.4	10.6	16	26	9	-65.4	9.3 ***	52	0.126	0.045	-0.081	0.038 **	-64.2
"Traill's" Flycatcher	123	459	403	-12.2	8.3	37	22	48	118.2	68.0 **	123	0.048	0.119	0.071	0.026 ***	148.5
Least Flycatcher	28	82	61	-25.6	14.9	13	11	14	27.3	72.3	31	0.134	0.230	0.095	0.092	71.1
Hammond's Flycatcher	66	143	130	-9.1	16.2	27	29	42	44.8	58.1	68	0.203	0.323	0.120	0.126	59.3
Dusky Flycatcher	75	366	305	-16.7	8.4 *	28	39	48	23.1	35.9	76	0.107	0.157	0.051	0.039	47.7
"Western" Flycatcher	93	324	264	-18.5	8.9 *	62	110	103	-6.4	14.3	100	0.340	0.390	0.051	0.094	14.9
Black Phoebe	27	37	42	13.5	25.3	36	51	69	35.3	38.2	38	1.378	1.643	0.265	0.601	19.2
Eastern Phoebe	43	55	41	-25.5	19.3	35	94	33	-64.9	9.4 ***	56	1.709	0.805	-0.904	0.441 **	-52.9
Ash-throated Flycatcher	46	162	134	-17.3	12.4	13	8	24	200.0	156.1	47	0.049	0.179	0.130	0.045 ***	262.7
White-eyed Vireo	57	291	273	-6.2	8.3	42	76	82	7.9	21.8	61	0.261	0.300	0.039	0.064	15.0
Bell's Vireo	12	40	49	22.5	18.3	8	9	17	88.9	75.2	13	0.225	0.347	0.122	0.162	54.2
Cassin's Vireo	45	76	83	9.2	16.7	25	19	34	78.9	50.1 **	53	0.250	0.410	0.160	0.109	63.9
Warbling Vireo	136	615	577	-6.2	7.4	57	56	85	51.8	34.8 *	142	0.091	0.147	0.056	0.031 *	61.8
Red-eyed Vireo	114	407	377	-7.4	7.9	25	23	18	-21.7	27.5	114	0.057	0.048	-0.009	0.022	-15.5
Blue Jay	65	83	92	10.8	20.2	28	22	38	72.7	66.3	70	0.265	0.413	0.148	0.123	55.8
Tree Swallow	29	44	51	15.9	25.7	9	4	7	75.0	124.0	32	0.091	0.137	0.046	0.085	51.0
Cliff Swallow	10	47	38	-19.1	48.3	2	3	0	-100.0	0.0	11	0.064	0.000	-0.064	0.044	-100.0
Carolina Chickadee	66	154	107	-30.5	11.3 **	50	120	62	-48.3	11.0 ***	73	0.779	0.579	-0.200	0.179	-25.6
Black-capped Chickadee	116	437	450	3.0	8.3	101	317	391	23.3	15.0 *	127	0.725	0.869	0.144	0.140	19.8
Mountain Chickadee	50	161	188	16.8	14.0	40	146	109	-25.3	20.5	55	0.907	0.580	-0.327	0.230	-36.1
Chestnut-backed Chick.	53	165	144	-12.7	9.8	40	147	154	4.8	27.4	55	0.891	1.069	0.179	0.327	20.0

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Oak Titmouse	15	39	32	-17.9	24.2	11	39	27	-30.8	23.9	16	1.000	0.844	-0.156	0.380	-15.6
Tufted Titmouse	104	250	200	-20.0	8.1 **	87	271	163	-39.9	8.2 ***	111	1.084	0.815	-0.269	0.169	-24.8
Black-crested Titmouse	9	25	22	-12.0	33.4	7	46	25	-45.7	17.7 **	9	1.840	1.136	-0.704	0.692	-38.2
Bushtit	64	353	182	-48.4	9.9 ***	54	270	168	-37.8	15.2 *	70	0.765	0.923	0.158	0.276	20.7
Red-breasted Nuthatch	63	88	70	-20.5	13.3	44	73	97	32.9	48.2	74	0.830	1.386	0.556	0.450	67.0
White-breasted Nuthatch	60	80	58	-27.5	14.5 *	36	25	19	-24.0	25.9	79	0.313	0.328	0.015	0.124	4.8
Brown Creeper	61	72	89	23.6	17.2	68	80	101	26.3	19.9	86	1.111	1.135	0.024	0.287	2.1
Carolina Wren	84	397	285	-28.2	5.9 ***	79	357	209	-41.5	7.6 ***	93	0.899	0.733	-0.166	0.158	-18.5
Bewick's Wren	75	348	362	4.0	8.9	76	443	461	4.1	13.1	83	1.273	1.274	0.001	0.263	0.0
House Wren	94	463	488	5.4	7.7	93	366	370	1.1	11.7	109	0.791	0.758	-0.032	0.155	-4.1
Winter Wren	32	66	84	27.3	16.4	31	27	73	170.4	80.2 ***	43	0.409	0.869	0.460	0.248 *	112.4
Marsh Wren	8	8	5	-37.5	43.8	10	15	45	200.0	71.7 **	13	1.875	9.000	7.125	2.402 **	380.0
Golden-crowned Kinglet	49	124	113	-8.9	15.5	36	198	279	40.9	47.2	59	1.597	2.469	0.872	1.086	54.6
Ruby-crowned Kinglet	32	87	157	80.5	40.3 **	20	43	63	46.5	32.6	34	0.494	0.401	-0.093	0.239	-18.8
Blue-gray Gnatcatcher	39	60	52	-13.3	17.3	24	17	44	158.8	84.7 **	49	0.283	0.846	0.563	0.310 *	198.6
Eastern Bluebird	25	39	24	-38.5	16.5 *	15	41	17	-58.5	19.7	29	1.051	0.708	-0.343	0.445	-32.6
Veery	54	304	260	-14.5	7.1 *	32	38	47	23.7	36.6	54	0.125	0.181	0.056	0.048	44.6
Swainson's Thrush	116	1353	1185	-12.4	5.3 **	73	175	210	20.0	16.3	118	0.129	0.177	0.048	0.030	37.0
Hermit Thrush	69	152	123	-19.1	9.0 *	47	54	47	-13.0	21.9	81	0.355	0.382	0.027	0.092	7.6
Wood Thrush	84	506	391	-22.7	5.7 ***	60	110	121	10.0	16.6	86	0.217	0.310	0.092	0.048 *	42.4
American Robin	221	949	963	1.5	6.3	139	337	398	18.1	15.3	231	0.355	0.413	0.058	0.064	16.4
Wrentit	41	460	293	-36.3	8.2 **	40	174	406	133.3	65.4 ***	43	0.378	1.386	1.007	0.271 ***	266.3
Gray Catbird	116	1614	1505	-6.8	4.5	80	591	752	27.2	14.9 **	120	0.366	0.500	0.134	0.078 *	36.5
Brown Thrasher	43	68	63	-7.4	18.7	29	28	26	-7.1	30.5	51	0.412	0.413	0.001	0.146	0.2
Cedar Waxwing	86	478	417	-12.8	9.7	14	11	31	181.8	160.1	87	0.023	0.074	0.051	0.025 **	223.0
Blue-winged Warbler	24	79	56	-29.1	13.9 **	11	12	11	-8.3	36.8	24	0.152	0.196	0.045	0.071	29.3
Tennessee Warbler	14	29	57	96.6	116.8	6	26	51	96.2	16.3 *	14	0.897	0.895	-0.002	1.132	-0.2
Orange-crowned Warbler	68	272	242	-11.0	15.0	51	144	199	38.2	43.9	74	0.529	0.822	0.293	0.276	55.3
Nashville Warbler	38	112	109	-2.7	18.7	26	121	47	-61.2	13.7 **	42	1.080	0.431	-0.649	0.379 *	-60.1
Virginia's Warbler	12	71	81	14.1	25.6	8	38	38	0.0	25.8	13	0.535	0.469	-0.066	0.229	-12.3
Lucy's Warbler	13	115	103	-10.4	19.5	10	23	46	100.0	106.9	13	0.200	0.447	0.247	0.153	123.3
Northern Parula	23	22	43	95.5	63.3 *	13	10	15	50.0	85.2	28	0.455	0.349	-0.106	0.276	-23.3
Yellow Warbler	150	1549	1429	-7.7	5.0	97	430	599	39.3	17.8 **	155	0.278	0.419	0.142	0.052 ***	51.0
Chestnut-sided Warbler	22	72	73	1.4	17.6	7	25	15	-40.0	16.3 **	22	0.347	0.206	-0.142	0.167	-40.8
Magnolia Warbler	16	45	47	4.4	30.3	8	18	10	-44.4	32.1	16	0.400	0.213	-0.187	0.163	-46.8

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Yellow-rumped Warbler	95	522	428	-18.0	7.3 **	54	473	271	-42.7	30.8	96	0.906	0.633	-0.273	0.467	-30.1
Black-thrtd Green Warb.	19	42	27	-35.7	14.6 *	9	12	10	-16.7	31.7	23	0.286	0.370	0.085	0.281	29.6
Townsend's Warbler	23	111	88	-20.7	12.8	13	65	130	100.0	79.2	23	0.586	1.477	0.892	0.658	152.3
Hermit Warbler	35	140	135	-3.6	19.0	24	128	36	-71.9	13.9 ***	37	0.914	0.267	-0.648	0.314 **	-70.8
Prairie Warbler	17	70	56	-20.0	14.1	13	21	28	33.3	32.3	20	0.300	0.500	0.200	0.151	66.7
Black-and-white Warbler	68	127	134	5.5	14.7	40	51	59	15.7	30.1	78	0.402	0.440	0.039	0.120	9.6
American Redstart	73	376	348	-7.4	11.9	34	91	92	1.1	18.8	78	0.242	0.264	0.022	0.072	9.2
Prothonotary Warbler	18	107	110	2.8	18.4	9	23	24	4.3	76.8	18	0.215	0.218	0.003	0.137	1.5
Worm-eating Warbler	50	111	124	11.7	16.3	26	63	56	-11.1	19.3	53	0.568	0.452	-0.116	0.237	-20.4
Ovenbird	102	405	341	-15.8	7.2 **	65	135	151	11.9	18.7	108	0.333	0.443	0.110	0.082	32.8
Northern Waterthrush	21	36	39	8.3	27.0	14	10	14	40.0	63.7	28	0.278	0.359	0.081	0.199	29.2
Louisiana Waterthrush	43	80	83	3.8	14.4	27	49	45	-8.2	18.8	46	0.612	0.542	-0.070	0.192	-11.5
Kentucky Warbler	32	145	150	3.4	13.8	22	54	39	-27.8	21.0	34	0.372	0.260	-0.112	0.100	-30.2
MacGillivray's Warbler	117	965	797	-17.4	4.8 ***	82	248	347	39.9	14.9 ***	124	0.257	0.435	0.178	0.055 ***	69.4
Common Yellowthroat	174	1370	1173	-14.4	4.3 ***	103	415	593	42.9	25.1 *	179	0.303	0.506	0.203	0.107 *	66.9
Hooded Warbler	40	167	154	-7.8	10.5	24	45	44	-2.2	18.9	42	0.270	0.286	0.016	0.118	6.0
Wilson's Warbler	102	854	687	-19.6	8.5 **	57	223	312	39.9	19.3 **	105	0.261	0.454	0.193	0.110 *	73.9
Canada Warbler	15	33	42	27.3	33.6	13	12	20	66.7	43.8 *	20	0.364	0.476	0.113	0.190	31.0
Yellow-breasted Chat	71	480	386	-19.6	6.7 **	37	95	72	-24.2	15.0	73	0.198	0.187	-0.011	0.062	-5.8
Summer Tanager	48	128	137	7.0	15.9	15	8	14	75.0	82.0	49	0.063	0.102	0.040	0.041	63.5
Scarlet Tanager	45	57	57	0.0	19.1	10	13	11	-15.4	60.3	49	0.228	0.193	-0.035	0.171	-15.4
Western Tanager	106	347	276	-20.5	8.4 **	47	115	162	40.9	49.9	111	0.331	0.587	0.256	0.186	77.1
Green-tailed Towhee	26	69	60	-13.0	15.6	19	47	32	-31.9	23.4	31	0.681	0.533	-0.148	0.271	-21.7
Spotted Towhee	83	510	451	-11.6	7.1	72	285	301	5.6	23.6	90	0.559	0.667	0.109	0.153	19.4
Eastern Towhee	66	123	118	-4.1	12.5	35	40	36	-10.0	23.2	71	0.325	0.305	-0.020	0.094	-6.2
California Towhee	26	122	65	-46.7	12.6 **	18	7	67	857.1	518.8	28	0.057	1.031	0.973	0.236 ***	1696.5
Rufous-crowned Sparrow	15	38	25	-34.2	19.6	10	14	28	100.0	127.8	16	0.368	1.120	0.752	0.575	204.0
Chipping Sparrow	97	239	225	-5.9	10.5	51	70	111	58.6	31.7 **	105	0.293	0.493	0.200	0.116 *	68.4
Clay-colored Sparrow	4	66	58	-12.1	3.1 *	3	15	41	173.3	50.7 *	5	0.227	0.707	0.480	0.283	211.0
Brewer's Sparrow	21	61	45	-26.2	22.0	19	46	33	-28.3	26.8	26	0.754	0.733	-0.021	0.300	-2.8
Field Sparrow	41	169	139	-17.8	11.4	25	39	50	28.2	29.0	42	0.231	0.360	0.129	0.134	55.9
Savannah Sparrow	13	98	60	-38.8	5.7 ***	7	12	11	-8.3	60.6	14	0.122	0.183	0.061	0.151	49.7
Grasshopper Sparrow	6	48	43	-10.4	33.3	5	78	37	-52.6	22.3	7	1.625	0.860	-0.765	0.647	-47.0
Fox Sparrow	38	105	83	-21.0	12.0	15	15	17	13.3	59.3	41	0.143	0.205	0.062	0.089	43.4
Song Sparrow	191	1867	1672	-10.4	3.9 **	191	1319	1573	19.3	9.6 **	206	0.707	0.941	0.234	0.088 ***	33.2

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Lincoln's Sparrow	51	268	236	-11.9	7.8	41	109	104	-4.6	23.7	56	0.407	0.441	0.034	0.118	8.3
Swamp Sparrow	16	60	42	-30.0	13.8	9	39	50	28.2	36.5	19	0.650	1.191	0.541	0.364	83.1
White-throated Sparrow	15	55	70	27.3	26.0	10	16	18	12.5	52.5	15	0.291	0.257	-0.034	0.143	-11.6
White-crowned Sparrow	21	80	75	-6.3	12.1	15	35	53	51.4	51.5	24	0.438	0.707	0.269	0.217	61.5
Dark-eyed Junco	96	819	590	-28.0	3.7 ***	93	560	547	-2.3	15.4	108	0.684	0.927	0.243	0.168	35.6
Northern Cardinal	129	882	797	-9.6	6.1	97	367	326	-11.2	11.2	130	0.416	0.409	-0.007	0.065	-1.7
Rose-breasted Grosbeak	31	79	69	-12.7	15.4	13	15	14	-6.7	34.2	34	0.190	0.203	0.013	0.113	6.9
Black-headed Grosbeak	122	495	455	-8.1	8.4	75	117	169	44.4	31.4	129	0.236	0.371	0.135	0.102	57.1
Blue Grosbeak	31	94	111	18.1	22.0	6	3	11	266.7	247.7	31	0.032	0.099	0.067	0.036 *	210.5
Lazuli Bunting	83	237	225	-5.1	11.9	30	53	59	11.3	31.0	85	0.224	0.262	0.039	0.086	17.3
Indigo Bunting	84	418	387	-7.4	9.4	32	49	29	-40.8	19.1	86	0.117	0.075	-0.042	0.033	-36.1
Painted Bunting	20	150	154	2.7	9.3	16	74	37	-50.0	9.2 ***	21	0.493	0.240	-0.253	0.091 ***	-51.3
Dickcissel	6	81	66	-18.5	42.2	3	0	5	++++		6	0.000	0.076	0.076	0.027 **	++++
Red-winged Blackbird	70	284	316	11.3	12.0	22	28	32	14.3	68.1	72	0.099	0.101	0.003	0.051	2.7
Common Grackle	50	93	93	0.0	22.2	14	13	17	30.8	66.8	51	0.140	0.183	0.043	0.083	30.8
Brown-headed Cowbird	155	287	284	-1.0	9.9	52	23	52	126.1	61.7 ***	166	0.080	0.183	0.103	0.042 **	128.5
Orchard Oriole	15	41	51	24.4	23.7	6	6	5	-16.7	91.4	16	0.146	0.098	-0.048	0.101	-33.0
Bullock's Oriole	60	183	176	-3.8	12.9	27	51	54	5.9	42.8	64	0.279	0.307	0.028	0.115	10.1
Baltimore Oriole	41	74	64	-13.5	20.1	19	34	28	-17.6	64.0	44	0.460	0.438	-0.022	0.338	-4.8
Purple Finch	49	221	237	7.2	13.2	33	100	54	-46.0	9.6 ***	54	0.453	0.228	-0.225	0.077 ***	-49.6
Cassin's Finch	34	47	80	70.2	53.3	13	11	17	54.5	61.2	34	0.234	0.213	-0.022	0.116	-9.2
House Finch	61	259	194	-25.1	11.0 *	45	245	178	-27.3	15.9	70	0.946	0.918	-0.028	0.285	-3.0
Pine Siskin	48	132	172	30.3	25.5	23	93	167	79.6	88.2	50	0.705	0.971	0.266	0.477	37.8
Lesser Goldfinch	42	187	156	-16.6	19.9	28	47	85	80.9	43.2 **	46	0.251	0.545	0.294	0.199	116.8
American Goldfinch	132	964	755	-21.7	5.2 ***	18	17	24	41.2	53.9	133	0.018	0.032	0.014	0.013	80.3
Evening Grosbeak	14	89	136	52.8	22.1	5	4	7	75.0	125.0	14	0.045	0.052	0.007	0.027	14.5
House Sparrow	13	18	35	94.4	46.9 *	4	29	16	-44.8	19.6	14	1.611	0.457	-1.154	0.488 **	-71.6
All species pooled	**349**	**34130**	**30624**	**-10.3**	**1.6 *** **	**348**	**13331**	**14547**	**9.1**	**5.4 *** **	**349**	**0.391**	**0.475**	**0.084**	**0.028 *** **	**21.6**
	Number decreasing:86/128 (67%)***					Number increasing: 78/128 (61%)***					Number increasing: 84/128 (66%)***					
NORTHWEST MAPS REGION																
Red-naped Sapsucker	34	53	64	20.8	13.1 *	21	16	43	168.8	63.3 ***	36	0.302	0.672	0.370	0.158 **	122.6
Red-breasted Sapsucker	51	126	137	8.7	12.6	32	73	47	-35.6	16.2 *	52	0.579	0.343	-0.236	0.110 **	-40.8
Downy Woodpecker	52	53	67	26.4	23.4	33	38	38	0.0	24.8	56	0.717	0.567	-0.150	0.206	-20.9
Hairy Woodpecker	52	40	32	-20.0	17.9	25	18	11	-38.9	23.2	63	0.450	0.344	-0.106	0.176	-23.6

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Northern Flicker	36	31	40	29.0	36.9	27	19	22	15.8	37.6	49	0.613	0.550	-0.063	0.265	-10.3
Western Wood-Pewee	65	184	201	9.2	14.2	35	28	43	53.6	42.0	67	0.152	0.214	0.062	0.056	40.6
"Traill's" Flycatcher	69	252	239	-5.2	10.7	21	15	27	80.0	78.7	69	0.060	0.113	0.053	0.037	89.8
Hammond's Flycatcher	63	125	130	4.0	15.0	27	29	42	44.8	58.1	65	0.232	0.323	0.091	0.130	39.3
Dusky Flycatcher	67	306	280	-8.5	7.8	25	33	46	39.4	43.7	68	0.108	0.164	0.056	0.043	52.3
"Western" Flycatcher	59	156	160	2.6	13.2	43	63	55	-12.7	18.0	65	0.404	0.344	-0.060	0.108	-14.9
Cassin's Vireo	44	74	83	12.2	17.0	25	19	34	78.9	50.1 **	52	0.257	0.410	0.153	0.110	59.5
Warbling Vireo	96	498	472	-5.2	8.2	37	38	52	36.8	38.1	97	0.076	0.110	0.034	0.028	44.4
Black-capped Chickadee	43	173	162	-6.4	10.6	43	130	193	48.5	27.1 **	48	0.751	1.191	0.440	0.236 *	58.5
Mountain Chickadee	48	160	187	16.9	14.1	38	142	109	-23.2	21.4	53	0.888	0.583	-0.305	0.230	-34.3
Chestnut-backed Chick.	44	129	119	-7.8	11.7	31	73	93	27.4	39.6	46	0.566	0.781	0.216	0.245	38.1
Bushtit	26	62	61	-1.6	31.4	21	102	46	-54.9	25.7	30	1.645	0.754	-0.891	0.365 **	-54.2
Red-breasted Nuthatch	58	85	66	-22.4	13.4	42	72	94	30.6	48.3	68	0.847	1.424	0.577	0.471	68.1
Brown Creeper	51	63	82	30.2	19.1 *	60	77	96	24.7	20.1	71	1.222	1.171	-0.052	0.319	-4.2
Bewick's Wren	20	65	49	-24.6	14.7	21	95	86	-9.5	17.2	25	1.462	1.755	0.294	0.665	20.1
House Wren	27	154	143	-7.1	10.8	33	128	141	10.2	19.3	36	0.831	0.986	0.155	0.248	18.6
Winter Wren	26	62	80	29.0	16.6 *	26	27	68	151.9	76.6 ***	34	0.436	0.850	0.415	0.258	95.2
Golden-crowned Kinglet	42	110	105	-4.5	17.0	34	196	279	42.3	47.7	51	1.782	2.657	0.875	1.156	49.1
Ruby-crowned Kinglet	28	84	155	84.5	42.0 **	18	43	60	39.5	30.2 *	29	0.512	0.387	-0.125	0.244	-24.4
Swainson's Thrush	83	1019	941	-7.7	5.3	56	116	143	23.3	23.6	84	0.114	0.152	0.038	0.032	33.5
Hermit Thrush	37	63	62	-1.6	16.3	26	22	28	27.3	37.9	44	0.349	0.452	0.102	0.137	29.3
American Robin	114	516	537	4.1	7.1	66	130	176	35.4	27.0	118	0.252	0.328	0.076	0.069	30.1
Wrentit	17	54	65	20.4	20.9	17	58	61	5.2	24.3	19	1.074	0.939	-0.136	0.260	-12.6
Gray Catbird	17	166	224	34.9	20.7	13	49	87	77.6	45.5	17	0.295	0.388	0.093	0.135	31.6
Cedar Waxwing	38	243	200	-17.7	11.0	10	8	24	200.0	200.7	39	0.033	0.120	0.087	0.039 **	264.5
Orange-crowned Warbler	45	156	153	-1.9	20.1	30	94	92	-2.1	20.4	50	0.603	0.601	-0.001	0.262	-0.2
Nashville Warbler	26	89	74	-16.9	12.2	21	90	24	-73.3	8.0 ***	29	1.011	0.324	-0.687	0.367 *	-67.9
Virginia's Warbler	5	41	57	39.0	46.2	4	23	31	34.8	28.8	6	0.561	0.544	-0.017	0.332	-3.1
Yellow Warbler	71	957	943	-1.5	7.6	53	306	404	32.0	18.2 *	73	0.320	0.428	0.109	0.066 *	34.0
Yellow-rumped Warbler	75	483	394	-18.4	7.6 **	47	465	191	-58.9	20.4 ***	76	0.963	0.485	-0.478	0.480	-49.6
Townsend's Warbler	22	110	88	-20.0	12.9	13	65	130	100.0	79.2	22	0.591	1.477	0.886	0.659	150.0
Hermit Warbler	35	140	135	-3.6	19.0	24	128	36	-71.9	13.9 ***	37	0.914	0.267	-0.648	0.314 **	-70.8
American Redstart	12	79	64	-19.0	16.7	9	12	19	58.3	112.1	13	0.152	0.297	0.145	0.133	95.4
MacGillivray's Warbler	99	900	767	-14.8	4.7 ***	79	246	342	39.0	14.8 ***	104	0.273	0.446	0.173	0.057 ***	63.1
Common Yellowthroat	39	265	233	-12.1	10.6	21	137	200	46.0	55.2	40	0.517	0.858	0.341	0.449	66.0

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Wilson's Warbler	85	637	541	-15.1	10.4	47	99	147	48.5	36.0	88	0.155	0.272	0.116	0.071	74.8
Yellow-breasted Chat	21	99	111	12.1	13.3	12	43	26	-39.5	23.6	22	0.434	0.234	-0.200	0.188	-46.1
Western Tanager	90	296	245	-17.2	8.8 *	44	110	118	7.3	33.7	94	0.372	0.482	0.110	0.144	29.6
Green-tailed Towhee	22	62	59	-4.8	17.1	18	45	27	-40.0	21.1	27	0.726	0.458	-0.268	0.280	-36.9
Spotted Towhee	42	204	198	-2.9	9.4	41	132	146	10.6	16.1	49	0.647	0.737	0.090	0.196	14.0
Chipping Sparrow	51	153	149	-2.6	14.2	28	53	84	58.5	37.8 *	55	0.346	0.564	0.217	0.157	62.7
Brewer's Sparrow	17	55	43	-21.8	24.2	17	46	31	-32.6	25.9	22	0.836	0.721	-0.115	0.319	-13.8
Savannah Sparrow	10	94	57	-39.4	5.6 ***	6	11	11	0.0	69.0	10	0.117	0.193	0.076	0.165	64.9
Fox Sparrow	37	105	82	-21.9	11.9	15	15	17	13.3	59.3	40	0.143	0.207	0.064	0.090	45.1
Song Sparrow	98	953	942	-1.2	5.0	99	726	881	21.4	12.9 *	106	0.762	0.935	0.173	0.126	22.8
Lincoln's Sparrow	45	264	229	-13.3	7.7	38	109	99	-9.2	23.0	49	0.413	0.432	0.019	0.120	4.7
White-crowned Sparrow	18	76	74	-2.6	12.7	12	33	51	54.5	55.7	19	0.434	0.689	0.255	0.224	58.7
Dark-eyed Junco	79	766	553	-27.8	3.9 ***	76	491	425	-13.4	13.0	85	0.641	0.769	0.128	0.137	19.9
Black-headed Grosbeak	83	276	279	1.1	12.0	51	82	108	31.7	31.2	89	0.297	0.387	0.090	0.153	30.3
Lazuli Bunting	60	197	183	-7.1	12.7	24	53	41	-22.6	17.7	62	0.269	0.224	-0.045	0.093	-16.7
Red-winged Blackbird	24	124	129	4.0	15.9	9	13	11	-15.4	71.4	26	0.105	0.085	-0.020	0.078	-18.7
Brown-headed Cowbird	60	113	133	17.7	16.4	22	7	30	328.6	178.5 ***	63	0.062	0.226	0.164	0.074 **	264.1
Bullock's Oriole	29	120	96	-20.0	13.6	15	43	34	-20.9	37.6	32	0.358	0.354	-0.004	0.173	-1.2
Purple Finch	33	176	208	18.2	13.8	23	79	44	-44.3	11.0 **	36	0.449	0.212	-0.237	0.080 ***	-52.9
Cassin's Finch	34	47	80	70.2	53.3	13	11	17	54.5	61.2	34	0.234	0.213	-0.022	0.116	-9.2
House Finch	17	77	44	-42.9	12.9 ***	16	91	47	-48.4	15.6 ***	21	1.182	1.068	-0.114	0.272	-9.6
Pine Siskin	47	131	171	30.5	25.7	22	93	166	78.5	88.0	49	0.710	0.971	0.261	0.480	36.7
Lesser Goldfinch	17	50	86	72.0	37.7 *	12	31	54	74.2	34.5 *	18	0.620	0.628	0.008	0.415	1.3
American Goldfinch	30	183	221	20.8	12.5 *	9	11	16	45.5	73.2	30	0.060	0.072	0.012	0.046	20.4
Evening Grosbeak	14	89	136	52.8	22.1	5	4	7	75.0	125.0	14	0.045	0.052	0.007	0.027	14.5
All species pooled	**126**	**14161**	**13597**	**-4.0**	**2.2 ***	**126**	**6076**	**6547**	**7.8**	**8.9**	**126**	**0.429**	**0.482**	**0.052**	**0.048**	**12.2**
	Number decreasing: 38/64 (59%)*					Number increasing: 42/64 (66%)***					Number increasing: 40/64 (63%)**					
SOUTHWEST MAPS REGION																
Nuttall's Woodpecker	23	42	40	-4.8	27.4	21	37	38	2.7	23.3	25	0.881	0.950	0.069	0.403	7.8
Downy Woodpecker	23	33	30	-9.1	25.0	19	38	32	-15.8	28.5	23	1.152	1.067	-0.085	0.481	-7.4
Western Wood-Pewee	24	60	47	-21.7	17.1	5	4	3	-25.0	57.6	25	0.067	0.064	-0.003	0.059	-4.3
Dusky Flycatcher	8	60	25	-58.3	24.0 *	3	6	2	-66.7	25.5	8	0.100	0.080	-0.020	0.079	-20.0
"Western" Flycatcher	34	168	104	-38.1	11.1 **	19	47	48	2.1	23.4	35	0.280	0.462	0.182	0.173	65.0
Black Phoebe	19	31	30	-3.2	22.0	28	29	52	79.3	58.1 **	29	0.936	1.733	0.798	0.555	85.3

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Ash-throated Flycatcher	39	151	121	-19.9	12.9	11	8	20	150.0	127.8	40	0.053	0.165	0.112	0.045 **	212.0
Warbling Vireo	26	102	88	-13.7	19.0	12	15	25	66.7	75.9	29	0.147	0.284	0.137	0.134	93.2
Chestnut-backed Chick.	9	36	25	-30.6	18.9	9	74	61	-17.6	33.2	9	2.056	2.440	0.384	1.396	18.7
Oak Titmouse	15	39	32	-17.9	24.2	11	39	27	-30.8	23.9	16	1.000	0.844	-0.156	0.380	-15.6
Bushtit	37	291	118	-59.5	7.8 ***	33	168	122	-27.4	19.0	39	0.577	1.034	0.457	0.319	79.1
Bewick's Wren	47	254	277	9.1	11.1	47	299	319	6.7	18.7	49	1.177	1.152	-0.026	0.306	-2.2
House Wren	29	164	188	14.6	13.5	26	154	129	-16.2	14.4	31	0.939	0.686	-0.253	0.267	-26.9
Swainson's Thrush	18	286	207	-27.6	13.7 *	11	50	54	8.0	17.3	18	0.175	0.261	0.086	0.074	49.2
American Robin	22	69	67	-2.9	17.3	11	5	26	420.0	365.9	24	0.073	0.388	0.316	0.142 **	435.5
Wrentit	24	406	228	-43.8	7.5 ***	23	116	345	197.4	105.8 ***	24	0.286	1.513	1.227	0.338 ***	429.6
Orange-crowned Warbler	22	112	85	-24.1	21.4	20	50	106	112.0	129.7	23	0.446	1.247	0.801	0.590	179.3
Lucy's Warbler	13	115	103	-10.4	19.5	10	23	46	100.0	106.9	13	0.200	0.447	0.247	0.153	123.3
Yellow Warbler	32	162	122	-24.7	8.3 **	12	13	36	176.9	100.4	32	0.080	0.295	0.215	0.098 **	267.7
MacGillivray's Warbler	18	65	30	-53.8	17.4 ***	3	2	5	150.0	377.5	20	0.031	0.167	0.136	0.111	441.7
Common Yellowthroat	36	466	311	-33.3	5.5 ***	22	91	149	63.7	50.3	36	0.195	0.479	0.284	0.127 **	145.3
Wilson's Warbler	15	217	140	-35.5	12.0 **	10	124	165	33.1	21.2	15	0.571	1.179	0.607	0.309 *	106.3
Yellow-breasted Chat	23	240	155	-35.4	8.6 **	11	18	19	5.6	40.1	23	0.075	0.123	0.048	0.059	63.4
Summer Tanager	9	68	68	0.0	21.5	5	1	7	600.0	758.3	9	0.015	0.103	0.088	0.045 *	600.0
Western Tanager	15	50	31	-38.0	26.8	2	4	44	1000.0	50.0	15	0.080	1.419	1.339	0.942	1674.2
Spotted Towhee	40	305	251	-17.7	10.0 *	31	153	155	1.3	40.7	40	0.502	0.617	0.116	0.222	23.1
California Towhee	25	121	65	-46.3	12.8 **	18	7	67	857.1	518.8	27	0.058	1.031	0.973	0.236 ***	1681.8
Song Sparrow	41	556	417	-25.0	5.9 ***	39	414	442	6.8	18.1	42	0.745	1.060	0.315	0.176 *	42.4
Black-headed Grosbeak	38	212	166	-21.7	11.8 *	23	34	50	47.1	71.5	39	0.160	0.301	0.141	0.112	87.8
Blue Grosbeak	22	88	104	18.2	23.3	6	3	11	266.7	247.7	22	0.034	0.106	0.072	0.039 *	210.3
Lazuli Bunting	22	40	41	2.5	32.5	6	0	18	++++		22	0.000	0.439	0.439	0.209 **	++++
Brown-headed Cowbird	32	85	51	-40.0	11.9 **	6	4	3	-25.0	69.1	33	0.047	0.059	0.012	0.047	25.0
Bullock's Oriole	27	50	65	30.0	24.1	9	3	10	233.3	258.2	28	0.060	0.154	0.094	0.069	156.4
Purple Finch	10	35	24	-31.4	20.7	6	17	8	-52.9	24.5 *	10	0.486	0.333	-0.152	0.284	-31.4
House Finch	32	164	142	-13.4	15.0	22	147	124	-15.6	23.6	34	0.896	0.873	-0.023	0.393	-2.6
Lesser Goldfinch	25	137	70	-48.9	14.5 **	16	16	31	93.8	114.4	28	0.117	0.443	0.326	0.135 **	279.2
American Goldfinch	19	130	76	-41.5	8.7 ***	5	4	6	50.0	123.4	19	0.031	0.079	0.048	0.044	156.6
All species pooled	**52**	**6402**	**4740**	**-26.0**	**4.2 *****	**52**	**2391**	**3130**	**30.9**	**18.9 ** **	**52**	**0.374**	**0.660**	**0.287**	**0.086 *****	**76.8**
	Number decreasing: 31/37 (84%)***					Number increasing: 27/37 (73%)***					Number increasing: 29/37 (78%)***					

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
NORTH-CENTRAL MAPS REGION																
Downy Woodpecker	16	22	31	40.9	32.5	15	31	33	6.5	23.1	19	1.409	1.065	-0.345	0.491	-24.5
"Traill's" Flycatcher	14	86	64	-25.6	24.1	4	4	9	125.0	179.1	14	0.047	0.141	0.094	0.070	202.3
Red-eyed Vireo	11	55	52	-5.5	21.2	3	2	2	0.0	150.0	11	0.036	0.039	0.002	0.042	5.8
Black-capped Chickadee	19	75	96	28.0	23.0	15	62	78	25.8	41.8	20	0.827	0.813	-0.014	0.336	-1.7
House Wren	14	89	102	14.6	16.3	13	45	69	53.3	44.7	15	0.506	0.677	0.171	0.331	33.8
American Robin	20	96	69	-28.1	18.0	14	47	52	10.6	21.3	20	0.490	0.754	0.264	0.248	53.9
Gray Catbird	18	353	302	-14.4	6.5 **	17	114	151	32.5	24.5	18	0.323	0.500	0.177	0.142	54.8
Cedar Waxwing	16	68	54	-20.6	27.2	2	1	2	100.0	400.0	16	0.015	0.037	0.022	0.044	151.9
Tennessee Warbler	5	11	49	345.5	157.5 *	3	1	5	400.0	458.3	5	0.091	0.102	0.011	0.081	12.2
Yellow Warbler	14	209	185	-11.5	7.6	13	35	83	137.1	82.0 *	15	0.168	0.449	0.281	0.106 **	167.9
American Redstart	12	69	68	-1.4	24.1	3	5	3	-40.0	36.0	12	0.073	0.044	-0.028	0.041	-39.1
Ovenbird	13	41	47	14.6	22.5	5	19	7	-63.2	17.8 **	13	0.463	0.149	-0.315	0.214	-67.9
Common Yellowthroat	19	223	216	-3.1	7.7	15	97	120	23.7	55.2	20	0.435	0.556	0.121	0.209	27.7
Clay-colored Sparrow	2	64	58	-9.4	0.8	3	15	41	173.3	50.7 *	3	0.234	0.707	0.473	0.312	201.6
Field Sparrow	12	61	54	-11.5	25.0	7	11	13	18.2	68.0	12	0.180	0.241	0.060	0.128	33.5
Grasshopper Sparrow	3	36	22	-38.9	24.1	2	52	10	-80.8	6.4	3	1.444	0.455	-0.990	0.816	-68.5
Song Sparrow	18	119	143	20.2	15.7	19	54	92	70.4	36.8 *	20	0.454	0.643	0.190	0.206	41.8
Northern Cardinal	14	56	65	16.1	19.9	9	17	14	-17.6	37.2	14	0.304	0.215	-0.088	0.121	-29.1
Indigo Bunting	14	59	61	3.4	17.8	3	1	3	200.0	458.3	14	0.017	0.049	0.032	0.042	190.2
Dickcissel	3	63	21	-66.7	6.0 ***	1	0	1	++++		3	0.000	0.048	0.048	0.065	++++
Red-winged Blackbird	12	86	79	-8.1	14.0	6	10	5	-50.0	49.0	12	0.116	0.063	-0.053	0.060	-45.6
Baltimore Oriole	14	39	32	-17.9	23.3	8	13	23	76.9	199.0	14	0.333	0.719	0.385	0.712	115.6
American Goldfinch	19	241	159	-34.0	9.6 **	0	0	0			19	0.000	0.000	0.000		
All species pooled	**24**	**2809**	**2611**	**-7.0**	**4.5**	**23**	**819**	**975**	**19.0**	**18.1**	**24**	**0.292**	**0.373**	**0.082**	**0.063**	**28.1**
	Number decreasing: 15/23 (65%)					Number increasing: 16/23 (70%)**					Number increasing: 16/23 (70%)**					
SOUTH-CENTRAL MAPS REGION																
Common Ground-Dove	6	31	47	51.6	45.5	2	1	12	1100.0	2000.0	6	0.032	0.255	0.223	0.063 **	691.5
Downy Woodpecker	11	25	18	-28.0	31.1	11	27	24	-11.1	20.3	12	1.080	1.333	0.253	0.571	23.5
Acadian Flycatcher	11	68	68	0.0	22.9	4	15	6	-60.0	9.5 **	12	0.221	0.088	-0.132	0.061 *	-60.0
White-eyed Vireo	22	176	174	-1.1	11.9	18	40	56	40.0	37.5	22	0.227	0.322	0.095	0.081	41.6
Carolina Chickadee	23	55	61	10.9	25.6	21	50	22	-56.0	16.4 ***	25	0.909	0.361	-0.548	0.292 *	-60.3
Tufted Titmouse	18	67	54	-19.4	17.9	17	64	53	-17.2	17.5	19	0.955	0.981	0.026	0.328	2.7
Black-crested Titmouse	9	25	22	-12.0	33.4	7	46	25	-45.7	17.7 **	9	1.840	1.136	-0.704	0.692	-38.2

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Carolina Wren	21	104	115	10.6	16.2	19	116	80	-31.0	14.8	21	1.115	0.696	-0.420	0.311	-37.6
Bewick's Wren	8	29	36	24.1	18.0	8	49	56	14.3	22.5	9	1.690	1.556	-0.134	1.100	-7.9
Prothonotary Warbler	8	70	79	12.9	28.0	8	9	23	155.6	118.9	8	0.129	0.291	0.163	0.132	126.4
Kentucky Warbler	12	74	88	18.9	21.3	13	35	28	-20.0	28.0	14	0.473	0.318	-0.155	0.154	-32.7
Hooded Warbler	4	31	28	-9.7	14.4	4	19	15	-21.1	7.8	4	0.613	0.536	-0.077	0.258	-12.6
Yellow-breasted Chat	7	70	56	-20.0	13.9	6	17	13	-23.5	30.2	8	0.243	0.232	-0.011	0.104	-4.4
Field Sparrow	10	42	44	4.8	20.9	6	19	23	21.1	31.7	10	0.452	0.523	0.070	0.352	15.6
Northern Cardinal	29	330	281	-14.8	11.6	27	202	149	-26.2	14.5	29	0.612	0.530	-0.082	0.137	-13.4
Indigo Bunting	13	166	154	-7.2	14.8	7	16	5	-68.8	21.2	13	0.096	0.033	-0.064	0.044	-66.3
Painted Bunting	19	138	148	7.2	9.0	15	70	37	-47.1	9.5 ***	20	0.507	0.250	-0.257	0.096 **	-50.7
Brown-headed Cowbird	20	44	31	-29.5	16.3	5	6	0	-100.0	0.0	20	0.136	0.000	-0.136	0.060 **	-100.0
All species pooled	**31**	**2033**	**2143**	**5.4**	**5.4**	**31**	**980**	**822**	**-16.1**	**8.5 ***	**31**	**0.482**	**0.384**	**-0.099**	**0.074**	**-20.4**
	Number increasing: 8/18 (44%)					Number decreasing: 13/18 (72%)**					Number decreasing: 12/18 (67%)					
NORTHEAST MAPS REGION																
Downy Woodpecker	52	79	53	-32.9	14.2 *	50	82	64	-22.0	13.4	62	1.038	1.208	0.170	0.313	16.3
"Traill's" Flycatcher	22	83	66	-20.5	16.5	10	2	8	300.0	333.3	22	0.024	0.121	0.097	0.039 **	403.0
Eastern Phoebe	27	41	29	-29.3	22.6	18	65	18	-72.3	9.7 ***	31	1.585	0.621	-0.965	0.487 **	-60.8
Red-eyed Vireo	54	175	127	-27.4	8.7 ***	13	14	9	-35.7	28.2	54	0.080	0.071	-0.009	0.039	-11.4
Blue Jay	35	47	47	0.0	22.8	13	10	23	130.0	149.9	36	0.213	0.489	0.277	0.195	130.0
Black-capped Chickadee	50	180	185	2.8	13.9	38	118	109	-7.6	16.7	54	0.656	0.589	-0.066	0.196	-10.1
Tufted Titmouse	43	61	55	-9.8	15.1	41	111	57	-48.6	9.6 ***	49	1.820	1.036	-0.783	0.459 *	-43.0
Carolina Wren	26	92	42	-54.3	10.6 ***	25	81	34	-58.0	13.6 ***	33	0.880	0.810	-0.071	0.284	-8.1
House Wren	19	54	48	-11.1	26.8	19	35	26	-25.7	29.8	22	0.648	0.542	-0.107	0.304	-16.4
Veery	40	235	197	-16.2	8.5 *	24	23	34	47.8	46.9	40	0.098	0.173	0.075	0.041 *	76.3
Hermit Thrush	18	64	29	-54.7	6.9 ***	15	20	12	-40.0	37.9	22	0.313	0.414	0.101	0.200	32.4
Wood Thrush	46	266	188	-29.3	6.7 ***	34	63	69	9.5	25.8	47	0.237	0.367	0.130	0.074 *	55.0
American Robin	53	243	266	9.5	16.7	39	133	113	-15.0	14.6	56	0.547	0.425	-0.123	0.146	-22.4
Gray Catbird	61	1030	937	-9.0	5.2 *	45	372	476	28.0	20.5	63	0.361	0.508	0.147	0.102	40.7
Cedar Waxwing	29	163	159	-2.5	20.5	2	2	5	150.0	500.0	29	0.012	0.031	0.019	0.028	156.3
Yellow Warbler	28	211	166	-21.3	6.1 ***	17	74	74	0.0	38.5	30	0.351	0.446	0.095	0.193	27.1
Chestnut-sided Warbler	18	51	48	-5.9	21.7	5	20	11	-45.0	16.9 *	18	0.392	0.229	-0.163	0.224	-41.6
Magnolia Warbler	14	38	40	5.3	36.3	6	15	5	-66.7	22.3 **	14	0.395	0.125	-0.270	0.169	-68.3
Black-thrtd. Green Warb.	15	39	26	-33.3	15.5 *	8	12	9	-25.0	27.5	18	0.308	0.346	0.039	0.294	12.5
Black-and-white Warbler	34	74	61	-17.6	14.2	20	21	35	66.7	53.6	39	0.284	0.574	0.290	0.164 *	102.2

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
American Redstart	37	188	179	-4.8	20.5	18	61	59	-3.3	21.0	40	0.325	0.330	0.005	0.111	1.6
Worm-eating Warbler	25	54	72	33.3	27.8	12	46	46	0.0	22.5	27	0.852	0.639	-0.213	0.409	-25.0
Ovenbird	59	231	194	-16.0	9.3	39	70	101	44.3	30.1	62	0.303	0.521	0.218	0.105 **	71.8
Louisiana Waterthrush	16	27	24	-11.1	23.5	12	25	22	-12.0	22.6	18	0.926	0.917	-0.009	0.492	-1.0
Common Yellowthroat	47	300	304	1.3	9.7	28	51	75	47.1	32.1 *	48	0.170	0.247	0.077	0.055	45.1
Hooded Warbler	18	64	58	-9.4	19.2	8	15	20	33.3	36.2	19	0.234	0.345	0.111	0.191	47.1
Eastern Towhee	34	75	62	-17.3	16.9	20	32	22	-31.3	20.4	36	0.427	0.355	-0.072	0.132	-16.8
Chipping Sparrow	23	44	38	-13.6	15.9	12	9	15	66.7	91.9	26	0.205	0.395	0.190	0.196	93.0
Song Sparrow	33	216	167	-22.7	10.2 **	32	114	149	30.7	21.6	36	0.528	0.892	0.364	0.160 **	69.1
Swamp Sparrow	11	43	33	-23.3	20.4	7	26	38	46.2	55.7	13	0.605	1.152	0.547	0.465	90.4
Dark-eyed Junco	12	47	32	-31.9	8.4 **	11	51	103	102.0	105.1	14	1.085	3.219	2.134	1.461	196.6
Northern Cardinal	48	173	168	-2.9	9.5	31	31	58	87.1	49.8 ***	49	0.179	0.345	0.166	0.082 **	92.7
Indigo Bunting	30	81	67	-17.3	16.4	10	18	14	-22.2	36.9	31	0.222	0.209	-0.013	0.083	-6.0
Red-winged Blackbird	19	49	82	67.3	42.2 *	2	2	12	500.0	1200.0	19	0.041	0.146	0.106	0.120	258.5
Common Grackle	25	50	61	22.0	26.9	6	7	4	-42.9	36.6	25	0.140	0.066	-0.074	0.081	-53.2
Baltimore Oriole	25	33	31	-6.1	36.4	11	21	5	-76.2	15.0 ***	28	0.636	0.161	-0.475	0.195 **	-74.7
American Goldfinch	44	299	239	-20.1	6.3 **	2	2	0	-100.0	0.0	44	0.007	0.000	-0.007	0.004	-100.0
All species pooled	**76**	**5953**	**5225**	**-12.2**	**2.5 *** **	**76**	**2042**	**2132**	**4.4**	**7.1**	**76**	**0.343**	**0.408**	**0.065**	**0.040**	**19.0**
	Number decreasing: 29/37 (78%)***					Number increasing: 16/37 (43%)					Number increasing: 21/37 (57%)					
SOUTHEAST MAPS REGION																
Downy Woodpecker	23	29	31	6.9	27.4	16	37	28	-24.3	25.2	26	1.276	0.903	-0.373	0.470	-29.2
Acadian Flycatcher	24	109	111	1.8	14.2	7	5	3	-40.0	41.0	25	0.046	0.027	-0.019	0.026	-41.1
White-eyed Vireo	24	79	65	-17.7	10.5	18	32	20	-37.5	17.2 *	27	0.405	0.308	-0.097	0.144	-24.0
Red-eyed Vireo	26	128	140	9.4	14.3	5	2	6	200.0	193.6	26	0.016	0.043	0.027	0.029	174.3
Carolina Chickadee	29	79	29	-63.3	11.6 ***	22	61	36	-41.0	17.1 *	33	0.772	1.241	0.469	0.440	60.8
Tufted Titmouse	37	111	83	-25.2	12.1 *	25	88	51	-42.0	15.8 **	37	0.793	0.614	-0.178	0.191	-22.5
Carolina Wren	36	200	122	-39.0	6.4 ***	33	152	94	-38.2	12.2 **	37	0.760	0.771	0.011	0.252	1.4
Wood Thrush	27	214	162	-24.3	9.7 **	19	37	42	13.5	21.7	27	0.173	0.259	0.086	0.068	50.0
American Robin	9	22	23	4.5	32.2	8	20	31	55.0	141.1	10	0.909	1.348	0.439	0.909	48.3
Gray Catbird	15	58	34	-41.4	8.2 ***	5	56	38	-32.1	2.5 ***	17	0.966	1.118	0.152	0.655	15.8
Prairie Warbler	10	48	40	-16.7	19.3	8	12	18	50.0	51.2	12	0.250	0.450	0.200	0.128	80.0
Prothonotary Warbler	9	37	28	-24.3	16.0	1	14	1	-92.9		9	0.378	0.036	-0.343	0.199	-90.6
Worm-eating Warbler	18	47	38	-19.1	11.9	13	16	8	-50.0	25.2	19	0.340	0.211	-0.130	0.099	-38.2
Ovenbird	24	116	78	-32.8	12.8 **	16	34	30	-11.8	26.7	26	0.293	0.385	0.092	0.173	31.2

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[a]	2002	2003	%chg.	SE[b]	n[c]	2002	2003	%chg.	SE[d]	n[e]	2002	2003	change	SE[f]	%chg.
Louisiana Waterthrush	20	42	49	16.7	22.9	12	18	17	-5.6	41.5	21	0.429	0.347	-0.082	0.155	-19.0
Kentucky Warbler	15	62	55	-11.3	16.8	8	18	11	-38.9	33.3	15	0.290	0.200	-0.090	0.147	-31.1
Common Yellowthroat	24	100	80	-20.0	10.0	13	33	40	21.2	42.6	26	0.330	0.500	0.170	0.141	51.5
Hooded Warbler	18	72	68	-5.6	16.5	12	11	9	-18.2	39.8	19	0.153	0.132	-0.020	0.075	-13.4
Yellow-breasted Chat	10	54	43	-20.4	16.7	6	16	12	-25.0	21.0	10	0.296	0.279	-0.017	0.097	-5.8
Eastern Towhee	21	42	40	-4.8	17.7	10	7	10	42.9	67.3	23	0.167	0.250	0.083	0.132	50.0
Northern Cardinal	33	307	264	-14.0	9.9	29	117	103	-12.0	18.4	33	0.381	0.390	0.009	0.095	2.4
Indigo Bunting	24	109	98	-10.1	23.9	11	14	5	-64.3	25.3 **	25	0.128	0.051	-0.077	0.065	-60.3
American Goldfinch	14	90	47	-47.8	12.9 ***	2	0	2	++++		15	0.000	0.043	0.043	0.037	++++
All species pooled	**37**	**2609**	**2131**	**-18.3**	**3.4 *****	**37**	**942**	**748**	**-20.6**	**8.1 ****	**37**	**0.361**	**0.351**	**-0.010**	**0.056**	**-2.8**
	Number decreasing: 18/23 (78%)***					Number decreasing: 16/23 (70%)**					Number decreasing: 11/23 (48%)					
ALASKA AND BOREAL CANADA MAPS REGIONS																
Tennessee Warbler	3	13	5	-61.5	9.9 **	3	25	46	84.0	11.7	3	1.923	9.200	7.277	6.874	378.4
Yellow-rumped Warbler	3	14	14	0.0	61.9	3	5	77	1440.0	915.0	3	0.357	5.500	5.143	3.016	1440.0
All species pooled	**3**	**163**	**177**	**8.6**	**22.2**	**3**	**81**	**193**	**138.3**	**19.2 ****	**3**	**0.497**	**1.090**	**0.594**	**0.477**	**119.4**
	Number increasing: 0/2 (0%)					Number increasing: 2/2 (100%)					Number increasing: 2/2 (100%)					

[a] Number of stations at which at least one individual adult bird of the species was captured in either year.
[b] Standard error of the percent change in the number of adult birds captured.
[c] Number of stations at which at least one individual young bird of the species was captured in either year.
[d] Standard error of the percent change in the number of young birds captured.
[e] Number of stations at which at least one individual aged bird of the species was captured in either year.
[f] Standard error of the change in the reproductive index.
++++ Percent change undefined because no young were captured during the first year of the comparison.
* $0.05 \leq P < 0.10$; ** $0.01 \leq P < 0.05$; *** $P < 0.01$

program-wide, 64 species in the Northwest, 37 in the Southwest, 23 in the North-central, 18 in the South-central, 37 in the Northeast, 23 in the Southeast, and 2 in the combined Alaska and Boreal Canada regions.

(a) *Changes in adult populations* — Overall, the index of adult population size for all species pooled decreased substantially in 2003 in those regions where productivity was dramatically reduced during 2002. Indeed, the number of adults captured decreased between 2002 and 2003 in all regions except the South-central and Alaska/Boreal Canada regions (where it increased by non-significant 5.4% and 8.6%, respectively). The decreases in the Southwest (26.0%), Southeast (18.3%), and Northeast (12.2%) regions were highly significant, while the decreases in the Northwest (4.0%) and North-central (7.0%) regions were nearly significant and non-significant, respectively. Likewise, the proportions of decreasing species were highly significantly >50% in the Southwest (84%), Southeast (78%), and Northeast (78%) regions, and were nearly significantly and non-significantly >50% in the Northwest (59%) and North-central (65%) regions, respectively. This proportion was non significantly different from 50% in either the South-central or Alaska/Boreal Canada regions. Summing over these latter two regions, only one species showed a significant decrease in adult population size while no species showed a significant or nearly significant increase. In contrast, summing over the other five regions, 35 species had significant decreases in numbers of adults and an additional 10 species showed nearly significant decreases, while only eight species showed significant or nearly significant increases in numbers of adults.

Program-wide, the index for adult population size for all species pooled decreased by a highly significant 10.3%. The program-wide proportion of decreasing species (67%) was also highly significantly >50%. Program-wide, 20 species had significant decreases in numbers of adults and another 12 species had nearly significant decreases, while only four species showed significant or nearly significant increases.

(b) *Changes in productivity* — Overall, productivity generally increased in 2003 compared to 2002 in five of seven regions, but the only significant increase (30.9%) in number of young birds of all species pooled was in the Southwest Region. Non-significant increases in numbers of young birds of all species pooled in the other four regions ranged from 19.2% and 19.0% in the Alaska/Boreal Canada and North-central regions, respectively, to 7.8% and 4.4% in the Northwest and Northeast regions, respectively. In contrast, numbers of young birds of all species pooled showed significant and nearly significant decreases of 20.6% in the Southeast and 16.1% in the South-central regions, respectively. Changes in reproductive index for all species pooled generally paralleled changes in numbers of young with a highly significant 76.8% increase in the Southwest, non-significant increases in four other regions ranging from 12.2% in the Northwest to 28.1% in the North-central Region (and 119.4% in Alaska/Boreal Canada Region, which is based on only three stations in Boreal Canad(a), and non-significant decreases of 2.8% in the Southeast and 28.1% in the South-central regions, respectively. Although increases between 2002 and 2003 in the numbers of young and the reproductive index were generally not significant, the proportion of species with increasing numbers of young and the proportion of species with increasing reproductive indices were more often significantly >50%. Indeed, both proportions were highly significantly >50% for the Southwest (73% and 78% respectively), highly significantly and significantly greater for the Northwest (66% and 63%, respectively), nearly significantly and significantly greater, respectively, for the North-central region (both 70%), and non-significantly different than 50% for the Northeast (43% and 57%, respectively). Paralleling the decreases in numbers of young in the Southeast and South-central, the proportions of decreasing species there were significantly >50% (70% and 72% respectively). The proportions of species with decreasing reproductive indices in those regions, however, were not significantly different from 50%. Summing over the seven regions, 18 species had significant or nearly significant regional increases in numbers of young while 19 species had significant or nearly significant decreases. In contrast, again summing over the seven regions, 27 species had significant or nearly significant regional increases in reproductive index while only 12 species had significant or nearly significant decreases.

Program-wide, the number of young for all

species pooled increased by a nearly significant 9.1% while the reproductive index for all species pooled increased by a highly significant 21.6% from 0.391 in 2002 to 0.475 in 2003. The program-wide proportions of species with increasing numbers of young (61%) and increasing reproductive indices (66%) were both highly significantly >50%. Program-wide, 21 species had significant or nearly significant increases in numbers of young, while 13 species had significant or nearly significant decreases. Similarly, and again program-wide, 22 species had significant or nearly significant increases in reproductive indices, while only eight showed significant or nearly significant decreases.

3. *Twelve-year (1992-2003) program-wide trends* — Chained indices of adult population size (Fig. 3a) and productivity (Fig. 3b) for all species pooled at the program-wide scale showed a highly significant ($P < 0.001$) decreasing trend in adult population size of -1.86% per year, and a widely fluctuating temporal pattern in reproductive index with a decreasing tendency of -1.02% per year. Interestingly, all five decreases in productivity were followed by decreases in adult population size the next year, while three of the five increases in productivity were followed by increases in adult population size the next year. Moreover, seven of the eight significant or nearly significant changes in productivity were followed the next year by changes of adult population size of the same sign, while only one of two non-significant changes in productivity was followed the next year by a change of adult population size of the same sign.

SURVIVAL-RATE ESTIMATES

Maximum-likelihood estimates of time-constant annual adult apparent survival rates, recapture probabilities, and proportions of residents among the newly captured adults that were not recaptured seven or more days later during their first year of capture are presented in Table 3 for species that met survivorship selection criteria (see Methods - Data Analysis) for each of the seven MAPS regions and program-wide. These estimates were derived from 12 years (1992-2003) of mark-recapture data pooled over all stations in each region (or program-wide) that were operated for four or more consecutive years during this period. Data were thus pooled from 550 stations program-wide, and from 151 stations in the Northwest, 83 in the Southwest, 44 in the North-central, 71 in the South-central, 91 in the Northeast, 79 in the Southeast, and 31 in the Alaska/Boreal Canada region, for an average of 79 stations per region (Table 4). The regional increases for the 12-yr period (1992-2003) over the 10-yr period (1992-2001) in the number of stations contributing data to survivorship analyses ranged from 7% in the Alaska/Boreal Canada Region to 25% in the Northeast and averaged 15%, which was also the program-wide increase.

Tables 3 and 4 show that 184 species fulfilled selection criteria for survivorship analyses program-wide, while 81 species fulfilled these criteria in the Northwest Region, 86 in the Southwest, 54 in the North-central, 62 in the South-central, 75 in the Northeast, 45 in the Southeast, and 34 in the Alaska/Boreal Canada Region, for an average of 62 species per region. Changes in the number of species per region that fulfilled selection criteria for survivorship analyses ranged from -5.6% in the Alaska/Boreal Canada Region to 19.4% in the Southwest and averaged 5.4%; the program-wide change was an increase of 2.2%.

Also included in Table 3 for each species in each region are the number of stations from which data were pooled and the total number of individual adult birds captured during the 10 years, as well as the total number of captures and total number of returns of those individuals. The mean number of individual adult birds captured per station per species during the 12 years (1992-2003) was lowest for the Northeast (22.7) and Southeast (23.8) regions, higher for the South-central Region (32.2), higher still for the Southwest (35.4), North-central (36.7), and Northwest (36.8) regions, and highest for the Alaska/Boreal Canada Region (51.0). Altogether, the 550 stations included in these survivorship analysis were operated for an average of 7.70 years each (67 stations for four years, 109 for five, 44 for six, 58 for seven, 40 for eight, 66 for nine, 56 for 10, 40 for 11, and 70 for12 years) and produced an average capture rate of 4.23 adult individuals per station per species per year.

As in past years, the average total number of adult captures per individual per species (for species that met survivorship selection criteria) was remarkably constant over the seven regions,

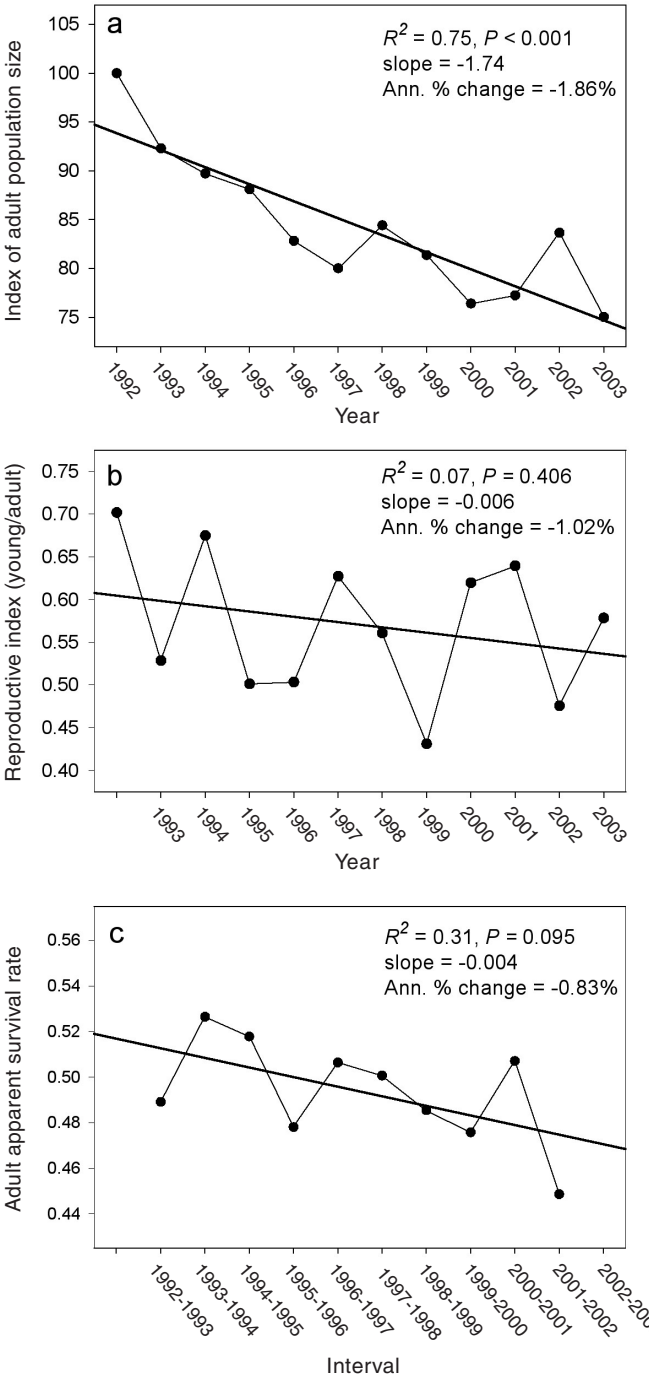

FIGURE 3. Program-wide 12-yr (1992-2003) trends for all species pooled for a) adult population size and b) productivity (reproductive index: young/adult) from chain indices of constant-effort year-to-year changes derived from the analysis of >722,000 captures of >527,000 aged individuals, and c) the program-wide 10-yr trend for all species pooled for adult annual apparent survival rate from the fully time-dependent CJS mark-recapture model applied to >319,000 capture histories of individual adult birds.

TABLE 3. Program-wide and regional time-constant estimates of annual adult apparent survival probability, recapture probability, and proportion of residents from modified Cormack-Jolly-Seber mark-recapture analyses[a] (using transient models[b]), and selected and equivalent time-dependent models from twelve years (1992-2003) of MAPS data.

					Survival				Recapture				Proportion of							
					Survival probability[h]				Recapture probability[j]				Proportion of residents[k]				Models selected[l]			
Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	p	SE(p)	CV(p)	$w(p_i)$[i]	τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	1	2	3	4
PROGRAM-WIDE																				
Common Ground-Dove†	10	479	536	12	0.453	0.154	34.0	0.003	0.042	0.043	101.2	0.002	1.000	0.952	95.2	0.001	...			
Yellow-billed Cuckoo	95	603	648	18	0.480	0.098	20.4	0.028	0.187	0.093	49.8	0.253	0.200	0.107	53.5	0.004	...			
Belted Kingfisher*†	9	28	43	5	0.299	0.174	58.2	0.000	0.435	0.347	79.7	0.000	1.000	0.993	99.3	0.000	...			
Acorn Woodpecker	11	70	84	8	0.463	0.177	38.1	0.000	0.727	0.229	31.5	0.000	0.234	0.146	62.7	0.000	...			
Golden-fronted Woodpecker*†	7	145	180	8	0.179	0.115	64.4	0.012	0.343	0.301	87.8	0.002	1.000	0.886	88.6	0.001	...			
Red-bellied Woodpecker	101	429	481	29	0.423	0.079	18.6	0.001	0.147	0.073	49.7	0.022	0.754	0.387	51.3	0.002	...			
Williamson's Sapsucker	14	189	248	17	0.382	0.095	24.9	0.006	0.260	0.119	45.6	0.774	0.560	0.267	47.7	0.002	.t.			
Yellow-bellied Sapsucker	16	143	197	19	0.486	0.098	20.2	0.017	0.335	0.124	37.0	0.011	0.522	0.233	44.6	0.042	...			
Red-naped Sapsucker	34	614	1090	155	0.479	0.032	6.8	0.001	0.537	0.050	9.3	0.011	0.505	0.072	14.2	0.001	...			
R.-naped x R.-breasted Hybrid	6	62	118	16	0.537	0.110	20.4	0.012	0.399	0.136	34.0	0.027	0.648	0.280	43.2	0.023	...			
Red-breasted Sapsucker	52	898	1448	156	0.456	0.033	7.3	0.007	0.410	0.047	11.5	0.018	0.561	0.081	14.4	0.011	...			
Ladder-backed Woodpecker	22	147	193	27	0.610	0.090	14.7	0.000	0.324	0.096	29.4	0.002	0.519	0.184	35.5	0.001	...			
Nuttall's Woodpecker	26	319	483	69	0.596	0.052	8.7	0.000	0.374	0.061	16.4	0.001	0.476	0.099	20.9	0.029	...			
Downy Woodpecker	264	2508	3239	316	0.509	0.024	4.7	0.000	0.354	0.030	8.5	0.001	0.376	0.039	10.4	0.001	...			
Hairy Woodpecker	171	800	1006	127	0.666	0.035	5.3	0.027	0.199	0.031	15.3	0.006	0.520	0.088	17.0	0.073	...			
Three-toed Woodpecker	4	28	40	6	0.775	0.120	15.5	0.000	0.335	0.156	46.7	0.000	0.101	0.104	102.2	0.000	...			
Northern Flicker	166	684	783	36	0.433	0.072	16.6	0.000	0.129	0.055	42.4	0.002	0.627	0.270	43.0	0.003	...			
Olive-sided Flycatcher	20	125	164	17	0.708	0.083	11.7	0.002	0.388	0.107	27.6	0.002	0.086	0.045	53.1	0.001	...			
Western Wood-Pewee	84	1859	2511	281	0.500	0.025	5.1	0.036	0.346	0.032	9.2	0.214	0.508	0.056	11.0	0.766	..t			
Eastern Wood-Pewee	115	811	1005	86	0.524	0.046	8.8	0.000	0.356	0.057	16.0	0.031	0.298	0.059	19.9	0.009	...			
Acadian Flycatcher	82	3205	4648	592	0.491	0.017	3.5	0.014	0.529	0.026	4.8	0.020	0.375	0.027	7.2	0.374	...	..t		
"Traill's" Flycatcher	88	3790	5444	498	0.482	0.018	3.8	0.011	0.501	0.027	5.5	0.002	0.271	0.022	8.0	0.018	...			
Least Flycatcher	31	1414	1891	150	0.400	0.034	8.4	0.013	0.433	0.053	12.3	0.271	0.374	0.057	15.2	0.002	...	.t.		
Hammond's Flycatcher	56	1353	1940	219	0.442	0.027	6.2	0.132	0.412	0.041	9.8	0.025	0.509	0.063	12.3	0.001	...			
Dusky Flycatcher	50	2527	3758	358	0.499	0.021	4.2	0.998	0.417	0.029	7.0	0.008	0.307	0.029	9.6	0.004	t..			
"Western" Flycatcher	75	3209	4059	307	0.503	0.023	4.7	0.769	0.325	0.029	8.9	0.189	0.299	0.032	10.6	0.284	t..	t.t		
Black Phoebe	26	268	325	27	0.486	0.081	16.7	0.002	0.411	0.113	27.6	0.031	0.278	0.098	35.1	0.001	...			
Eastern Phoebe	46	391	511	30	0.457	0.073	15.9	0.109	0.388	0.102	26.2	0.070	0.208	0.070	33.7	0.051	...			
Vermilion Flycatcher†	5	102	121	10	0.368	0.154	42.0	0.000	0.227	0.184	81.4	0.000	1.000	0.862	86.2	0.000	...			
Ash-throated Flycatcher	54	1172	1353	109	0.645	0.045	7.0	0.006	0.205	0.038	18.6	0.002	0.373	0.075	20.2	0.182	...			
Great Crested Flycatcher	114	699	796	64	0.644	0.050	7.8	0.453	0.188	0.044	23.1	0.040	0.332	0.084	25.3	0.062	...	t..		

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Brown-crested Flycatcher	9	294	375	47	0.496	0.066	13.4	0.005	0.296	0.083	28.0	0.015	0.736	0.243	33.1	0.004	...			
Eastern Kingbird	39	251	288	16	0.459	0.108	23.5	0.270	0.435	0.159	36.5	0.003	0.200	0.096	48.2	0.027	...	t..		
White-eyed Vireo	89	3572	6343	808	0.504	0.014	2.8	0.077	0.513	0.021	4.1	0.270	0.427	0.027	6.3	0.005	...	.t.		
Bell's Vireo	18	650	1017	141	0.567	0.033	5.9	0.004	0.402	0.044	11.0	0.487	0.448	0.066	14.6	0.025	...	.t.		
Yellow-throated Vireo	18	60	68	6	0.617	0.173	28.1	0.000	0.161	0.144	89.0	0.000	0.494	0.488	98.9	0.000	...			
Plumbeous Vireo	10	95	129	19	0.616	0.103	16.7	0.002	0.441	0.126	28.7	0.001	0.354	0.140	39.6	0.000	...			
Cassin's Vireo	32	573	681	40	0.566	0.064	11.3	0.002	0.151	0.049	32.5	0.007	0.422	0.144	34.0	0.007	...			
Blue-headed Vireo	15	151	187	13	0.393	0.115	29.3	0.001	0.205	0.125	61.0	0.004	0.712	0.443	62.2	0.001	...			
Hutton's Vireo	20	133	185	20	0.568	0.096	16.9	0.001	0.282	0.100	35.5	0.018	0.457	0.188	41.3	0.024	...			
Warbling Vireo	133	6243	8817	877	0.490	0.014	2.8	0.003	0.414	0.019	4.6	0.003	0.352	0.021	6.1	1.000	..t			
Red-eyed Vireo	182	5774	7534	850	0.578	0.014	2.4	0.508	0.257	0.015	5.7	0.348	0.495	0.032	6.5	0.016	t..	...	.t.	
Gray Jay†	21	105	153	35	0.626	0.064	10.2	0.076	0.262	0.069	26.2	0.002	1.000	0.295	29.5	0.002	...			
Steller's Jay	63	365	429	45	0.713	0.055	7.8	0.001	0.166	0.044	26.8	0.499	0.413	0.119	28.8	0.002	...	.t.		
Blue Jay	158	1062	1164	72	0.645	0.049	7.6	0.004	0.111	0.032	29.2	0.018	0.441	0.134	30.5	0.498	...	..t		
Green Jay*†	3	28	32	3	0.940	0.268	28.5	0.000	0.034	0.083	247.9	0.000	1.000	2.428	242.8	0.000	...			
Western Scrub-Jay	36	181	210	21	0.554	0.090	16.3	0.002	0.225	0.094	41.8	0.000	0.501	0.231	46.1	0.100	...			
Mexican Jay*	3	38	46	3	0.366	0.223	60.9	0.000	0.289	0.312	108.0	0.000	0.486	0.560	115.1	0.000	...			
Tree Swallow	48	815	1053	65	0.392	0.050	12.8	0.003	0.276	0.066	23.8	0.001	0.517	0.134	25.9	0.004	...			
Violet-green Swallow	9	189	238	16	0.460	0.101	22.0	0.044	0.213	0.101	47.5	0.601	0.442	0.223	50.4	0.078	.t.	...		
N. Rough-winged Swallow	20	126	136	7	0.384	0.175	45.5	0.000	0.645	0.283	43.8	0.001	0.158	0.117	74.0	0.000	...			
Barn Swallow	15	406	492	37	0.478	0.063	13.2	0.329	0.186	0.061	32.7	0.329	0.543	0.188	34.6	0.017	...	t..	.t.	
Carolina Chickadee	135	1677	1972	137	0.491	0.037	7.4	0.001	0.198	0.035	17.6	0.004	0.502	0.094	18.8	0.000	...			
Black-capped Chickadee	168	3931	5550	619	0.471	0.017	3.6	0.029	0.366	0.023	6.2	0.004	0.559	0.041	7.4	0.007	...			
Mountain Chickadee	53	1484	1888	168	0.437	0.032	7.4	0.052	0.330	0.043	13.0	0.034	0.512	0.077	15.0	0.004	...			
Chestnut-backed Chickadee	52	1375	1801	174	0.421	0.033	7.8	0.008	0.378	0.047	12.4	0.050	0.525	0.077	14.7	0.017	...			
Boreal Chickadee	11	135	202	29	0.446	0.075	16.9	0.073	0.336	0.102	30.3	0.120	0.881	0.307	34.9	0.004	...			
Bridled Titmouse	6	40	56	10	0.642	0.161	25.2	0.000	0.256	0.143	55.9	0.000	0.845	0.498	58.9	0.000	...			
Oak Titmouse	20	278	418	50	0.529	0.058	11.0	0.000	0.395	0.076	19.2	0.001	0.423	0.107	25.3	0.029	...			
Juniper Titmouse	4	51	93	19	0.586	0.095	16.3	0.000	0.482	0.130	26.8	0.000	0.630	0.243	38.5	0.000	...			
Tufted Titmouse	161	2557	3522	450	0.465	0.020	4.3	0.997	0.405	0.028	7.0	0.018	0.574	0.050	8.7	0.003	t..			
Black-crested Titmouse	19	312	407	45	0.498	0.063	12.6	0.004	0.214	0.062	29.0	0.002	0.821	0.253	30.8	0.007	...			
Verdin*	5	71	88	5	0.522	0.221	42.3	0.000	0.126	0.137	108.7	0.000	0.658	0.695	105.5	0.000	...			
Bushtit	57	1945	2320	122	0.359	0.041	11.3	0.965	0.209	0.045	21.3	0.133	0.660	0.143	21.7	0.041	t..			
Red-breasted Nuthatch	87	728	808	31	0.337	0.077	22.9	0.002	0.117	0.069	58.5	0.002	0.835	0.493	59.1	0.008	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
White-breasted Nuthatch	107	485	582	43	0.442	0.066	15.0	0.002	0.303	0.085	28.0	0.003	0.436	0.140	32.0	0.001	...			
Brown Creeper	66	839	1045	61	0.313	0.052	16.7	0.007	0.259	0.076	29.2	0.018	0.757	0.232	30.6	0.001	...			
Carolina Wren	138	3726	6075	664	0.379	0.015	3.9	1.000	0.595	0.027	4.6	0.018	0.470	0.033	7.0	0.007	t..			
Bewick's Wren	95	2485	4071	503	0.428	0.018	4.3	0.179	0.560	0.030	5.4	0.027	0.528	0.042	7.9	0.167	...			
House Wren	116	3793	5517	388	0.341	0.020	5.7	0.072	0.406	0.034	8.3	0.044	0.501	0.048	9.6	0.016	...			
Winter Wren	46	1101	1777	145	0.362	0.031	8.4	0.333	0.516	0.058	11.2	0.121	0.388	0.060	15.4	0.016	...	t..		
Golden-crowned Kinglet*	69	1188	1490	18	0.149	0.075	50.5	0.079	0.235	0.150	63.8	0.009	0.314	0.150	47.6	0.044	...			
Ruby-crowned Kinglet	34	1058	1322	51	0.302	0.055	18.4	0.733	0.252	0.076	30.2	0.180	0.480	0.144	30.1	0.023	t..			
Arctic Warbler	2	259	481	52	0.324	0.050	15.6	0.029	0.630	0.104	16.5	0.003	0.648	0.163	25.2	0.001	...			
Blue-gray Gnatcatcher	100	767	847	26	0.401	0.087	21.7	0.010	0.111	0.065	59.0	0.371	0.557	0.333	59.7	0.042	...	.t.		
Eastern Bluebird	40	255	352	17	0.404	0.096	23.8	0.014	0.274	0.115	42.2	0.081	0.323	0.148	46.0	0.018	...			
Western Bluebird	17	148	201	13	0.321	0.095	29.5	0.001	0.570	0.205	36.0	0.004	0.279	0.145	51.9	0.015	...			
Townsend's Solitaire*†	4	29	33	3	0.571	0.214	37.5	0.000	0.090	0.154	171.4	0.000	1.000	1.771	177.1	0.000	...			
Veery	61	2709	5246	1011	0.587	0.013	2.2	0.017	0.563	0.018	3.2	0.029	0.499	0.026	5.3	0.011	...			
Gray-cheeked Thrush	6	253	539	74	0.441	0.044	10.1	0.000	0.705	0.072	10.2	0.000	0.527	0.108	20.4	0.001	...			
Bicknell's Thrush	1	28	45	10	0.613	0.124	20.3	0.000	0.318	0.150	47.2	0.000	0.840	0.479	57.0	0.000	...			
Swainson's Thrush	115	12214	26195	4245	0.585	0.006	1.1	0.000	0.621	0.009	1.4	0.000	0.366	0.010	2.8	0.998	..t			
Hermit Thrush	82	2513	4428	629	0.467	0.016	3.4	0.280	0.609	0.026	4.2	0.074	0.468	0.033	7.0	0.032	...	t..		
Wood Thrush	138	6057	10153	1000	0.435	0.012	2.8	0.995	0.494	0.020	4.1	0.993	0.409	0.023	5.7	0.001	tt.			
American Robin	307	9936	12804	1206	0.508	0.012	2.4	0.998	0.267	0.013	5.0	0.003	0.516	0.029	5.6	0.002	t..			
Varied Thrush	41	551	718	57	0.431	0.052	12.1	0.122	0.375	0.076	20.2	0.547	0.356	0.087	24.6	0.001	.t.	...		
Wrentit	46	2232	4521	722	0.594	0.015	2.6	0.973	0.538	0.021	3.9	0.897	0.412	0.028	6.8	0.198	tt.			
Gray Catbird	137	12026	19272	2410	0.511	0.008	1.7	0.007	0.455	0.012	2.6	0.004	0.450	0.016	3.6	0.002	...			
Northern Mockingbird	34	539	658	18	0.286	0.088	31.0	0.077	0.197	0.106	53.8	0.015	0.418	0.213	51.0	0.066	...			
Brown Thrasher	60	756	974	94	0.572	0.041	7.2	0.001	0.235	0.041	17.6	0.049	0.462	0.091	19.8	0.001	...			
Long-billed Thrasher	4	176	237	34	0.582	0.083	14.2	0.004	0.381	0.097	25.3	0.141	0.626	0.204	32.6	0.000	...			
California Thrasher†	15	134	173	21	0.690	0.108	15.7	0.007	0.121	0.061	50.0	0.005	1.000	0.498	49.8	0.000	...			
European Starling*†	31	207	215	3	0.299	0.248	82.9	0.001	0.049	0.143	293.5	0.001	1.000	2.897	289.7	0.000	...			
Cedar Waxwing	92	4167	4582	23	0.530	0.093	17.5	0.001	0.024	0.013	53.2	0.002	0.231	0.116	50.1	0.015	...			
Blue-winged Warbler	35	1128	1646	189	0.523	0.029	5.6	0.001	0.382	0.039	10.1	0.007	0.402	0.052	13.0	0.001	...			
Orange-crowned Warbler	77	4652	6475	552	0.423	0.017	4.0	0.232	0.459	0.027	5.9	0.379	0.357	0.028	7.8	0.024	...	.t.	t..	
Nashville Warbler	34	1305	1575	70	0.339	0.047	13.9	0.077	0.354	0.075	21.3	0.562	0.301	0.071	23.7	0.034	.t.	...		
Virginia's Warbler	13	609	744	52	0.440	0.058	13.1	0.002	0.317	0.076	24.1	0.817	0.401	0.110	27.5	0.001	.t.			
Lucy's Warbler	8	401	505	48	0.466	0.065	13.9	0.004	0.317	0.080	25.1	0.000	0.567	0.160	28.3	0.002	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Northern Parula	45	475	542	32	0.358	0.073	20.3	0.002	0.515	0.131	25.5	0.007	0.247	0.084	34.1	0.023	...			
Yellow Warbler	151	12139	19262	2445	0.534	0.009	1.6	0.001	0.474	0.012	2.5	0.002	0.401	0.014	3.5	0.120	...			
Chestnut-sided Warbler	22	929	1551	189	0.448	0.029	6.4	0.110	0.506	0.046	9.0	0.019	0.518	0.067	12.9	0.119	...			
Magnolia Warbler	17	655	1039	101	0.391	0.039	10.0	0.995	0.659	0.071	10.8	0.008	0.320	0.058	18.1	0.000	t..			
Black-throated Blue Warbler	8	134	184	22	0.492	0.089	18.1	0.001	0.451	0.127	28.2	0.000	0.409	0.155	38.0	0.007	...			
Yellow-rumped Warbler	99	5162	6340	466	0.453	0.020	4.3	0.001	0.263	0.023	8.6	0.077	0.464	0.044	9.5	0.001	...			
Black-throated Gray Warbler	20	174	200	7	0.441	0.165	37.5	0.006	0.066	0.072	108.8	0.004	0.911	0.960	105.4	0.001	...			
Black-throated Green Warbler	23	486	730	85	0.391	0.045	11.5	0.002	0.546	0.078	14.3	0.017	0.515	0.101	19.6	0.047	...			
Townsend's Warbler	29	1191	1482	109	0.437	0.040	9.2	0.002	0.205	0.042	20.5	0.004	0.665	0.144	21.6	0.004	...			
Hermit Warbler	32	1275	1399	43	0.597	0.063	10.6	0.018	0.099	0.033	33.7	0.004	0.271	0.093	34.4	0.004	...			
Blackburnian Warbler	5	46	57	5	0.566	0.189	33.5	0.000	0.106	0.111	104.4	0.000	0.899	0.946	105.2	0.000	...			
Pine Warbler	35	245	287	12	0.345	0.128	37.1	0.001	0.292	0.175	59.7	0.008	0.363	0.228	62.9	0.001	...			
Prairie Warbler	28	676	908	82	0.457	0.048	10.5	0.007	0.299	0.057	19.0	0.047	0.526	0.112	21.4	0.001	...			
Blackpoll Warbler	8	184	280	23	0.302	0.068	22.4	0.000	0.733	0.152	20.7	0.000	0.320	0.124	38.8	0.003	...			
Black-and-white Warbler	82	1346	1758	179	0.530	0.032	5.9	0.170	0.312	0.037	11.9	0.018	0.436	0.061	14.1	0.064	...			
American Redstart	69	3913	5666	569	0.502	0.017	3.4	0.221	0.346	0.022	6.3	0.093	0.445	0.034	7.7	0.769	..t	...	t.t	
Prothonotary Warbler	23	711	923	74	0.457	0.048	10.5	0.011	0.237	0.053	22.2	0.004	0.613	0.147	23.9	0.002	...			
Worm-eating Warbler	31	946	1339	148	0.547	0.034	6.3	0.004	0.421	0.045	10.8	0.029	0.337	0.049	14.5	0.002	...			
Swainson's Warbler	9	149	249	22	0.525	0.090	17.1	0.029	0.305	0.102	33.4	0.855	0.529	0.208	39.4	0.018	.t.			
Ovenbird	126	4655	6833	866	0.552	0.014	2.5	0.004	0.426	0.019	4.4	0.004	0.380	0.023	6.0	0.003	...			
Northern Waterthrush	23	615	936	107	0.503	0.039	7.8	0.254	0.581	0.059	10.1	0.058	0.282	0.049	17.2	0.025	...	t..		
Louisiana Waterthrush	38	697	1218	152	0.505	0.034	6.7	0.004	0.608	0.050	8.3	0.032	0.353	0.050	14.3	0.002	...			
Kentucky Warbler	60	2266	4051	629	0.537	0.016	3.0	0.011	0.571	0.024	4.1	0.004	0.415	0.029	7.0	0.004	...			
Mourning Warbler	9	272	460	59	0.445	0.052	11.6	0.053	0.439	0.079	18.0	0.023	0.701	0.163	23.2	0.001	...			
MacGillivray's Warbler	99	7431	14402	1787	0.483	0.010	2.0	0.857	0.600	0.015	2.5	0.005	0.404	0.017	4.2	0.118	t..			
Common Yellowthroat	213	11335	19082	2069	0.478	0.009	1.8	0.022	0.504	0.014	2.7	0.002	0.382	0.015	3.9	0.263	...	..t		
Hooded Warbler	53	1556	2687	305	0.470	0.023	4.9	0.016	0.537	0.036	6.7	0.002	0.390	0.040	10.2	0.118	...			
Wilson's Warbler	85	10861	16282	1278	0.405	0.011	2.6	0.026	0.532	0.019	3.5	0.116	0.277	0.014	5.1	1.000	..t			
Canada Warbler	11	380	571	58	0.456	0.053	11.6	0.091	0.531	0.084	15.7	0.003	0.329	0.077	23.5	0.245	...	..t		
Yellow-breasted Chat	80	4003	6742	893	0.489	0.014	2.8	0.900	0.482	0.020	4.2	0.120	0.492	0.029	5.9	0.146	t..			
Summer Tanager	69	883	1179	138	0.535	0.038	7.1	0.071	0.355	0.045	12.8	0.028	0.474	0.074	15.6	0.069	...			
Scarlet Tanager	93	750	855	44	0.557	0.063	11.2	0.007	0.090	0.035	39.1	0.007	0.625	0.246	39.3	0.048	...			
Western Tanager	89	2296	2528	134	0.521	0.038	7.3	0.000	0.136	0.030	22.3	0.001	0.510	0.119	23.4	0.000	...			
Olive Sparrow	4	241	465	75	0.511	0.048	9.4	0.002	0.757	0.065	8.6	0.004	0.503	0.099	19.8	0.007	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Green-tailed Towhee	18	431	639	81	0.616	0.048	7.8	0.007	0.307	0.051	16.5	0.007	0.477	0.094	19.7	0.002	...			
Spotted Towhee	100	3474	5196	707	0.500	0.016	3.2	0.071	0.435	0.022	5.2	0.178	0.560	0.037	6.6	0.002	...			
Eastern Towhee	114	1140	1612	197	0.469	0.030	6.4	0.002	0.355	0.040	11.1	0.003	0.623	0.083	13.3	0.001	...			
Canyon Towhee*†	4	56	69	3	0.926	0.290	31.3	0.000	0.025	0.036	143.5	0.000	1.000	1.392	139.2	0.000	...			
California Towhee	32	713	991	142	0.562	0.037	6.6	0.006	0.329	0.042	12.9	0.005	0.607	0.092	15.1	0.878	..t			
Abert's Towhee	5	131	173	16	0.486	0.126	25.9	0.000	0.390	0.157	40.3	0.000	0.389	0.189	48.7	0.001	...			
Rufous-crowned Sparrow	19	269	402	43	0.528	0.065	12.3	0.076	0.320	0.076	23.7	0.002	0.508	0.139	27.5	0.003	...			
American Tree Sparrow	7	203	338	35	0.460	0.063	13.8	0.001	0.548	0.104	19.0	0.001	0.335	0.103	30.6	0.002	...			
Chipping Sparrow	93	1802	2273	159	0.427	0.033	7.7	0.018	0.216	0.036	16.5	0.018	0.645	0.112	17.4	0.011	...			
Clay-colored Sparrow	7	365	446	21	0.465	0.101	21.7	0.011	0.340	0.120	35.4	0.041	0.209	0.087	41.6	0.004	...			
Field Sparrow	76	2365	3409	377	0.443	0.021	4.6	0.010	0.346	0.028	8.1	0.810	0.621	0.059	9.6	0.001	.t.			
Vesper Sparrow	5	67	87	13	0.736	0.098	13.3	0.003	0.263	0.104	39.5	0.003	0.331	0.158	47.8	0.001	...			
Lark Sparrow	18	482	523	23	0.453	0.090	19.9	0.018	0.259	0.104	40.2	0.019	0.242	0.107	44.0	0.006	...			
Black-throated Sparrow*	11	175	186	5	0.597	0.202	33.7	0.002	0.087	0.092	106.1	0.005	0.291	0.309	106.3	0.004	...			
Sage Sparrow*†	2	99	104	3	0.496	0.277	55.8	0.001	0.037	0.093	254.1	0.000	1.000	2.485	248.5	0.000	...			
Savannah Sparrow	15	609	838	120	0.574	0.043	7.4	0.018	0.372	0.048	13.0	0.011	0.486	0.080	16.5	0.000	...			
Grasshopper Sparrow	9	236	350	35	0.438	0.069	15.7	0.068	0.360	0.096	26.6	0.471	0.564	0.176	31.3	0.003	...	.t.		
Fox Sparrow	42	1157	1956	239	0.523	0.026	4.9	0.432	0.489	0.037	7.6	0.235	0.375	0.043	11.6	0.577	t.t	.t.	..t	...
Song Sparrow	217	13799	26064	3314	0.478	0.007	1.5	0.266	0.540	0.011	2.0	0.075	0.485	0.015	3.1	0.012	...	t..		
Lincoln's Sparrow	54	2912	6752	819	0.428	0.013	3.1	0.119	0.610	0.023	3.8	0.012	0.581	0.037	6.3	0.010	...			
Swamp Sparrow	16	440	784	88	0.447	0.042	9.3	0.904	0.677	0.068	10.1	0.027	0.309	0.061	19.7	0.097	t..			
White-throated Sparrow	22	1176	1965	159	0.342	0.029	8.5	0.009	0.504	0.056	11.1	0.335	0.509	0.074	14.6	0.127	...	.t.		
White-crowned Sparrow	31	1416	2377	294	0.450	0.023	5.0	0.004	0.464	0.035	7.6	0.007	0.557	0.058	10.4	0.029	...			
Golden-crowned Sparrow	5	281	539	76	0.498	0.043	8.6	0.006	0.522	0.067	12.9	0.118	0.522	0.107	20.4	0.001	...			
Dark-eyed Junco	127	7781	13192	1622	0.436	0.010	2.3	0.923	0.505	0.016	3.2	0.085	0.536	0.024	4.4	0.002	t..			
Northern Cardinal	205	7990	11797	1684	0.546	0.010	1.9	0.577	0.380	0.013	3.4	0.084	0.543	0.023	4.3	0.003	t..	...		
Pyrrhuloxia*	2	129	134	3	0.955	0.252	26.4	0.000	0.230	0.206	89.7	0.000	0.035	0.032	91.9	0.000	...			
Rose-breasted Grosbeak	54	859	1013	60	0.448	0.056	12.5	0.006	0.238	0.062	25.9	0.617	0.414	0.118	28.4	0.009	.t.	...		
Black-headed Grosbeak	119	4824	6191	636	0.539	0.017	3.1	0.340	0.290	0.019	6.5	0.031	0.441	0.033	7.5	0.076	...	t..		
Blue Grosbeak	31	405	481	36	0.431	0.076	17.7	0.025	0.281	0.093	33.1	0.002	0.554	0.205	37.0	0.009	...			
Lazuli Bunting	52	2111	2660	179	0.489	0.031	6.3	0.007	0.284	0.035	12.3	0.009	0.310	0.044	14.1	0.271	...	..t		
Indigo Bunting	130	4927	6958	774	0.475	0.015	3.1	0.420	0.384	0.020	5.3	0.182	0.488	0.032	6.5	0.007	...	t..		
Varied Bunting*†	2	69	80	5	0.365	0.282	77.4	0.000	0.208	0.315	151.6	0.000	1.000	1.630	163.0	0.000	...			
Painted Bunting	34	2013	2745	331	0.548	0.024	4.3	0.028	0.456	0.032	7.0	0.044	0.330	0.032	9.6	0.171	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Dickcissel	15	697	784	29	0.438	0.073	16.6	0.004	0.230	0.084	36.7	0.007	0.285	0.116	40.6	0.028	...			
Red-winged Blackbird	94	2647	2950	161	0.586	0.036	6.2	0.666	0.166	0.028	16.7	0.303	0.331	0.058	17.6	0.252	t..			
Eastern Meadowlark	12	55	65	5	0.590	0.168	28.4	0.000	0.347	0.213	61.4	0.000	0.219	0.175	80.2	0.000	...			
Common Grackle	57	1192	1236	26	0.426	0.085	19.9	0.011	0.098	0.067	68.6	0.053	0.349	0.249	71.4	0.025	...			
Bronzed Cowbird	4	84	104	10	0.444	0.141	31.7	0.000	0.319	0.190	59.7	0.000	0.614	0.440	71.6	0.000	...			
Brown-headed Cowbird	254	2766	3844	451	0.489	0.020	4.1	0.006	0.413	0.027	6.6	0.029	0.472	0.040	8.5	0.018	...			
Orchard Oriole	23	330	390	24	0.433	0.085	19.7	0.027	0.158	0.079	50.2	0.002	0.750	0.389	51.9	0.177	...			
Bullock's Oriole	51	1500	1892	130	0.442	0.037	8.4	0.011	0.333	0.049	14.6	0.018	0.355	0.060	16.8	0.001	...			
Baltimore Oriole	55	876	1076	79	0.482	0.047	9.8	0.032	0.275	0.055	20.1	0.859	0.400	0.091	22.6	0.004	.t.			
Pine Grosbeak	10	144	172	11	0.401	0.130	32.3	0.002	0.284	0.178	62.6	0.016	0.489	0.354	72.3	0.002	...			
Purple Finch	57	4029	5075	448	0.461	0.020	4.3	0.118	0.324	0.026	7.9	0.004	0.424	0.039	9.2	0.010	...			
Cassin's Finch	25	667	714	19	0.468	0.093	19.9	0.001	0.070	0.051	72.6	0.130	0.516	0.375	72.7	0.023	...			
House Finch	61	1514	1598	31	0.508	0.081	16.0	0.002	0.090	0.046	51.5	0.004	0.283	0.147	51.8	0.006	...			
Common Redpoll	14	1631	2035	18	0.385	0.098	25.4	0.003	0.026	0.018	68.7	0.006	0.780	0.489	62.8	0.000	...			
Pine Siskin	52	2652	2832	20	0.394	0.095	24.1	0.023	0.015	0.016	105.0	0.006	0.870	0.889	102.2	0.015	...			
Lesser Goldfinch	44	1625	1758	51	0.385	0.063	16.4	0.006	0.092	0.043	46.2	0.002	0.653	0.300	45.8	0.047	...			
American Goldfinch	165	8850	10720	736	0.432	0.016	3.6	0.204	0.263	0.018	7.0	0.125	0.463	0.035	7.6	0.125	...	t..		
Mean (184 species)[m]	55	1732	2590	277	0.487	0.069	15.0	0.118	0.340	0.075	33.7	0.093	0.500	0.228	37.7	0.065				
Mean (159 better-estimated sp.)[m,n]	62	1976	2964	319	0.487	0.052	10.8	0.135	0.359	0.061	22.1	0.107	0.466	0.125	26.1	0.074				
NORTHWEST MAPS REGION																				
Williamson's Sapsucker	9	93	126	9	0.292	0.121	41.5	0.002	0.348	0.218	62.5	0.028	0.679	0.453	66.6	0.003	...			
Red-naped Sapsucker	30	465	798	92	0.422	0.042	9.9	0.004	0.506	0.068	13.5	0.001	0.546	0.102	18.6	0.001	...			
R.-naped x R.-breasted Hybrid	6	62	118	16	0.537	0.110	20.4	0.012	0.399	0.136	34.0	0.027	0.648	0.280	43.2	0.023	...			
Red-breasted Sapsucker	50	868	1409	151	0.449	0.034	7.5	0.004	0.413	0.049	11.8	0.011	0.571	0.084	14.7	0.018	...			
Downy Woodpecker	46	435	547	45	0.340	0.061	18.0	0.017	0.406	0.104	25.6	0.867	0.542	0.162	29.9	0.001	.t.			
Hairy Woodpecker	60	311	392	58	0.611	0.055	9.1	0.122	0.238	0.054	22.7	0.011	0.635	0.164	25.9	0.330	...	..t		
Northern Flicker†	58	230	253	8	0.414	0.158	38.2	0.001	0.062	0.076	122.8	0.001	1.000	1.210	121.0	0.001	...			
Olive-sided Flycatcher*†	15	59	72	3	0.830	0.202	24.3	0.000	0.017	0.025	150.0	0.000	1.000	1.455	145.5	0.000	...			
Western Wood-Pewee	62	1354	1803	199	0.509	0.031	6.0	0.077	0.344	0.037	10.9	0.100	0.475	0.062	13.1	0.804	..t			
"Traill's" Flycatcher	34	1446	2171	241	0.527	0.027	5.1	0.094	0.486	0.038	7.9	0.010	0.312	0.036	11.5	0.860	..t			
Least Flycatcher	3	43	64	6	0.587	0.168	28.6	0.000	0.716	0.234	32.7	0.000	0.139	0.107	76.9	0.000	...			
Hammond's Flycatcher	55	1345	1932	219	0.442	0.027	6.2	0.194	0.412	0.041	9.9	0.020	0.512	0.063	12.3	0.001	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Dusky Flycatcher	43	2355	3561	349	0.500	0.021	4.2	0.998	0.413	0.029	7.1	0.008	0.321	0.031	9.7	0.007	t..			
"Western" Flycatcher	51	1889	2532	235	0.496	0.026	5.3	0.083	0.331	0.033	10.0	0.028	0.386	0.047	12.1	0.021	...			
Cassin's Vireo	32	573	681	40	0.566	0.064	11.3	0.002	0.151	0.049	32.5	0.007	0.422	0.144	34.0	0.007	...			
Hutton's Vireo	8	33	48	8	0.607	0.153	25.2	0.000	0.368	0.178	48.4	0.000	0.515	0.316	61.4	0.000	...			
Warbling Vireo	92	4473	6635	743	0.489	0.015	3.1	0.029	0.407	0.021	5.1	0.002	0.439	0.029	6.6	0.798	..t			
Red-eyed Vireo	7	142	214	20	0.646	0.089	13.8	0.078	0.210	0.073	34.8	0.019	0.360	0.147	40.8	0.002	...			
Gray Jay	9	51	74	19	0.727	0.080	11.1	0.002	0.222	0.078	35.2	0.002	0.799	0.310	38.9	0.000	...			
Steller's Jay	54	244	266	18	0.667	0.095	14.2	0.000	0.116	0.065	55.7	0.001	0.433	0.251	57.9	0.002	...			
Western Scrub-Jay	11	48	56	6	0.622	0.145	23.3	0.000	0.204	0.144	70.3	0.000	0.405	0.314	77.6	0.000	...			
Tree Swallow	19	468	652	50	0.424	0.058	13.7	0.004	0.283	0.073	25.8	0.002	0.645	0.184	28.5	0.003	...			
Violet-green Swallow*†	4	76	86	3	0.307	0.240	78.3	0.001	0.097	0.184	190.7	0.000	1.000	1.874	187.4	0.000	...			
N. Rough-winged Swallow*	10	78	83	3	0.525	0.261	49.6	0.000	0.460	0.360	78.1	0.000	0.095	0.102	107.3	0.000	...			
Barn Swallow	5	322	402	35	0.498	0.065	13.0	0.273	0.191	0.062	32.6	0.273	0.582	0.202	34.7	0.003	...	t..	.t.	
Black-capped Chickadee	52	1111	1611	202	0.480	0.030	6.3	0.309	0.402	0.041	10.3	0.492	0.588	0.075	12.7	0.005	...	tt.	.t.	
Mountain Chickadee	43	1189	1499	132	0.454	0.037	8.2	0.029	0.340	0.048	14.2	0.121	0.454	0.076	16.7	0.004	...			
Chestnut-backed Chickadee	45	1026	1203	82	0.333	0.048	14.5	0.002	0.203	0.060	29.4	0.048	0.959	0.297	30.9	0.002	...			
Bushtit†	13	210	251	11	0.420	0.140	33.4	0.007	0.094	0.082	87.4	0.023	1.000	0.854	85.4	0.004	...			
Red-breasted Nuthatch	67	629	705	28	0.361	0.081	22.6	0.001	0.113	0.067	58.8	0.003	0.807	0.479	59.3	0.005	...			
Brown Creeper	48	603	763	54	0.332	0.056	17.0	0.002	0.269	0.080	29.9	0.011	0.798	0.255	31.9	0.000	...			
Bewick's Wren	18	277	463	60	0.423	0.051	12.1	0.007	0.521	0.086	16.6	0.011	0.614	0.141	22.9	0.002	...			
House Wren	27	796	1154	85	0.339	0.043	12.7	0.001	0.371	0.071	19.1	0.000	0.619	0.132	21.3	0.000	...			
Winter Wren	35	1053	1721	144	0.361	0.031	8.5	0.426	0.527	0.058	11.0	0.151	0.395	0.061	15.4	0.041	...	t..	.t.	
Golden-crowned Kinglet*	56	1057	1315	14	0.111	0.072	64.7	0.006	0.322	0.243	75.4	0.004	0.260	0.138	53.3	0.013	...			
Ruby-crowned Kinglet	18	829	1061	47	0.329	0.059	17.8	0.694	0.263	0.078	29.8	0.277	0.475	0.145	30.4	0.015	t..	.t.		
Veery	6	181	404	76	0.570	0.049	8.7	0.001	0.726	0.067	9.3	0.086	0.414	0.087	21.1	0.085	...			
Swainson's Thrush	81	8784	20182	3545	0.592	0.007	1.1	0.002	0.625	0.010	1.5	0.000	0.422	0.013	3.0	0.269	...	..t		
Hermit Thrush	36	927	1430	173	0.433	0.030	6.9	0.001	0.551	0.050	9.1	0.029	0.428	0.058	13.5	0.003	...			
American Robin	130	5092	6840	761	0.544	0.015	2.8	0.998	0.258	0.016	6.2	0.002	0.588	0.041	6.9	0.013	t..			
Varied Thrush	31	436	582	52	0.453	0.054	12.0	0.171	0.385	0.078	20.3	0.766	0.346	0.088	25.4	0.001	.t.			
Wrentit	21	613	1440	241	0.550	0.025	4.6	0.895	0.638	0.038	5.9	0.143	0.428	0.054	12.6	0.103	t..			
Gray Catbird	14	841	1315	170	0.556	0.035	6.4	0.009	0.390	0.042	10.8	0.001	0.545	0.073	13.5	0.267	...	..t		
Cedar Waxwing	32	1967	2273	19	0.480	0.105	22.0	0.005	0.039	0.022	55.4	0.001	0.288	0.148	51.5	0.028	...			
Orange-crowned Warbler	38	1617	2272	229	0.449	0.027	6.1	0.020	0.470	0.042	8.9	0.020	0.382	0.046	11.9	0.007	...			
Nashville Warbler	21	829	1009	50	0.332	0.056	16.7	0.004	0.428	0.099	23.2	0.007	0.279	0.076	27.3	0.018	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Virginia's Warbler†	2	265	300	20	0.407	0.104	25.5	0.005	0.157	0.103	65.3	0.584	1.000	0.685	68.5	0.001	.t.	...		
Yellow Warbler	64	6225	10298	1388	0.561	0.011	2.0	0.402	0.496	0.016	3.2	0.028	0.389	0.018	4.7	0.761	..t	t..	t.t	
Yellow-rumped Warbler	62	3689	4415	299	0.482	0.025	5.2	0.041	0.208	0.024	11.6	0.786	0.484	0.060	12.3	0.003	.t.			
Black-throated Gray Warbler	18	143	165	5	0.454	0.189	41.6	0.007	0.077	0.087	112.2	0.002	0.612	0.665	108.7	0.001	...			
Townsend's Warbler	25	1032	1283	101	0.457	0.042	9.2	0.002	0.198	0.042	21.4	0.003	0.689	0.155	22.5	0.003	...			
Hermit Warbler	32	1275	1399	43	0.597	0.063	10.6	0.018	0.099	0.033	33.7	0.004	0.271	0.093	34.4	0.004	...			
American Redstart	7	366	629	65	0.452	0.048	10.6	0.006	0.519	0.078	14.9	0.116	0.357	0.081	22.7	0.026	...			
Northern Waterthrush	7	177	262	29	0.621	0.083	13.4	0.909	0.443	0.098	22.2	0.012	0.205	0.070	34.3	0.007	t..			
MacGillivray's Warbler	91	7258	14191	1776	0.485	0.010	2.0	0.898	0.601	0.015	2.5	0.005	0.409	0.017	4.2	0.076	t..			
Common Yellowthroat	31	2000	3831	480	0.501	0.018	3.6	0.004	0.543	0.028	5.1	0.004	0.395	0.033	8.3	0.076	...			
Wilson's Warbler	57	4386	6951	679	0.428	0.015	3.5	0.023	0.535	0.025	4.7	0.002	0.345	0.024	7.0	0.715	..t	...		
Yellow-breasted Chat	18	1092	2033	278	0.505	0.023	4.6	0.895	0.520	0.036	6.9	0.071	0.423	0.047	11.1	0.174	t..			
Western Tanager	76	1842	2022	108	0.516	0.043	8.4	0.000	0.121	0.033	27.0	0.004	0.594	0.167	28.1	0.000	...			
Green-tailed Towhee	12	350	546	77	0.657	0.050	7.6	0.002	0.305	0.051	16.6	0.002	0.503	0.099	19.8	0.003	...			
Spotted Towhee	52	1436	2181	286	0.492	0.025	5.1	0.822	0.451	0.036	7.9	0.040	0.522	0.054	10.4	0.009	t..			
Chipping Sparrow	40	1027	1276	84	0.432	0.046	10.6	0.010	0.201	0.047	23.4	0.016	0.626	0.154	24.5	0.116	...			
Vesper Sparrow	3	56	73	11	0.754	0.110	14.6	0.000	0.265	0.114	43.1	0.002	0.328	0.170	51.7	0.000	...			
Savannah Sparrow	4	421	591	100	0.621	0.049	7.9	0.011	0.333	0.050	14.9	0.004	0.585	0.107	18.2	0.001	...			
Fox Sparrow	27	662	1152	136	0.535	0.035	6.6	0.566	0.437	0.048	10.9	0.071	0.395	0.061	15.4	0.089	t..	...		
Song Sparrow	109	7478	15446	2036	0.477	0.009	1.8	0.928	0.579	0.014	2.4	0.859	0.500	0.020	4.0	0.001	tt.			
Lincoln's Sparrow	37	2428	5701	744	0.433	0.014	3.3	0.333	0.610	0.024	4.0	0.016	0.641	0.042	6.5	0.121	...	t..		
White-crowned Sparrow	15	704	1215	167	0.463	0.030	6.6	0.007	0.534	0.048	9.1	0.002	0.495	0.068	13.7	0.007	...			
Dark-eyed Junco	88	6308	10836	1396	0.453	0.011	2.4	0.996	0.502	0.017	3.4	0.006	0.525	0.025	4.7	0.018	t..			
Black-headed Grosbeak	75	2622	3416	371	0.554	0.022	3.9	0.003	0.263	0.023	8.8	0.002	0.512	0.051	10.0	0.011	...			
Lazuli Bunting	31	1479	1901	143	0.517	0.035	6.7	0.001	0.263	0.037	13.9	0.001	0.359	0.056	15.7	0.076	...			
Red-winged Blackbird	28	1064	1192	77	0.676	0.059	8.7	0.068	0.139	0.035	24.9	0.068	0.372	0.094	25.2	0.042	...			
Brown-headed Cowbird	72	999	1479	196	0.485	0.030	6.2	0.004	0.457	0.044	9.6	0.047	0.514	0.065	12.6	0.007	...			
Bullock's Oriole	24	841	1086	96	0.462	0.044	9.5	0.007	0.391	0.061	15.6	0.011	0.387	0.074	19.1	0.001	...			
Pine Grosbeak*†	3	57	63	3	0.325	0.251	77.2	0.000	0.131	0.269	204.8	0.000	1.000	2.157	215.7	0.000	...			
Purple Finch	36	2795	3473	287	0.437	0.025	5.6	0.011	0.334	0.033	10.0	0.020	0.414	0.048	11.6	0.005	...			
Cassin's Finch	22	548	584	14	0.524	0.109	20.9	0.001	0.078	0.058	73.6	0.105	0.330	0.243	73.6	0.007	...			
House Finch†	5	328	368	15	0.436	0.109	24.9	0.028	0.070	0.066	93.3	0.017	1.000	0.940	94.0	0.003	...			
Pine Siskin	45	2529	2704	20	0.268	0.093	34.7	0.046	0.027	0.029	107.1	0.011	0.828	0.847	102.2	0.029	...			
Lesser Goldfinch†	7	343	369	9	0.389	0.153	39.4	0.000	0.056	0.075	134.4	0.000	1.000	1.323	132.3	0.001	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
American Goldfinch	22	1855	2485	227	0.476	0.027	5.7	0.380	0.326	0.034	10.6	0.988	0.440	0.054	12.4	0.012	.t.	tt.		
Mean (81 species)[m]	35	1403	2227	253	0.485	0.067	15.3	0.161	0.333	0.070	35.0	0.093	0.531	0.251	38.3	0.076				
Mean (68 better-estimated sp.)[m,n]	38	1590	2562	300	0.501	0.049	9.7	0.190	0.369	0.056	19.9	0.101	0.478	0.112	23.8	0.090				
SOUTHWEST MAPS REGION																				
Common Ground-Dove*†	3	81	93	2	0.697	0.698	100.1	0.000	0.024	0.058	248.3	0.000	1.000	2.126	212.6	0.000	...			
Acorn Woodpecker	8	58	72	8	0.464	0.177	38.1	0.000	0.726	0.230	31.6	0.000	0.279	0.174	62.4	0.000	...			
Williamson's Sapsucker	5	96	122	8	0.469	0.142	30.3	0.001	0.208	0.136	65.4	0.004	0.456	0.312	68.5	0.000	...			
Red-naped Sapsucker	4	149	292	63	0.576	0.050	8.8	0.002	0.583	0.072	12.3	0.018	0.526	0.116	22.1	0.002	...			
Red-breasted Sapsucker	2	30	39	5	0.688	0.178	25.9	0.000	0.454	0.220	48.4	0.000	0.261	0.192	73.5	0.000	...			
Ladder-backed Woodpecker*†	9	48	63	7	0.512	0.205	40.0	0.000	0.222	0.185	83.5	0.000	1.000	0.899	89.9	0.000	...			
Nuttall's Woodpecker	26	319	483	69	0.596	0.052	8.7	0.000	0.374	0.061	16.4	0.001	0.476	0.099	20.9	0.029	...			
Downy Woodpecker	27	332	507	65	0.623	0.052	8.3	0.000	0.373	0.061	16.3	0.003	0.355	0.077	21.7	0.003	...			
Hairy Woodpecker	11	102	144	19	0.794	0.082	10.3	0.001	0.184	0.062	34.0	0.017	0.357	0.143	40.1	0.001	...			
Northern Flicker	25	175	206	15	0.412	0.113	27.4	0.011	0.153	0.105	68.6	0.040	0.909	0.659	72.5	0.009	...			
Olive-sided Flycatcher	2	59	85	14	0.832	0.083	10.0	0.000	0.706	0.121	17.2	0.001	0.025	0.025	99.9	0.000	...			
Western Wood-Pewee	18	332	445	45	0.516	0.061	11.8	0.006	0.286	0.070	24.5	0.004	0.564	0.158	28.0	0.075	...			
"Traill's" Flycatcher	5	63	75	6	0.483	0.196	40.5	0.000	0.328	0.237	72.3	0.000	0.427	0.333	78.1	0.000	...			
Dusky Flycatcher	7	172	197	9	0.428	0.154	36.0	0.001	0.701	0.236	33.7	0.003	0.108	0.065	60.2	0.001	...			
"Western" Flycatcher	24	1320	1527	72	0.520	0.051	9.8	0.258	0.308	0.058	18.9	0.980	0.177	0.040	22.5	0.040	.t.	tt.		
Black Phoebe	23	208	249	20	0.545	0.096	17.6	0.001	0.323	0.112	34.5	0.003	0.282	0.116	41.0	0.000	...			
Vermilion Flycatcher*†	3	56	67	7	0.476	0.205	43.0	0.000	0.199	0.193	96.8	0.000	1.000	1.079	107.9	0.000	...			
Ash-throated Flycatcher	48	1089	1268	107	0.644	0.045	7.0	0.003	0.206	0.038	18.6	0.002	0.391	0.079	20.3	0.269	...	..t		
Brown-crested Flycatcher*	5	42	49	4	0.621	0.241	38.8	0.000	0.614	0.309	50.3	0.000	0.163	0.140	86.0	0.000	...			
Bell's Vireo	6	163	269	35	0.574	0.072	12.5	0.001	0.473	0.097	20.6	0.000	0.415	0.122	29.5	0.003	...			
Plumbeous Vireo	7	62	96	19	0.621	0.104	16.8	0.001	0.432	0.127	29.5	0.000	0.603	0.232	38.5	0.000	...			
Hutton's Vireo	12	100	137	12	0.560	0.125	22.4	0.001	0.242	0.117	48.5	0.054	0.424	0.231	54.4	0.005	...			
Warbling Vireo	18	1507	1876	114	0.526	0.039	7.3	0.001	0.458	0.054	11.8	0.004	0.144	0.024	16.8	1.000	..t			
Steller's Jay	9	121	163	27	0.738	0.067	9.0	0.001	0.189	0.058	30.5	0.817	0.586	0.197	33.6	0.000	.t.			
Western Scrub-Jay†	23	113	129	10	0.494	0.143	28.9	0.003	0.114	0.107	93.3	0.001	1.000	0.960	96.0	0.010	...			
Mexican Jay*	3	38	46	3	0.366	0.223	60.9	0.000	0.289	0.312	108.0	0.000	0.486	0.560	115.1	0.000	...			
Tree Swallow	11	104	123	6	0.520	0.159	30.7	0.005	0.286	0.182	63.7	0.002	0.150	0.114	76.0	0.006	...			
Violet-green Swallow	5	113	152	13	0.500	0.110	22.0	0.002	0.247	0.117	47.2	0.973	0.416	0.218	52.5	0.000	.t.			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Black-capped Chickadee	5	105	175	21	0.400	0.087	21.8	0.001	0.574	0.150	26.1	0.000	0.676	0.261	38.6	0.000	...			
Mountain Chickadee	10	295	389	36	0.381	0.066	17.5	0.451	0.292	0.092	31.6	0.451	0.798	0.275	34.4	0.001	t..	.t.		
Chestnut-backed Chickadee	7	349	598	92	0.494	0.044	8.9	0.087	0.477	0.063	13.3	0.885	0.633	0.114	18.0	0.000	.t.			
Bridled Titmouse	6	40	56	10	0.642	0.161	25.2	0.000	0.256	0.143	55.9	0.000	0.845	0.498	58.9	0.000	...			
Oak Titmouse	19	272	412	50	0.530	0.058	11.0	0.000	0.395	0.076	19.3	0.001	0.435	0.110	25.3	0.018	...			
Juniper Titmouse	4	51	93	19	0.586	0.095	16.3	0.000	0.482	0.130	26.8	0.000	0.630	0.243	38.5	0.000	...			
Verdin*†	3	42	55	2	0.422	0.334	79.3	0.000	0.092	0.186	200.7	0.000	1.000	1.910	191.0	0.000	...			
Bushtit	44	1735	2069	111	0.358	0.042	11.8	0.884	0.237	0.050	21.2	0.239	0.588	0.129	21.9	0.302	t..	tt.	t.t	
White-breasted Nuthatch	20	155	200	20	0.459	0.103	22.4	0.060	0.384	0.139	36.1	0.007	0.507	0.221	43.5	0.054	...			
Brown Creeper*	7	188	229	5	0.231	0.170	73.6	0.054	0.191	0.227	119.0	0.013	0.614	0.669	109.0	0.005	...			
Bewick's Wren	55	1630	2738	336	0.438	0.023	5.2	0.796	0.559	0.037	6.6	0.032	0.532	0.051	9.6	0.715	t.t	t..		
House Wren	34	1358	1974	144	0.384	0.034	8.7	0.003	0.401	0.053	13.2	0.003	0.457	0.071	15.5	0.001	...			
Golden-crowned Kinglet*	5	49	70	4	0.312	0.194	62.1	0.000	0.315	0.320	101.5	0.000	0.695	0.755	108.6	0.000	...			
Blue-gray Gnatcatcher*†	11	117	142	4	0.254	0.205	80.8	0.001	0.123	0.217	176.6	0.001	1.000	1.739	173.9	0.000	...			
Western Bluebird	12	113	154	9	0.318	0.119	37.3	0.000	0.409	0.221	54.1	0.004	0.419	0.264	63.0	0.002	...			
Swainson's Thrush	10	2354	4226	437	0.588	0.020	3.3	0.791	0.612	0.027	4.5	0.061	0.171	0.015	9.0	1.000	t.t			
Hermit Thrush	7	494	767	123	0.477	0.038	8.0	0.115	0.403	0.053	13.2	0.043	0.828	0.135	16.4	0.001	...			
American Robin	30	785	1008	114	0.490	0.040	8.2	0.585	0.265	0.046	17.3	0.053	0.685	0.132	19.2	0.362	t..	..t		
Wrentit	25	1619	3081	481	0.618	0.019	3.1	0.431	0.494	0.025	5.1	0.377	0.408	0.033	8.1	0.654	..t	tt.		
California Thrasher†	15	134	173	21	0.690	0.108	15.7	0.007	0.121	0.061	50.0	0.005	1.000	0.498	49.8	0.000	...			
Orange-crowned Warbler	22	1651	2072	130	0.422	0.038	8.9	0.149	0.346	0.052	14.9	0.055	0.352	0.061	17.4	0.149	...			
Virginia's Warbler	11	344	444	32	0.451	0.069	15.3	0.007	0.388	0.101	25.9	0.396	0.281	0.092	32.6	0.007	...	.t.		
Lucy's Warbler	8	401	505	48	0.466	0.065	13.9	0.004	0.317	0.080	25.1	0.000	0.567	0.160	28.3	0.002	...			
Yellow Warbler	19	1009	1378	127	0.513	0.037	7.2	0.813	0.412	0.050	12.2	0.005	0.305	0.049	15.9	0.211	t..			
Yellow-rumped Warbler†	6	360	417	22	0.392	0.091	23.3	0.592	0.124	0.083	66.5	0.105	1.000	0.689	68.9	0.254	t..	..t		
Black-throated Gray Warbler*†	2	31	35	2	0.447	0.351	78.6	0.000	0.091	0.192	212.4	0.000	1.000	2.050	205.0	0.000	...			
MacGillivray's Warbler	8	173	211	11	0.369	0.121	32.7	0.003	0.334	0.179	53.5	0.032	0.334	0.196	58.7	0.005	...			
Common Yellowthroat	32	2445	3821	388	0.512	0.023	4.4	0.943	0.435	0.030	7.0	0.002	0.393	0.036	9.1	0.030	t..			
Wilson's Warbler	12	3554	4571	249	0.441	0.025	5.7	0.011	0.460	0.039	8.5	0.942	0.178	0.021	11.6	1.000	.tt			
Yellow-breasted Chat	18	1020	1783	248	0.518	0.028	5.3	0.136	0.497	0.039	7.8	0.050	0.509	0.056	11.1	0.015	...			
Summer Tanager	9	236	392	69	0.562	0.058	10.3	0.076	0.435	0.070	16.1	0.002	0.763	0.156	20.4	0.001	...			
Western Tanager	11	449	501	26	0.537	0.080	14.9	0.002	0.185	0.073	39.7	0.003	0.325	0.140	43.1	0.000	...			
Spotted Towhee	48	2038	3015	421	0.504	0.021	4.2	0.024	0.425	0.029	6.8	0.170	0.585	0.050	8.6	0.063	...			
California Towhee	31	704	979	140	0.563	0.037	6.6	0.004	0.332	0.043	12.9	0.007	0.596	0.091	15.2	0.923	..t			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Abert's Towhee	5	131	173	16	0.486	0.126	25.9	0.000	0.390	0.157	40.3	0.000	0.389	0.189	48.7	0.001	...			
Rufous-crowned Sparrow	12	179	263	26	0.581	0.090	15.6	0.002	0.254	0.084	32.9	0.005	0.513	0.183	35.7	0.000	...			
Chipping Sparrow†	7	145	166	10	0.493	0.134	27.3	0.001	0.087	0.088	100.3	0.001	1.000	1.025	102.5	0.001	...			
Lark Sparrow	8	304	332	17	0.427	0.102	23.9	0.009	0.342	0.143	41.8	0.007	0.229	0.112	48.9	0.004	...			
Black-throated Sparrow*	10	136	145	4	0.593	0.220	37.1	0.000	0.114	0.120	105.1	0.001	0.217	0.236	108.8	0.002	...			
Sage Sparrow*†	2	99	104	3	0.496	0.277	55.8	0.001	0.037	0.093	254.1	0.000	1.000	2.485	248.5	0.000	...			
Fox Sparrow	2	84	140	19	0.531	0.082	15.5	0.000	0.548	0.128	23.4	0.000	0.327	0.144	44.0	0.000	...			
Song Sparrow	36	3195	5377	759	0.537	0.016	2.9	0.887	0.474	0.022	4.5	0.275	0.477	0.030	6.3	0.283	t..	t.t	tt.	
Lincoln's Sparrow	2	110	380	35	0.437	0.057	13.0	0.000	0.876	0.080	9.1	0.000	0.176	0.101	57.3	0.000	...			
White-crowned Sparrow	3	63	83	8	0.668	0.118	17.6	0.000	0.162	0.098	60.3	0.000	0.483	0.317	65.6	0.000	...			
Dark-eyed Junco	8	428	650	69	0.356	0.047	13.2	0.002	0.532	0.088	16.6	1.000	0.621	0.137	22.1	0.001	.t.			
Northern Cardinal	2	47	73	8	0.394	0.151	38.5	0.000	0.637	0.272	42.7	0.000	0.460	0.290	63.0	0.000	...			
Black-headed Grosbeak	43	2133	2681	258	0.517	0.026	5.1	0.084	0.338	0.032	9.6	0.019	0.357	0.041	11.5	0.923	..t			
Blue Grosbeak	21	324	391	33	0.467	0.083	17.8	0.002	0.311	0.100	32.0	0.000	0.505	0.186	36.9	0.002	...			
Lazuli Bunting	20	629	756	36	0.372	0.063	17.0	0.168	0.418	0.108	25.8	0.557	0.200	0.063	31.5	0.015	.t.	...		
Varied Bunting*†	2	69	80	5	0.365	0.282	77.4	0.000	0.208	0.315	151.6	0.000	1.000	1.630	163.0	0.000	...			
Red-winged Blackbird†	13	326	359	17	0.714	0.150	21.0	0.005	0.035	0.032	90.4	0.004	1.000	0.869	86.9	0.005	...			
Brown-headed Cowbird	39	452	678	93	0.530	0.045	8.6	0.002	0.462	0.061	13.3	0.004	0.454	0.082	18.1	0.001	...			
Bullock's Oriole	25	568	698	30	0.391	0.075	19.2	0.001	0.280	0.094	33.6	0.000	0.294	0.105	35.7	0.000	...			
Purple Finch	9	1082	1411	145	0.522	0.036	6.8	0.347	0.307	0.041	13.3	0.571	0.430	0.067	15.6	0.016	.t.	t..		
Cassin's Finch*†	3	119	130	5	0.318	0.171	53.8	0.000	0.098	0.157	159.3	0.000	1.000	1.621	162.1	0.000	...			
House Finch	40	994	1027	14	0.660	0.144	21.8	0.028	0.136	0.078	57.4	0.010	0.085	0.052	61.7	0.066	...			
Lesser Goldfinch	36	1270	1377	42	0.389	0.069	17.8	0.012	0.113	0.052	46.2	0.001	0.532	0.246	46.1	0.373	...	..t		
American Goldfinch	19	961	1061	43	0.495	0.071	14.4	0.002	0.139	0.051	36.4	0.015	0.403	0.151	37.3	0.011	...			
Mean (86 species)	15	549	770	75	0.504	0.111	23.7	0.103	0.336	0.112	50.5	0.109	0.526	0.370	56.9	0.104				
Mean (59 better-estimated sp.)[n]	19	749	1062	106	0.525	0.067	12.9	0.139	0.375	0.079	24.8	0.155	0.448	0.138	31.9	0.146				
NORTH-CENTRAL MAPS REGION																				
Red-bellied Woodpecker	10	54	60	5	0.424	0.187	44.1	0.000	0.273	0.248	90.9	0.000	0.607	0.624	102.9	0.000	...			
Downy Woodpecker†	26	354	460	45	0.382	0.062	16.3	0.000	0.251	0.081	32.1	0.001	1.000	0.347	34.7	0.001	...			
Hairy Woodpecker	18	79	91	10	0.427	0.144	33.8	0.012	0.769	0.201	26.1	0.000	0.229	0.128	55.9	0.000	...			
Northern Flicker*	20	89	111	4	0.321	0.185	57.7	0.001	0.313	0.277	88.5	0.001	0.236	0.227	95.9	0.000	...			
Western Wood-Pewee†	2	89	153	25	0.445	0.083	18.7	0.166	0.392	0.119	30.4	0.675	1.000	0.362	36.2	0.001	.t.			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Eastern Wood-Pewee	16	179	216	12	0.478	0.117	24.6	0.018	0.309	0.142	46.1	0.026	0.226	0.122	54.0	0.004	...			
"Traill's" Flycatcher	14	795	1208	115	0.476	0.037	7.8	0.007	0.495	0.057	11.5	0.029	0.341	0.056	16.6	0.018	...			
Least Flycatcher	15	1099	1526	139	0.397	0.035	8.8	0.002	0.448	0.056	12.5	0.880	0.438	0.069	15.7	0.001	.t.			
Great Crested Flycatcher	17	114	136	19	0.840	0.079	9.4	0.000	0.234	0.074	31.5	0.001	0.234	0.088	37.7	0.000	...			
White-eyed Vireo	2	32	74	11	0.509	0.104	20.4	0.000	0.578	0.172	29.7	0.000	0.334	0.238	71.2	0.000	...			
Warbling Vireo	9	126	138	8	0.505	0.150	29.8	0.005	0.275	0.174	63.3	0.039	0.243	0.181	74.3	0.001	...			
Red-eyed Vireo	26	761	1010	98	0.542	0.041	7.5	0.071	0.401	0.054	13.5	0.900	0.306	0.055	18.0	0.291	.t.	.tt		
Blue Jay†	23	215	239	17	0.524	0.101	19.4	0.004	0.087	0.068	78.2	0.005	1.000	0.805	80.5	0.001	...			
Black-capped Chickadee	33	872	1152	107	0.413	0.040	9.6	0.002	0.461	0.063	13.7	0.004	0.418	0.074	17.8	0.011	...			
Tufted Titmouse	11	201	282	45	0.524	0.062	11.8	0.003	0.456	0.087	19.0	0.001	0.498	0.129	25.9	0.007	...			
White-breasted Nuthatch	17	89	102	6	0.537	0.163	30.4	0.000	0.187	0.141	75.4	0.001	0.312	0.251	80.6	0.000	...			
Carolina Wren	7	91	135	15	0.339	0.090	26.5	0.231	0.651	0.186	28.5	0.040	0.418	0.197	47.1	0.000	...			
House Wren	22	1065	1610	113	0.298	0.033	11.2	0.632	0.459	0.068	14.9	0.088	0.516	0.091	17.7	0.239	t..	..t		
Veery	12	476	836	153	0.602	0.034	5.6	0.002	0.555	0.045	8.1	0.029	0.489	0.065	13.2	0.002	...			
Wood Thrush	13	366	578	64	0.417	0.052	12.5	0.001	0.402	0.078	19.3	0.002	0.731	0.167	22.9	0.007	...			
American Robin	31	978	1192	72	0.420	0.049	11.5	0.104	0.395	0.071	18.0	0.103	0.254	0.057	22.2	0.039	...			
Gray Catbird	28	2859	4737	573	0.503	0.017	3.4	0.087	0.474	0.025	5.2	0.808	0.438	0.032	7.4	0.137	.t.			
Brown Thrasher	6	107	142	20	0.672	0.086	12.8	0.000	0.187	0.073	38.8	0.002	0.652	0.280	42.9	0.060	...			
Blue-winged Warbler	5	166	295	30	0.620	0.074	12.0	0.002	0.327	0.081	24.9	0.029	0.366	0.119	32.4	0.007	...			
Nashville Warbler	4	208	240	9	0.401	0.129	32.3	0.003	0.352	0.193	54.9	0.001	0.210	0.138	65.5	0.004	...			
Yellow Warbler	20	1720	2728	374	0.549	0.021	3.9	0.000	0.402	0.028	6.9	0.001	0.484	0.044	9.0	0.003	...			
Chestnut-sided Warbler	5	413	720	84	0.385	0.042	11.0	0.047	0.614	0.076	12.3	0.006	0.621	0.120	19.3	0.004	...			
Yellow-rumped Warbler*†	1	37	45	2	0.374	0.277	74.1	0.000	0.102	0.242	238.3	0.000	1.000	2.453	245.3	0.000	...			
Black-and-white Warbler	7	131	170	19	0.485	0.091	18.8	0.031	0.543	0.141	26.0	0.003	0.237	0.097	41.1	0.001	...			
American Redstart	13	722	1020	70	0.441	0.048	10.8	0.001	0.312	0.061	19.4	0.075	0.412	0.093	22.5	0.017	...			
Ovenbird	10	462	609	61	0.577	0.053	9.2	0.195	0.339	0.063	18.6	0.067	0.345	0.080	23.2	0.331	...	..t	t..	
Northern Waterthrush†	2	65	84	7	0.314	0.147	46.7	0.000	0.270	0.228	84.6	0.000	1.000	0.912	91.2	0.000	...			
Kentucky Warbler	2	104	204	46	0.604	0.062	10.3	0.007	0.584	0.083	14.3	0.007	0.599	0.141	23.6	0.018	...			
Mourning Warbler	3	136	249	37	0.460	0.068	14.8	0.031	0.585	0.106	18.1	0.006	0.638	0.180	28.1	0.001	...			
Common Yellowthroat	30	1887	3303	324	0.451	0.022	5.0	0.030	0.520	0.036	6.8	0.048	0.407	0.041	10.0	0.994	..t			
Scarlet Tanager*	12	75	84	4	0.341	0.197	57.8	0.000	0.387	0.345	89.1	0.000	0.269	0.288	107.3	0.000	...			
Eastern Towhee	10	73	110	12	0.408	0.119	29.2	0.027	0.579	0.202	34.9	0.029	0.460	0.237	51.6	0.001	...			
Chipping Sparrow†	10	189	236	13	0.380	0.110	28.9	0.005	0.134	0.098	72.8	0.026	1.000	0.733	73.3	0.001	...			
Clay-colored Sparrow	7	365	446	21	0.465	0.101	21.7	0.011	0.340	0.120	35.4	0.041	0.209	0.087	41.6	0.004	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Field Sparrow	11	716	1060	112	0.430	0.038	8.8	0.016	0.331	0.051	15.4	0.073	0.663	0.116	17.6	0.027	...			
Savannah Sparrow*	3	39	49	3	0.466	0.203	43.6	0.000	0.460	0.326	70.9	0.000	0.113	0.130	115.1	0.000	...			
Song Sparrow	29	1417	2372	269	0.441	0.024	5.4	0.143	0.512	0.039	7.6	0.626	0.482	0.052	10.9	0.007	.t.	...		
Lincoln's Sparrow	2	48	90	10	0.426	0.115	26.9	0.000	0.786	0.183	23.3	0.000	0.233	0.146	62.8	0.000	...			
Swamp Sparrow	7	248	454	42	0.411	0.056	13.5	0.001	0.774	0.095	12.3	0.000	0.213	0.067	31.4	0.002	...			
White-throated Sparrow	3	320	647	60	0.380	0.045	11.8	0.058	0.623	0.087	13.9	0.026	0.496	0.119	23.9	0.005	...			
Northern Cardinal	22	736	984	118	0.499	0.038	7.6	0.002	0.366	0.050	13.7	0.007	0.498	0.084	16.8	0.011	...			
Rose-breasted Grosbeak	22	400	463	24	0.341	0.089	26.0	0.007	0.249	0.120	48.0	0.541	0.548	0.285	52.0	0.013	.t.	...		
Black-headed Grosbeak	1	69	94	7	0.454	0.169	37.1	0.006	0.221	0.165	74.6	0.000	0.673	0.525	78.0	0.001	...			
Indigo Bunting	21	972	1319	130	0.481	0.036	7.5	0.628	0.303	0.044	14.4	0.232	0.507	0.083	16.4	0.007	t..	.t.		
Red-winged Blackbird†	14	514	547	13	0.454	0.124	27.4	0.002	0.038	0.052	137.5	0.001	1.000	1.387	138.7	0.001	...			
Brown-headed Cowbird	26	296	402	40	0.488	0.064	13.1	0.007	0.412	0.090	21.9	0.003	0.351	0.100	28.5	0.029	...			
Bullock's Oriole*	1	58	75	4	0.605	0.208	34.4	0.000	0.057	0.064	112.7	0.000	0.936	1.043	111.5	0.000	...			
Baltimore Oriole	17	367	449	43	0.554	0.065	11.7	0.009	0.175	0.057	32.2	0.810	0.644	0.222	34.4	0.001	.t.			
American Goldfinch	26	2198	2764	226	0.358	0.028	7.7	0.621	0.326	0.041	12.6	0.026	0.646	0.090	13.9	0.390	t..	..t		
Mean (54 species)	13	486	713	72	0.464	0.089	20.4	0.060	0.390	0.113	40.1	0.117	0.503	0.275	48.7	0.050				
Mean (38 better-estimated sp.)[n]	15	632	943	98	0.479	0.061	13.2	0.080	0.442	0.086	21.2	0.148	0.437	0.119	29.4	0.071				
SOUTH-CENTRAL MAPS REGION																				
Common Ground-Dove	7	398	443	10	0.433	0.160	36.9	0.001	0.048	0.052	109.6	0.001	0.936	0.969	103.6	0.001	...			
Yellow-billed Cuckoo	52	492	534	17	0.505	0.101	20.0	0.022	0.196	0.096	49.1	0.107	0.207	0.111	53.6	0.003	...			
Golden-fronted Woodpecker*†	7	145	180	8	0.179	0.115	64.4	0.012	0.343	0.301	87.8	0.002	1.000	0.886	88.6	0.001	...			
Red-bellied Woodpecker	19	116	127	5	0.535	0.179	33.4	0.002	0.100	0.107	106.5	0.003	0.407	0.434	106.6	0.000	...			
Ladder-backed Woodpecker	13	99	130	20	0.642	0.099	15.4	0.000	0.361	0.111	30.6	0.001	0.420	0.165	39.3	0.001	...			
Downy Woodpecker	34	370	457	49	0.585	0.058	9.8	0.018	0.254	0.060	23.7	0.018	0.444	0.120	27.1	0.004	...			
Eastern Wood-Pewee	18	151	172	12	0.702	0.130	18.5	0.002	0.344	0.135	39.1	0.001	0.151	0.078	51.7	0.002	...			
Acadian Flycatcher	13	844	1255	180	0.502	0.031	6.1	0.001	0.546	0.046	8.4	0.003	0.399	0.052	13.0	0.004	...			
Great Crested Flycatcher	22	163	192	18	0.529	0.098	18.6	0.094	0.185	0.098	53.1	0.283	0.606	0.352	58.0	0.024	...	.t.		
Brown-crested Flycatcher	4	252	326	43	0.478	0.068	14.3	0.002	0.264	0.085	32.1	0.008	0.897	0.334	37.2	0.001	...			
Eastern Kingbird*	11	70	76	2	0.733	0.247	33.7	0.000	0.218	0.223	102.5	0.000	0.050	0.064	127.1	0.000	...			
White-eyed Vireo	31	2024	3548	461	0.539	0.019	3.5	0.015	0.513	0.027	5.3	0.078	0.386	0.032	8.3	0.056	...			
Bell's Vireo	12	487	748	106	0.564	0.038	6.7	0.008	0.380	0.049	13.0	0.994	0.464	0.078	16.9	0.005	.t.			
Red-eyed Vireo	21	468	559	56	0.554	0.056	10.1	0.003	0.166	0.048	29.1	0.011	0.758	0.234	30.8	0.011	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Green Jay*†	3	28	32	3	0.940	0.268	28.5	0.000	0.034	0.083	247.9	0.000	1.000	2.428	242.8	0.000	...			
Carolina Chickadee	44	752	864	43	0.489	0.063	12.9	0.004	0.122	0.045	36.9	0.075	0.593	0.221	37.3	0.002	...			
Black-capped Chickadee	6	138	169	12	0.407	0.117	28.7	0.229	0.232	0.138	59.5	0.023	0.557	0.348	62.5	0.062	...			
Tufted Titmouse	29	591	786	101	0.430	0.043	10.1	0.543	0.348	0.060	17.3	0.010	0.793	0.161	20.3	0.124	t..	...		
Black-crested Titmouse	19	312	407	45	0.498	0.063	12.6	0.004	0.214	0.062	29.0	0.002	0.821	0.253	30.8	0.007	...			
Verdin*	2	29	33	3	0.658	0.283	43.0	0.000	0.211	0.225	106.7	0.000	0.298	0.324	108.7	0.000	...			
Carolina Wren	37	1406	2395	310	0.407	0.022	5.3	0.764	0.624	0.038	6.2	0.152	0.495	0.050	10.2	0.088	t..			
Bewick's Wren	22	578	870	107	0.406	0.038	9.3	0.491	0.582	0.066	11.4	0.966	0.479	0.083	17.2	0.500	tt.	.tt		
House Wren	5	162	207	18	0.350	0.092	26.3	0.000	0.569	0.177	31.1	0.001	0.369	0.162	43.9	0.004	...			
Blue-gray Gnatcatcher	32	333	360	12	0.597	0.120	20.1	0.009	0.088	0.065	73.8	0.041	0.350	0.260	74.3	0.002	...			
Wood Thrush†	8	137	200	19	0.325	0.089	27.3	0.001	0.328	0.146	44.4	0.005	1.000	0.483	48.3	0.000	...			
Gray Catbird	8	795	1185	168	0.559	0.031	5.5	0.010	0.466	0.043	9.3	0.982	0.373	0.050	13.3	0.815	.tt			
Northern Mockingbird	18	377	469	16	0.316	0.092	29.3	0.024	0.223	0.116	52.0	0.009	0.392	0.203	51.9	0.031	...			
Brown Thrasher	15	312	394	31	0.377	0.071	18.8	0.014	0.553	0.127	23.0	0.054	0.300	0.100	33.3	0.005	...			
Long-billed Thrasher	4	176	237	34	0.582	0.083	14.2	0.004	0.381	0.097	25.3	0.141	0.626	0.204	32.6	0.000	...			
Blue-winged Warbler	4	280	420	61	0.549	0.053	9.6	0.002	0.519	0.075	14.4	0.002	0.328	0.074	22.4	0.000	...			
Northern Parula*†	10	61	67	3	0.315	0.240	76.3	0.000	0.127	0.230	181.1	0.000	1.000	1.811	181.1	0.000	...			
Yellow Warbler	3	108	156	28	0.502	0.079	15.6	0.003	0.375	0.107	28.5	0.029	0.754	0.264	35.0	0.002	...			
Prairie Warbler	3	155	204	22	0.550	0.097	17.6	0.220	0.193	0.078	40.4	0.085	0.737	0.324	44.0	0.001	...			
Black-and-white Warbler	13	214	239	12	0.607	0.119	19.6	0.004	0.232	0.113	48.6	0.004	0.187	0.103	55.1	0.083	...			
American Redstart	1	73	91	10	0.582	0.127	21.8	0.000	0.258	0.133	51.4	0.000	0.440	0.254	57.8	0.000	...			
Prothonotary Warbler	8	313	413	27	0.415	0.081	19.5	0.005	0.193	0.080	41.2	0.001	0.766	0.317	41.5	0.021	...			
Worm-eating Warbler	2	80	103	9	0.535	0.133	24.8	0.001	0.497	0.192	38.6	0.001	0.177	0.107	60.3	0.001	...			
Swainson's Warbler	3	79	153	15	0.405	0.107	26.4	0.006	0.551	0.181	32.8	0.045	0.586	0.271	46.2	0.001	...			
Ovenbird	5	88	124	17	0.593	0.094	15.8	0.000	0.360	0.117	32.4	0.001	0.365	0.157	42.9	0.000	...			
Louisiana Waterthrush	5	86	130	15	0.456	0.109	23.8	0.029	0.478	0.163	34.1	0.637	0.446	0.207	46.5	0.002	.t.	...		
Kentucky Warbler	17	696	1129	173	0.596	0.030	5.1	0.000	0.506	0.042	8.3	0.000	0.338	0.045	13.3	0.029	...			
Common Yellowthroat	16	519	804	88	0.453	0.041	9.0	0.024	0.468	0.064	13.8	0.265	0.413	0.079	19.1	0.007	...	.t.		
Hooded Warbler	6	196	273	20	0.376	0.090	24.0	0.001	0.391	0.140	35.9	0.004	0.482	0.203	42.2	0.003	...			
Yellow-breasted Chat	10	993	1612	231	0.510	0.027	5.3	0.047	0.414	0.037	8.9	0.926	0.599	0.069	11.5	0.011	.t.			
Summer Tanager	24	344	422	45	0.546	0.062	11.4	0.002	0.255	0.066	26.1	0.011	0.501	0.148	29.5	0.002	...			
Olive Sparrow	4	241	465	75	0.511	0.048	9.4	0.002	0.757	0.065	8.6	0.004	0.503	0.099	19.8	0.007	...			
Eastern Towhee†	13	69	87	8	0.484	0.144	29.8	0.000	0.154	0.123	80.0	0.001	1.000	0.832	83.2	0.000	...			
Rufous-crowned Sparrow	7	90	139	17	0.454	0.096	21.1	0.278	0.454	0.147	32.4	0.002	0.509	0.220	43.2	0.000	...	t..		

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Field Sparrow	32	1210	1750	207	0.484	0.027	5.6	0.007	0.331	0.035	10.7	0.874	0.607	0.077	12.7	0.015	.t.			
Lark Sparrow*†	7	142	152	4	0.532	0.236	44.3	0.000	0.033	0.072	214.8	0.000	1.000	2.139	213.9	0.000	...			
Grasshopper Sparrow	6	224	337	35	0.439	0.069	15.7	0.040	0.358	0.095	26.7	0.333	0.607	0.189	31.2	0.001	...	.t.		
Northern Cardinal	56	3416	5052	735	0.547	0.015	2.8	0.932	0.376	0.019	5.1	0.715	0.551	0.036	6.5	0.001	tt.	t..		
Pyrrhuloxia*	2	129	134	3	0.955	0.252	26.4	0.000	0.230	0.206	89.7	0.000	0.035	0.032	91.9	0.000	...			
Blue Grosbeak*†	7	72	81	3	0.299	0.226	75.6	0.001	0.131	0.218	166.2	0.000	1.000	1.615	161.5	0.000	...			
Indigo Bunting	28	1826	2665	313	0.464	0.023	5.0	0.040	0.441	0.034	7.7	0.002	0.480	0.049	10.1	0.176	...			
Painted Bunting	32	1949	2644	312	0.541	0.024	4.4	0.046	0.459	0.033	7.2	0.045	0.324	0.032	9.9	0.770	..t			
Dickcissel	15	697	784	29	0.438	0.073	16.6	0.004	0.230	0.084	36.7	0.007	0.285	0.116	40.6	0.028	...			
Eastern Meadowlark	11	54	64	5	0.589	0.167	28.4	0.000	0.349	0.214	61.2	0.000	0.223	0.179	80.1	0.000	...			
Bronzed Cowbird	2	73	92	10	0.454	0.143	31.4	0.000	0.350	0.197	56.3	0.000	0.639	0.451	70.7	0.000	...			
Brown-headed Cowbird	42	630	828	92	0.491	0.043	8.7	0.003	0.275	0.050	18.4	0.815	0.658	0.137	20.9	0.004	.t.			
Orchard Oriole	15	226	270	17	0.390	0.099	25.3	0.023	0.288	0.137	47.4	0.002	0.496	0.263	53.1	0.226	...			
American Goldfinch	19	561	658	39	0.360	0.064	17.7	0.107	0.188	0.072	38.5	0.106	0.732	0.291	39.8	0.006	...			
Mean (62 species)	15	453	644	74	0.504	0.099	20.6	0.066	0.324	0.106	48.5	0.143	0.538	0.330	53.7	0.051				
Mean (49 better-estimated sp.)[n]	17	543	779	92	0.498	0.072	14.8	0.083	0.363	0.089	28.9	0.181	0.489	0.162	34.7	0.064				
NORTHEAST MAPS REGION																				
Red-bellied Woodpecker†	19	70	81	7	0.547	0.158	28.8	0.000	0.112	0.115	102.7	0.001	1.000	1.046	104.6	0.000	...			
Yellow-bellied Sapsucker	12	119	161	16	0.467	0.108	23.2	0.005	0.370	0.145	39.3	0.012	0.502	0.244	48.7	0.011	...			
Downy Woodpecker	62	547	714	67	0.443	0.050	11.4	0.007	0.529	0.081	15.2	0.007	0.283	0.062	22.0	0.002	...			
Hairy Woodpecker	38	170	218	24	0.807	0.073	9.0	0.000	0.098	0.039	39.8	0.004	0.598	0.239	39.9	0.002	...			
Northern Flicker	36	126	145	9	0.553	0.140	25.3	0.000	0.164	0.117	71.2	0.001	0.446	0.337	75.4	0.004	...			
Eastern Wood-Pewee	35	212	275	25	0.497	0.081	16.3	0.002	0.313	0.098	31.3	0.168	0.399	0.148	37.1	0.010	...			
Acadian Flycatcher	13	167	216	13	0.592	0.112	19.0	0.000	0.286	0.118	41.1	0.016	0.215	0.110	51.4	0.001	...			
"Traill's" Flycatcher	20	808	1074	84	0.457	0.044	9.6	0.014	0.549	0.070	12.8	0.061	0.189	0.037	19.9	0.197	...			
Least Flycatcher*†	11	222	245	3	0.555	0.227	40.9	0.003	0.014	0.035	244.5	0.000	1.000	2.438	243.8	0.004	...			
Eastern Phoebe	27	272	376	28	0.507	0.075	14.8	0.047	0.426	0.105	24.7	0.018	0.215	0.073	34.2	0.001	...			
Great Crested Flycatcher	35	181	202	14	0.654	0.106	16.2	0.002	0.124	0.071	57.6	0.007	0.434	0.260	60.0	0.015	...			
Eastern Kingbird	9	50	70	9	0.528	0.136	25.7	0.000	0.511	0.196	38.4	0.000	0.367	0.212	57.7	0.000	...			
White-eyed Vireo	13	342	551	71	0.457	0.049	10.7	0.002	0.415	0.070	17.0	0.001	0.646	0.137	21.2	0.000	...			
Yellow-throated Vireo*	4	34	39	4	0.566	0.226	39.9	0.000	0.314	0.255	81.4	0.000	0.372	0.374	100.5	0.000	...			
Blue-headed Vireo	15	151	187	13	0.393	0.115	29.3	0.001	0.205	0.125	61.0	0.004	0.712	0.443	62.2	0.001	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Warbling Vireo	10	100	128	10	0.368	0.121	32.9	0.000	0.528	0.223	42.3	0.005	0.322	0.189	58.8	0.000	...			
Red-eyed Vireo	64	1777	2338	252	0.555	0.027	4.8	0.069	0.270	0.028	10.5	0.112	0.505	0.061	12.0	0.002	...			
Blue Jay	55	375	407	23	0.770	0.085	11.0	0.000	0.174	0.064	36.6	0.001	0.170	0.071	41.9	0.622	..t	...		
Carolina Chickadee	20	230	267	23	0.517	0.100	19.3	0.002	0.310	0.117	37.9	0.012	0.385	0.174	45.2	0.006	...			
Black-capped Chickadee	61	1454	2048	232	0.513	0.028	5.4	0.712	0.298	0.032	10.7	0.014	0.594	0.073	12.3	0.014	t..	...		
Tufted Titmouse	49	561	754	76	0.378	0.049	12.9	0.029	0.298	0.067	22.4	0.004	0.901	0.221	24.5	0.001	...			
White-breasted Nuthatch	29	126	159	14	0.414	0.115	27.8	0.003	0.280	0.150	53.7	0.009	0.675	0.405	60.0	0.001	...			
Carolina Wren	24	488	667	46	0.365	0.061	16.6	0.269	0.447	0.101	22.7	0.014	0.334	0.092	27.4	0.007	...	t..		
House Wren	24	345	477	23	0.276	0.078	28.3	0.010	0.376	0.147	39.1	0.006	0.455	0.185	40.6	0.019	...			
Eastern Bluebird	12	96	158	11	0.465	0.120	25.9	0.002	0.245	0.126	51.3	0.006	0.547	0.308	56.2	0.001	...			
Veery	43	2052	4006	782	0.581	0.014	2.5	0.091	0.558	0.020	3.6	0.150	0.508	0.031	6.0	0.091	...			
Bicknell's Thrush	1	28	45	10	0.613	0.124	20.3	0.000	0.318	0.150	47.2	0.000	0.840	0.479	57.0	0.000	...			
Swainson's Thrush	6	124	249	57	0.602	0.062	10.4	0.174	0.628	0.080	12.8	0.009	0.625	0.130	20.9	0.039	...			
Hermit Thrush	29	449	848	142	0.475	0.036	7.5	0.457	0.644	0.055	8.6	0.742	0.541	0.079	14.6	0.152	.t.	t..	tt.	.tt
Wood Thrush	59	2340	3571	303	0.426	0.022	5.3	0.117	0.401	0.034	8.4	0.105	0.405	0.043	10.5	0.233	...	..t		
American Robin	67	2022	2570	202	0.461	0.031	6.7	0.009	0.293	0.037	12.5	0.007	0.469	0.066	14.1	0.007	...			
Gray Catbird	62	6331	10265	1337	0.516	0.011	2.2	0.008	0.455	0.016	3.5	0.973	0.470	0.023	4.8	0.007	.t.			
Brown Thrasher	15	120	167	17	0.500	0.102	20.3	0.002	0.180	0.091	50.6	0.007	0.997	0.529	53.1	0.017	...			
Cedar Waxwing*†	38	1537	1595	2	0.715	0.282	39.4	0.002	0.001	0.004	477.2	0.002	1.000	4.735	473.5	0.001	...			
Blue-winged Warbler	17	369	465	42	0.403	0.062	15.4	0.016	0.382	0.095	24.9	0.099	0.454	0.138	30.4	0.166	...			
Nashville Warbler	8	257	312	11	0.348	0.127	36.5	0.010	0.134	0.104	78.0	0.257	0.659	0.499	75.7	0.001	...			
Northern Parula	7	136	174	15	0.484	0.107	22.1	0.003	0.518	0.162	31.2	0.075	0.212	0.099	46.8	0.011	...			
Yellow Warbler	33	1842	2773	358	0.500	0.023	4.5	0.001	0.486	0.032	6.6	0.002	0.432	0.040	9.3	0.999	..t			
Chestnut-sided Warbler	17	516	831	105	0.495	0.039	7.8	0.045	0.444	0.056	12.6	0.047	0.449	0.078	17.3	0.009	...			
Magnolia Warbler	12	517	810	83	0.409	0.045	11.0	0.978	0.605	0.077	12.8	0.024	0.350	0.069	19.7	0.001	t..			
Black-throated Blue Warbler	7	124	172	22	0.500	0.090	17.9	0.000	0.457	0.127	27.9	0.000	0.423	0.160	37.7	0.003	...			
Yellow-rumped Warbler	12	331	495	64	0.455	0.052	11.4	0.007	0.461	0.078	17.0	0.001	0.510	0.114	22.4	0.002	...			
Black-throated Green Warbler	19	445	683	84	0.395	0.046	11.5	0.004	0.568	0.079	13.9	0.071	0.533	0.104	19.5	0.071	...			
Blackburnian Warbler	5	46	57	5	0.566	0.189	33.5	0.000	0.106	0.111	104.4	0.000	0.899	0.946	105.2	0.000	...			
Pine Warbler*	8	107	141	9	0.222	0.130	58.4	0.000	0.404	0.301	74.4	0.000	0.913	0.694	76.0	0.000	...			
Blackpoll Warbler	2	80	109	6	0.338	0.128	37.9	0.000	0.577	0.281	48.7	0.000	0.076	0.081	106.6	0.000	...			
Black-and-white Warbler	40	746	1042	126	0.518	0.037	7.2	0.139	0.330	0.046	13.9	0.136	0.536	0.090	16.7	0.174	...			
American Redstart	40	2325	3326	352	0.511	0.022	4.4	0.007	0.340	0.028	8.1	0.004	0.459	0.045	9.8	0.981	..t			
Worm-eating Warbler	12	499	699	66	0.501	0.051	10.2	0.011	0.394	0.069	17.6	0.011	0.364	0.082	22.4	0.011	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Ovenbird	61	2134	3147	433	0.570	0.020	3.5	0.001	0.414	0.026	6.2	0.001	0.403	0.034	8.4	0.119	...			
Northern Waterthrush	4	96	127	12	0.400	0.110	27.4	0.000	0.500	0.188	37.7	0.000	0.384	0.203	52.8	0.002	...			
Louisiana Waterthrush	12	222	394	37	0.468	0.061	13.0	0.005	0.679	0.101	14.9	0.000	0.186	0.063	34.1	0.109	...			
Kentucky Warbler	4	63	95	13	0.558	0.114	20.4	0.000	0.423	0.153	36.2	0.000	0.347	0.170	49.1	0.001	...			
Mourning Warbler	3	58	91	7	0.637	0.147	23.1	0.000	0.110	0.079	71.2	0.000	0.748	0.532	71.2	0.000	...			
Common Yellowthroat	58	2768	4390	522	0.493	0.018	3.6	0.001	0.504	0.026	5.2	0.002	0.376	0.029	7.7	0.001	...			
Hooded Warbler	15	601	1034	121	0.430	0.037	8.6	0.017	0.645	0.061	9.5	0.001	0.395	0.064	16.1	0.047	...			
Canada Warbler	7	131	163	12	0.374	0.116	31.0	0.001	0.576	0.209	36.3	0.003	0.239	0.127	53.2	0.002	...			
Yellow-breasted Chat	6	233	332	41	0.462	0.063	13.7	0.002	0.397	0.091	22.9	0.001	0.520	0.147	28.2	0.004	...			
Scarlet Tanager	42	360	410	18	0.564	0.098	17.5	0.002	0.052	0.038	73.7	0.012	0.927	0.676	73.0	0.004	...			
Eastern Towhee	44	662	938	120	0.483	0.039	8.0	0.002	0.372	0.051	13.7	0.001	0.575	0.096	16.7	0.001	...			
Chipping Sparrow	24	317	428	37	0.413	0.070	16.9	0.000	0.310	0.091	29.2	0.001	0.629	0.203	32.3	0.000	...			
Song Sparrow	40	1518	2561	217	0.369	0.026	7.2	0.692	0.478	0.046	9.7	0.082	0.527	0.065	12.4	0.728	t.t	t..	..t	
Swamp Sparrow	9	192	330	46	0.483	0.061	12.7	0.978	0.601	0.094	15.6	0.002	0.415	0.107	25.8	0.005	t..			
White-throated Sparrow	15	595	923	75	0.263	0.040	15.0	0.064	0.604	0.097	16.1	0.068	0.573	0.125	21.8	0.771	..t			
Dark-eyed Junco	16	391	564	44	0.399	0.061	15.3	0.003	0.346	0.086	25.0	0.044	0.522	0.147	28.2	0.100	...			
Northern Cardinal	51	1123	1592	227	0.610	0.029	4.7	0.801	0.371	0.033	9.0	0.186	0.457	0.053	11.5	0.011	t..			
Rose-breasted Grosbeak	28	433	518	33	0.488	0.073	15.0	0.001	0.254	0.079	31.0	0.076	0.336	0.117	34.9	0.001	...			
Indigo Bunting	31	596	834	87	0.427	0.043	10.2	0.362	0.556	0.072	13.0	0.055	0.346	0.066	19.2	0.004	...	t..		
Red-winged Blackbird	24	604	698	50	0.552	0.060	10.9	0.156	0.314	0.071	22.5	0.245	0.257	0.069	27.0	0.003	...	.t.		
Common Grackle	24	402	426	14	0.338	0.117	34.5	0.005	0.257	0.167	65.1	0.004	0.309	0.224	72.4	0.079	...			
Brown-headed Cowbird	39	223	262	18	0.315	0.102	32.5	0.003	0.356	0.177	49.8	0.000	0.583	0.346	59.3	0.063	...			
Orchard Oriole*†	2	31	36	3	0.522	0.277	53.0	0.000	0.100	0.169	168.8	0.000	1.000	1.684	168.4	0.000	...			
Baltimore Oriole	29	404	511	32	0.373	0.070	18.7	0.129	0.470	0.122	26.0	0.217	0.288	0.096	33.5	0.035	...			
Purple Finch†	10	128	167	16	0.319	0.100	31.2	0.354	0.340	0.174	51.1	0.056	1.000	0.594	59.4	0.008	...	t..		
American Goldfinch	54	2409	2761	138	0.416	0.037	8.9	0.019	0.211	0.039	18.5	0.101	0.436	0.086	19.7	0.797	..t			
Mean (75 species)	25	654	948	102	0.479	0.084	18.2	0.091	0.368	0.098	42.7	0.058	0.509	0.312	48.9	0.091				
Mean (61 better-estimated sp.)[n]	28	749	1104	124	0.489	0.066	13.7	0.106	0.390	0.083	25.8	0.066	0.472	0.155	31.3	0.109				
SOUTHEAST MAPS REGION																				
Red-bellied Woodpecker	53	189	213	12	0.312	0.120	38.4	0.005	0.282	0.189	67.0	0.059	0.570	0.418	73.4	0.010	...			
Downy Woodpecker	67	461	545	45	0.621	0.062	10.0	0.001	0.331	0.070	21.1	0.000	0.204	0.054	26.7	0.011	...			
Hairy Woodpecker	35	121	143	15	0.524	0.113	21.5	0.001	0.141	0.095	67.0	0.001	0.991	0.701	70.8	0.000	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Eastern Wood-Pewee	46	269	342	37	0.522	0.075	14.4	0.002	0.442	0.098	22.2	0.018	0.333	0.100	30.0	0.000	...			
Acadian Flycatcher	53	2163	3144	398	0.483	0.021	4.3	0.005	0.535	0.032	5.9	0.003	0.380	0.033	8.8	0.268	...	..t		
Great Crested Flycatcher	40	241	266	13	0.459	0.120	26.2	0.001	0.224	0.127	56.7	0.007	0.311	0.191	61.3	0.002	...			
White-eyed Vireo	43	1174	2170	265	0.461	0.024	5.2	0.018	0.537	0.039	7.2	0.003	0.456	0.050	11.0	0.007	...			
Red-eyed Vireo	61	2592	3373	422	0.599	0.020	3.3	0.290	0.238	0.020	8.2	0.034	0.532	0.049	9.2	0.014	...	t..		
Blue Jay	60	396	440	31	0.672	0.075	11.1	0.001	0.105	0.046	43.9	0.093	0.487	0.219	44.9	0.388	...	..t		
Carolina Chickadee	71	695	841	71	0.499	0.051	10.3	0.000	0.228	0.052	22.8	0.001	0.511	0.126	24.6	0.000	...			
Tufted Titmouse	72	1204	1700	228	0.498	0.028	5.6	0.996	0.447	0.039	8.8	0.004	0.469	0.055	11.7	0.002	t..			
Carolina Wren	70	1741	2878	293	0.358	0.022	6.1	0.999	0.589	0.043	7.2	0.001	0.507	0.054	10.6	0.030	t..			
House Wren	4	67	95	5	0.478	0.177	37.0	0.000	0.151	0.129	85.8	0.000	0.536	0.465	86.7	0.000	...			
Wood Thrush	58	3214	5804	614	0.449	0.016	3.5	0.071	0.558	0.026	4.7	0.071	0.392	0.029	7.3	0.017	...			
American Robin	20	560	602	21	0.431	0.093	21.5	0.048	0.123	0.072	58.9	0.581	0.472	0.283	60.0	0.002	.t.	...		
Gray Catbird	24	1187	1745	161	0.421	0.031	7.3	0.484	0.451	0.049	10.9	0.025	0.381	0.055	14.3	0.009	...	t..		
Brown Thrasher	24	217	271	26	0.713	0.077	10.8	0.001	0.159	0.056	35.3	0.076	0.410	0.151	36.9	0.001	...			
Blue-winged Warbler	9	313	466	56	0.540	0.053	9.9	0.004	0.285	0.060	21.0	0.007	0.565	0.137	24.3	0.000	...			
Northern Parula	24	270	293	14	0.220	0.098	44.8	0.001	0.670	0.258	38.5	0.002	0.308	0.187	60.6	0.001	...			
Yellow Warbler†	1	59	76	8	0.418	0.155	37.1	0.000	0.235	0.179	76.2	0.001	1.000	0.803	80.3	0.000	...			
Pine Warbler*	24	133	141	3	0.650	0.281	43.3	0.000	0.230	0.220	95.8	0.000	0.065	0.073	111.7	0.000	...			
Prairie Warbler	20	492	671	59	0.421	0.055	13.1	0.004	0.353	0.076	21.5	0.029	0.497	0.124	24.9	0.002	...			
Black-and-white Warbler	18	189	227	18	0.654	0.110	16.8	0.001	0.114	0.065	57.1	0.001	0.723	0.428	59.1	0.001	...			
American Redstart*†	3	51	59	5	0.485	0.201	41.4	0.000	0.123	0.167	136.1	0.000	1.000	1.407	140.7	0.000	...			
Prothonotary Warbler	14	385	495	46	0.487	0.061	12.5	0.011	0.282	0.072	25.5	0.002	0.518	0.151	29.2	0.002	...			
Worm-eating Warbler	17	367	537	73	0.594	0.050	8.3	0.004	0.436	0.063	14.4	0.003	0.355	0.072	20.2	0.011	...			
Swainson's Warbler	6	70	96	7	0.678	0.146	21.5	0.000	0.119	0.089	74.9	0.000	0.549	0.426	77.5	0.000	...			
Ovenbird	47	1847	2791	346	0.525	0.022	4.2	0.001	0.467	0.031	6.7	0.003	0.374	0.035	9.5	0.004	...			
Louisiana Waterthrush	20	379	670	94	0.531	0.045	8.5	0.014	0.600	0.063	10.6	0.050	0.404	0.071	17.7	0.006	...			
Kentucky Warbler	37	1403	2623	397	0.503	0.020	4.0	0.002	0.614	0.031	5.0	0.047	0.444	0.039	8.8	0.002	...			
Common Yellowthroat	44	1691	2875	264	0.420	0.023	5.5	0.617	0.532	0.040	7.5	0.030	0.340	0.039	11.4	0.101	t..	...		
Hooded Warbler	32	759	1380	164	0.508	0.031	6.0	0.011	0.495	0.046	9.3	0.002	0.387	0.055	14.1	0.007	...			
Yellow-breasted Chat	26	640	953	95	0.335	0.039	11.5	0.623	0.565	0.077	13.7	0.380	0.516	0.097	18.8	0.001	t..	.t.		
Summer Tanager	32	276	334	22	0.441	0.094	21.2	0.099	0.299	0.116	38.8	0.005	0.412	0.181	43.9	0.012	...			
Scarlet Tanager	39	315	361	22	0.588	0.088	15.0	0.000	0.105	0.054	51.1	0.003	0.574	0.299	52.0	0.001	...			
Eastern Towhee	47	336	477	57	0.451	0.055	12.3	0.004	0.322	0.072	22.5	0.047	0.739	0.190	25.7	0.001	...			
Chipping Sparrow*	6	44	49	2	0.887	0.286	32.2	0.000	0.157	0.172	109.6	0.000	0.078	0.104	132.4	0.000	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Field Sparrow	18	264	380	45	0.351	0.061	17.3	0.001	0.522	0.110	21.1	0.817	0.633	0.176	27.8	0.001	.t.			
Song Sparrow	2	189	305	32	0.380	0.066	17.4	0.408	0.529	0.120	22.7	0.226	0.412	0.134	32.6	0.005	t..	...	.t.	
Northern Cardinal	74	2668	4096	596	0.532	0.017	3.2	0.003	0.391	0.022	5.7	0.011	0.587	0.042	7.2	0.001	...			
Indigo Bunting	50	1533	2140	244	0.501	0.027	5.3	0.499	0.319	0.032	10.2	0.500	0.565	0.067	11.9	0.002	...	tt.		
Painted Bunting	2	64	101	19	0.709	0.127	17.9	0.000	0.384	0.121	31.3	0.000	0.460	0.176	38.2	0.000	...			
Common Grackle†	20	632	651	11	0.257	0.126	49.0	0.007	0.052	0.109	210.6	0.026	1.000	2.148	214.8	0.007	...			
Brown-headed Cowbird	36	166	195	12	0.394	0.118	30.1	0.036	0.457	0.193	42.2	0.125	0.334	0.185	55.6	0.002	...			
American Goldfinch	25	866	991	63	0.528	0.053	10.1	0.003	0.150	0.042	27.9	0.003	0.498	0.145	29.2	0.001	...			
Mean (45 species)	33	731	1089	121	0.500	0.081	16.8	0.117	0.341	0.086	38.7	0.073	0.495	0.245	43.7	0.021				
Mean (36 better-estimated sp.)[n]	37	869	1312	149	0.511	0.058	11.2	0.145	0.361	0.063	24.4	0.086	0.483	0.145	28.1	0.025				
ALASKA AND BOREAL CANADA MAPS REGIONS																				
Western Wood-Pewee	2	84	110	12	0.430	0.122	28.5	0.000	0.664	0.190	28.6	0.000	0.323	0.165	51.1	0.000	...			
"Traill's" Flycatcher	14	585	820	50	0.375	0.050	13.5	0.007	0.517	0.094	18.2	0.002	0.236	0.062	26.2	0.005	...			
Gray Jay†	11	53	78	16	0.522	0.098	18.8	0.000	0.400	0.135	33.8	0.000	1.000	0.424	42.4	0.000	...			
Tree Swallow*†	1	77	91	6	0.213	0.143	67.2	0.000	0.326	0.334	102.3	0.000	1.000	1.145	114.5	0.000	...			
Black-capped Chickadee	11	251	395	45	0.412	0.056	13.5	0.125	0.384	0.086	22.4	0.324	0.805	0.218	27.1	0.043	...	.t.		
Boreal Chickadee	10	133	200	29	0.445	0.075	16.9	0.056	0.337	0.102	30.3	0.107	0.897	0.313	34.9	0.003	...			
Arctic Warbler	2	259	481	52	0.324	0.050	15.6	0.029	0.630	0.104	16.5	0.003	0.648	0.163	25.2	0.001	...			
Gray-cheeked Thrush	6	253	539	74	0.441	0.044	10.1	0.000	0.705	0.072	10.2	0.000	0.527	0.108	20.4	0.001	...			
Swainson's Thrush	17	900	1483	206	0.457	0.028	6.0	0.061	0.583	0.044	7.6	0.101	0.492	0.060	12.1	0.101	...			
Hermit Thrush	10	643	1383	191	0.487	0.028	5.7	0.499	0.777	0.040	5.2	0.004	0.342	0.047	13.8	0.011	...	t..		
American Robin†	16	392	469	29	0.305	0.073	24.1	0.027	0.192	0.096	50.0	0.002	1.000	0.517	51.7	0.000	...			
Varied Thrush*†	10	115	136	5	0.218	0.166	75.9	0.001	0.202	0.290	143.3	0.001	1.000	1.478	147.8	0.000	...			
Orange-crowned Warbler	16	1377	2123	193	0.393	0.026	6.7	0.040	0.529	0.048	9.0	0.176	0.374	0.049	13.1	0.002	...			
Yellow Warbler	11	1176	1853	162	0.413	0.030	7.2	0.121	0.501	0.050	10.1	0.009	0.385	0.055	14.2	0.011	...			
Yellow-rumped Warbler	18	745	968	79	0.364	0.044	12.2	0.001	0.446	0.077	17.3	0.004	0.445	0.097	21.9	0.004	...			
Townsend's Warbler*	4	159	199	8	0.197	0.112	56.7	0.000	0.430	0.309	71.7	0.000	0.492	0.385	78.2	0.001	...			
Blackpoll Warbler	5	98	164	17	0.300	0.084	28.2	0.001	0.814	0.163	20.0	0.000	0.513	0.223	43.5	0.001	...			
American Redstart	4	373	535	65	0.561	0.051	9.1	0.008	0.313	0.060	19.1	0.993	0.534	0.120	22.5	0.002	.t.			
Ovenbird	3	124	162	9	0.423	0.144	34.1	0.000	0.484	0.226	46.8	0.000	0.211	0.130	61.5	0.000	...			
Northern Waterthrush	10	277	463	59	0.509	0.052	10.3	0.004	0.710	0.076	10.6	0.002	0.280	0.065	23.3	0.000	...			
Mourning Warbler	3	78	120	15	0.335	0.100	29.7	0.000	0.478	0.187	39.1	0.000	0.909	0.449	49.4	0.000	...			

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4
Wilson's Warbler	15	2919	4758	350	0.344	0.018	5.3	0.019	0.595	0.038	6.4	0.860	0.297	0.030	10.1	0.664	.tt	.t.		
Canada Warbler	3	195	340	41	0.482	0.063	13.2	0.002	0.483	0.094	19.5	0.000	0.514	0.141	27.5	0.011	...			
American Tree Sparrow	7	203	338	35	0.460	0.063	13.8	0.001	0.548	0.104	19.0	0.001	0.335	0.103	30.6	0.002	...			
Chipping Sparrow	5	67	99	9	0.328	0.127	38.8	0.000	0.391	0.226	57.7	0.000	0.789	0.515	65.3	0.000	...			
Savannah Sparrow	6	130	166	12	0.294	0.111	37.6	0.000	0.738	0.218	29.6	0.000	0.340	0.188	55.3	0.000	...			
Fox Sparrow	13	411	664	84	0.511	0.042	8.3	0.179	0.568	0.065	11.5	0.021	0.353	0.068	19.3	0.802	..t			
Lincoln's Sparrow	12	320	575	30	0.401	0.066	16.4	0.000	0.315	0.091	28.8	0.004	0.387	0.134	34.7	0.001	...			
White-throated Sparrow	4	261	395	24	0.470	0.085	18.0	0.174	0.198	0.074	37.4	0.006	0.576	0.225	39.0	0.003	...			
White-crowned Sparrow	13	649	1079	119	0.411	0.035	8.5	0.049	0.417	0.056	13.3	0.592	0.678	0.113	16.6	0.001	.t.	...		
Golden-crowned Sparrow	5	281	539	76	0.498	0.043	8.6	0.006	0.522	0.067	12.9	0.118	0.522	0.107	20.4	0.001	...			
Dark-eyed Junco	15	654	1142	113	0.302	0.032	10.6	0.002	0.632	0.072	11.4	0.001	0.694	0.118	17.0	0.001	...			
Pine Grosbeak	7	87	109	8	0.445	0.150	33.8	0.001	0.362	0.214	59.2	0.004	0.389	0.286	73.5	0.000	...			
Common Redpoll	14	1631	2035	18	0.385	0.098	25.4	0.003	0.026	0.018	68.7	0.006	0.780	0.489	62.8	0.000	...			
Mean (34 species)	9	469	736	66	0.396	0.074	21.4	0.042	0.477	0.121	32.0	0.098	0.561	0.259	40.2	0.049				
Mean (25 better-estimated sp.)[n]	10	590	940	86	0.420	0.055	13.7	0.055	0.508	0.083	19.7	0.133	0.514	0.149	27.1	0.067				

[a] Using the computer program TMSURVIV (Hines et al. 2003), a modification of SURVIV (White 1983) to accommodate transient models.

[b] These models, developed by Pradel et. al (1997), modified by Nott and DeSante (2002), and fully formulated by Hines et al. (2003), include both between- and within-year information on transients and permit the estimation of three parameters: apparent survival probability (φ), recapture probability (p), and proportion of residents among those newly-banded adults that were not recaptured at least seven days later during their first year of capture (τ). In the time-constant model, each of these three parameters is constrained to be constant over all years.

[c] Species included are those for which (a) an average of at least 2.5 individual adult birds were captured per year over the twelve years 1992-2003 (30 year-unique records), (b) at least two returns were recorded during the twelve years from all stations pooled, and (c) survival and recapture probabilities were neither 1.000 nor 0.000. Data for any given species were only included from stations where the species was a regular or usual breeder and summer resident (i.e., attempted to breed during all or more than half of the years, respectively, that the station was operated).

[d] Number of super-stations that were operated for a least four consecutive years during the twelve-year period 1992-2003 at which (a) at least one adult individual of the species was captured and (b) the species was a regular or usual breeder. A super-station includes all stations within one km of each other.

[e] Total number of individual adult birds captured during the twelve years 1992-2003 at stations where the species was a regular or usual breeder; thus the number of capture histories upon which the estimates of survival probability, recapture probability, and proportion of residents were based.

[f] Total number of captures of adults of the species during the twelve years 1992-2003 at stations where the species was a regular or usual breeder.

[g] Total number of returns during the twelve years 1992-2003 at stations where the species was a regular or usual breeder. A return is defined as the first capture of an individual adult birds in any year other than the year during which it was initially banded.

[h] Defined as the probability of an adult bird surviving to and returning in a particular year (breeding season) to the area where it was present in the previous year (breeding season). The estimated probability (φ), standard error of the estimate (SE(φ)), and coefficient of variation (CV(φ)=100*SE(φ)/φ) are presented.

[i] The amount of support for time-dependence for each of the three parameters is provided by summing the w_i for all models in which time dependence of the

TABLE 3. Continued.

Species[c]	No. stn.[d]	No. indv.[e]	No. capt.[f]	No. btwn. year recap.[g]	Survival: Survival probability[h] φ	SE(φ)	CV(φ)	$w(\varphi_i)$[i]	Recapture: Recapture probability[j] p	SE(p)	CV(p)	$w(p_i)$[i]	Proportion of: Proportion of residents[k] τ	SE(τ)	CV(τ)	$w(\tau_i)$[i]	Models selected[l] 1	2	3	4

parameter of interest occurred (w_i; Burnham and Anderson 1998). w_i={exp(-ΔQAIC$_C$/2)}/Σ{exp(-ΔQAIC$_C$/2)} where QAIC$_C$ is the Akaike Information Criterion for model i, modified for small sample sizes and overdispersion of data, and ΔQAIC$_C$ is the difference between the QAIC$_C$ of model i and the model with the lowest QAIC$_C$. Values of w_i greater than 0.50 indicate strong support for time dependence in the parameter, while 0.5>w_i>0.25 suggest some support for time dependence in the parameter. Despite substantial support for time-dependence in one or more parameters, all parameter estimates presented in this table are for the time-constant model.

[j] Defined as the conditional probability of recapturing an adult bird at least once in a particular year (breeding season), given that it did survive and return to the area where it was present in the previous year (breeding season). Again, the estimated probability (p), standard error of the estimate (SE(p)), and coefficient of variation (CV(p)) are presented.

[k] The estimated proportion of residents among those newly-banded adults that were not recaptured seven or more days later during their first year of capture. Again, the estimated proportion (τ), standard error of the estimate (SE(τ)), and coefficient of variation (CV(τ)) are presented.

[l] Models involving time dependence were selected according to modified Akaike's Information Criterion (QAIC$_C$), with the selected model (Model 1) being the one with the lowest QAIC$_C$. All equivalent models (models with a QAIC$_C$ within 2.0 units of the selected model) are shown and listed in order (Models 2-5) of increasing QAIC$_C$. Despite time-dependence in one or more parameters (e.g., φ_t) being selected for a number of species, all parameter estimates presented in this summary are for the time-constant model. Models are designated as follows: ...=$\varphi p \tau$; t..=$\varphi_t p \tau$; .t.=$\varphi p_t \tau$; ..t=$\varphi p \tau_t$; tt.=$\varphi_t p_t \tau$; t.t=$\varphi_t p \tau_t$; .tt=$\varphi p_t \tau_t$; ttt=$\varphi_t p_t \tau_t$, where φ is the survival probability, p is the recapture probability, and τ is the proportion of residents among those newly-captured adults that were not recaptured seven or more days later during their first year of capture.

[m] Includes Red-naped x Red-breasted Sapsucker hybrid.

[n] Better-estimated species are those for which CV(φ)<30.0% and φ is not qualified by the use of * or †.

* The estimate for survival probability should be viewed with caution because it is based on fewer than five between-year recaptures or the estimate is very imprecise (SE(φ) ≥ 0.200 or CV(φ) ≥ 50.0%)

† The estimate for survival probability, recapture probability, or both may be biased low because the estimate for τ was 1.00.

TABLE 4. Comparison of numbers of stations contributing data to survivorship analyses, numbers of species for which survivorship could be estimated, and precision of the survivorship estimates using data from the ten years, 1992-2001, and the twelve years, 1992-2003.

	No. stations		No. species		Mean CV(φ)		Number (proportion) of species with CV(φ)<30%		CV(φ)<20%		CV(φ)<10%	
Region	10-YR	12-YR	10-YR	12-YR	10-YR	12-YR	10-YR	12-YR	10-YR	12-YR	10-YR	12-YR
PROGRAM-WIDE	479	550	180	184	17.1%	15.0%	146 (0.811)	163 (0.886)	122 (0.678)	140 (0.761)	75 (0.417)	86 (0.467)
NORTHWEST	136	151	77	81	16.4%	15.3%	67 (0.870)	71 (0.877)	58 (0.753)	61 (0.753)	34 (0.442)	42 (0.519)
SOUTHWEST	68	83	72	86	22.3%	23.7%	57 (0.792)	64 (0.744)	40 (0.556)	50 (0.581)	17 (0.236)	25 (0.291)
NORTH-CENTRAL	38	44	54	54	23.0%	20.4%	38 (0.704)	43 (0.796)	32 (0.593)	33 (0.611)	10 (0.185)	15 (0.278)
SOUTH-CENTRAL	62	71	60	62	23.4%	20.6%	44 (0.733)	53 (0.855)	28 (0.467)	36 (0.581)	12 (0.200)	17 (0.274)
NORTHEAST	73	91	71	75	19.2%	18.3%	55 (0.775)	62 (0.827)	45 (0.634)	48 (0.640)	16 (0.225)	20 (0.267)
SOUTHEAST	73	79	41	45	18.7%	16.8%	34 (0.829)	36 (0.800)	27 (0.659)	31 (0.689)	13 (0.317)	16 (0.356)
ALASKA/BOREAL CANADA	29	31	36	34	22.8%	21.4%	27 (0.750)	27 (0.794)	20 (0.556)	22 (0.647)	8 (0.222)	9 (0.265)
Mean of regions	68	79	59	62	20.8%	19.5%	46 (0.779)	51 (0.813)	36 (0.603)	40 (0.643)	16 (0.261)	21 (0.321)

ranging from 1.33±0.20 in the South-central Region to 1.54±0.25 in the Alaska/Boreal Canada Region, and averaging 1.38±0.25 overall. Similarly, the average total number of returns per individual per species also remained remarkably constant over the seven regions, ranging from 0.132±0.069 in the South-central Region to 0.154±0.074 in the Alaska/Boreal Canada Region, and averaging 0.135±0.077 overall.

The precision of the estimates of annual adult survival rate using 12 years of data (1992-2003) from a total of 550 stations increased over that obtained from 10 years of data (1992-2001) from a total of 479 stations (Table 4). The mean coefficient of variation in survival probability, CV(φ), for all species in each region ranged from 15.3% in the Northwest Region to 23.7% in the Southwest Region and averaged 19.5±2.9% over the seven regions; the mean program-wide CV(φ) was 15.0%. These figures compare to a range from 16.4% in the Northwest Region to 23.4% in the South-central Region, an average of 20.8±2.7% over the seven regions, and 17.1% program-wide for 1992-2001 data, and represent only a 6% average improvement going from 10 to 12 years of data (Table 4), compared to an 8% average improvement going from seven to 10 years of data and a 28% average improvement going from five to seven years of data. Another measure of the increased precision provided by 12, rather than 10, years of data is the mean numbers of species over the seven regions having CV(φ)<30%, which increased by 11% from 46 species with 10 years of data to 51 species with 12 years of data. Similarly, the mean number of species per region having CV(φ)<20% also increased by 11% from 36 to 40 species; and the mean number having CV(φ)<10% increased by 31% from 16 to 21 species (Table 4). The analogous program-wide increases in the numbers of species were 11%, 15%, and 15%. The mean proportions of species over the seven regions having CV(φ)<30%, <20%, and <10% also increased with 12, rather than 10, years of data (by 4%, 7%, and 23%, respectively; Table 4). The analogous program-wide increases in the proportions of species were 9%, 12%, and 12%.

Mean regional survival probabilities for all species in each region (Table 3) ranged from 0.396 (Alaska/Boreal Canada) to 0.504 (both Southwest and South-central) and averaged 0.476±0.038 for the seven regions; the mean program-wide survival probability was 0.487. Mean recapture probabilities ranged from 0.324 (South-central) to 0.477 (Alaska/Boreal Canada) and averaged 0.367±0.054; the mean program-wide recapture probability was 0.340. The mean proportion of residents among newly-captured adults ranged from 0.495 (Southeast) to 0.561 (Alaska/Boreal Canada) and averaged 0.522±0.023; the mean program-wide proportion of residents was 0.500.

As in previous years, mean regional survival and recapture probabilities increased and mean regional proportion of residents decreased when consideration was limited in each region to species for which survival was "better estimated" (see Methods). Indeed, when consideration was limited to these better-estimated species, mean regional survival probabilities ranged from 0.420 (Alaska/Boreal Canada) to 0.525 (Southwest) and averaged 0.488±0.037 for the seven regions; the mean program-wide survival probability was 0.487. Mean recapture probabilities ranged from 0.361 (Southeast) to 0.508 (Alaska/Boreal Canada) and averaged 0.401±0.055; the mean program-wide recapture probability was 0.359. The mean proportion of residents among newly-captured adults ranged from 0.437 (North-central) to 0.514 (Alaska/Boreal Canada) and averaged 0.474±0.026; the mean program-wide proportion of residents was 0.466.

Again, as in previous years, mean regional survival rates for better-estimated species were higher for the three more southerly regions (Southwest: 0.525±0.067; Southeast: 0.511±0.058; South-central: 0.498±0.072) than for the three more northerly regions (Northwest: 0.501±0.049; Northeast: 0.489±0.066; North-central: 0.479±0.061), and were lowest for the far northern Alaska/Boreal Canada region (0.420±0.055). Moreover, mean regional survival rates for better-estimated species were higher for the two western regions, lower for two eastern regions, and lowest for the two central regions. In contrast, mean regional recapture probabilities for these same species tended to show the opposite pattern with respect to latitude, being lower in the Southeast (0.361±0.063) and South-central (0.363±0.089) regions than in the Northeast (0.390±0.083) and North-central (0.442±0.086) regions, and highest of all in the Alaska/Boreal Canada region (0.508±0.083).

Breaking this pattern, however, were the western regions, where recapture probabilities were slightly lower in the Northwest (0.369±0.056) than Southwest Region (0.375±0.079). Mean regional proportion of residents among newly captured adults for these same species showed relatively little variation and no distinct pattern, being lowest for the North-central and Southwest regions (0.437±0.119 and 0.448±0.138, respectively), and highest for the Alaska/Boreal Canada region (0.514±0.149).

In general, mean regional survival probabilities from 12 years of data (1992-2003) were lower than those from 10 years of data (1992-2001), both for all species for which survival was estimated [by an average of 0.008 (1.84%)] and for better-estimated species [by an average of 0.009 (1.86%)]. The only exceptions to this rule were the Northwest and Southeast regions for all species for which survival was estimated, and the Southwest Region for the better-estimated species. To control for potential differences in the species being compared, we ran matched-pairs *t*-tests between survival estimates from 12 and 10 years of data for those species-region combinations for which survival for the species was estimated with CV(φ)<30% for both sets of data. We found that regional survival estimates were lower for 12 than for 10 years of data for each of the seven regions, significantly so by 0.017 (3.9%) for the Alaska & Boreal Canada (t = 3.99, n = 26, P = 0.001), by 0.019 (3.6%) for the South-central (t = 2.46, n = 44, P = 0.018), and by 0.015 (2.9%) for the Northeast (t = 2.62, n = 55, P = 0.012) regions. For all 318 species-region combinations with CV(φ)<30% for both sets of data, survival estimates were highly significantly (t = 3.26, n = 318, P = 0.001) lower by 0.008 (1.6%) for 12 than for 10 years of data.

For each species in each region, we also modeled all possible combinations of time dependence in the three parameters, φ, p, τ. The selected model (the one having the lowest QAIC$_C$) and up to four equivalent models (those having a QAIC$_C$ within 2.0 QAIC$_C$ units of the QAIC$_C$ of the selected model) are presented for each species in each region in Table 3. The numbers and proportions of species in each region having time-dependent survival or showing time-dependence in any of the three parameters are presented in Table 5. We detected time-dependence in at least one parameter (by having a time-dependent model that was at least an equivalent model) for 114 (26.1%) of the 437 species-region combinations and for 56 (30.4%) of the 184 species program-wide. We found that time-dependence in at least one parameter was the selected model (by having a QAIC$_C$ that was at least 2.0 QAIC$_C$ units lower than the QAIC$_C$ of the fully time-independent model) for 73 (16.7%) of the 437 species-region combinations and for 25 (13.6%) of the 184 species program-wide. Time dependence in survival rate was detected for 56 (12.8%) of the 437 species-region combinations and for 30 (16.3%) of the 184 species program-wide, and was found to be the selected model for 22 (5.0%) of the species-region combinations and for 15 (8.2%) of the 184 species program-wide. In general, these proportions were slightly higher than analogous proportions using 10 years of data (Table 5 in this report versus Table 6 in DeSante and Kaschube 2006).

Finally, we examined all nine combinations of time-constant, time-dependent, and linear trend models for *program-wide* survival (φ) and recapture (p) probabilities for *all species pooled*. The selected model, which had 100% of the QAIC$_C$ weight (w_i), was the one whereby both survival and recapture probabilities varied with time, suggesting that survival varied substantially over the study period (Fig. 3c; note that survival probability from 2002-2003 and recapture probability in 2003 are confounded in the fully time-dependent model, so only 10 survival estimates were available over the 12-yr period). Although we found little statistical support for linear trend models compared to the more general time-varying models, the estimated slope for the best linear trend model was significantly negative (Beta = -0.021, $P < 0.05$), and suggested an annual decline in survival of -0.62%. A negative trend in survival was supported by a regression fit to annual survival estimates derived from the best time-varying model (P = 0.095). This model suggested a similar annual decline in survival (-0.83%). Of further interest was that seven of nine annual changes in survival rate (Fig.3c) were associated with annual changes in productivity of the same sign (Fig. 3b); indeed, annual survival from years t to t+1 tended to be correlated with the reproductive index in year t+1 (Fig. 4; r = 0.54, P = 0.10).

TABLE 5. Number (proportion) of species in each region for which time-dependence in survival rate, φ_t, or time-dependence in any parameter, φ_t, ρ_t, or τ_t was detected using modified Cormack-Jolly-Seber mark-recapture analyses from twelve years (1992-2003) of MAPS data.

	Number (proportion) of species								
Model	Program-wide	Northwest	Southwest	North-central	South-central	Northeast	Southeast	Ak/Bor.Can.	All regions
φ_t selected[a]	15 (0.082)	9 (0.111)	6 (0.070)	0 (0.000)	2 (0.032)	3 (0.040)	2 (0.044)	0 (0.000)	22 (0.050)
φ_t equivalent[b]	15 (0.082)	8 (0.099)	6 (0.070)	4 (0.074)	3 (0.048)	6 (0.080)	6 (0.133)	1 (0.029)	34 (0.077)
φ_t detected[c]	30 (0.163)	17 (0.210)	12 (0.140)	4 (0.074)	5 (0.081)	9 (0.120)	8 (0.178)	1 (0.029)	56 (0.128)
φ_t time-independent[d]	154 (0.867)	64 (0.790)	74 (0.860)	50 (0.926)	57 (0.919)	66 (0.880)	37 (0.822)	33 (0.971)	381 (0.872)
Total	184	81	86	54	62	75	45	34	437
φ_t, ρ_t, or τ_t selected[e]	25 (0.136)	18 (0.222)	20 (0.233)	9 (0.167)	9 (0.145)	10 (0.133)	4 (0.089)	3 (0.088)	73 (0.167)
φ_t, ρ_t, or τ_t equivalent[e]	31 (0.168)	10 (0.123)	4 (0.047)	3 (0.056)	6 (0.097)	7 (0.0933)	8 (0.178)	3 (0.088)	41 (0.094)
φ_t, ρ_t, or τ_t detected[e]	56 (0.304)	28 (0.346)	24 (0.279)	12 (0.222)	15 (0.242)	17 (0.227)	12 (0.267)	6 (0.176)	114 (0.261)
φ, ρ, and τ each time-independent[e]	128 (0.696)	53 (0.654)	62 (0.721)	42 (0.778)	47 (0.758)	58 (0.773)	33 (0.733)	28 (0.824)	323 (0.739)
Total	184	81	86	54	62	75	45	34	437

[a] One or more models with time-dependent survival had $QAIC_C$ more than 2.0 units lower than all models with time-independent survival.

[b] One or more models with time-dependent survival had $QAIC_C$ within 2.0 units of the time-independent survival model with the lowest $QAIC_C$.

[c] All models that fulfilled either of the above two conditions.

[d] All time-dependent survival models had $QAIC_C$ more than 2.0 units higher than the model with the lowest $QAIC_C$.

[e] Same as corresponding criteria above but applied to any parameter, φ_t, ρ_t, or τ_t.

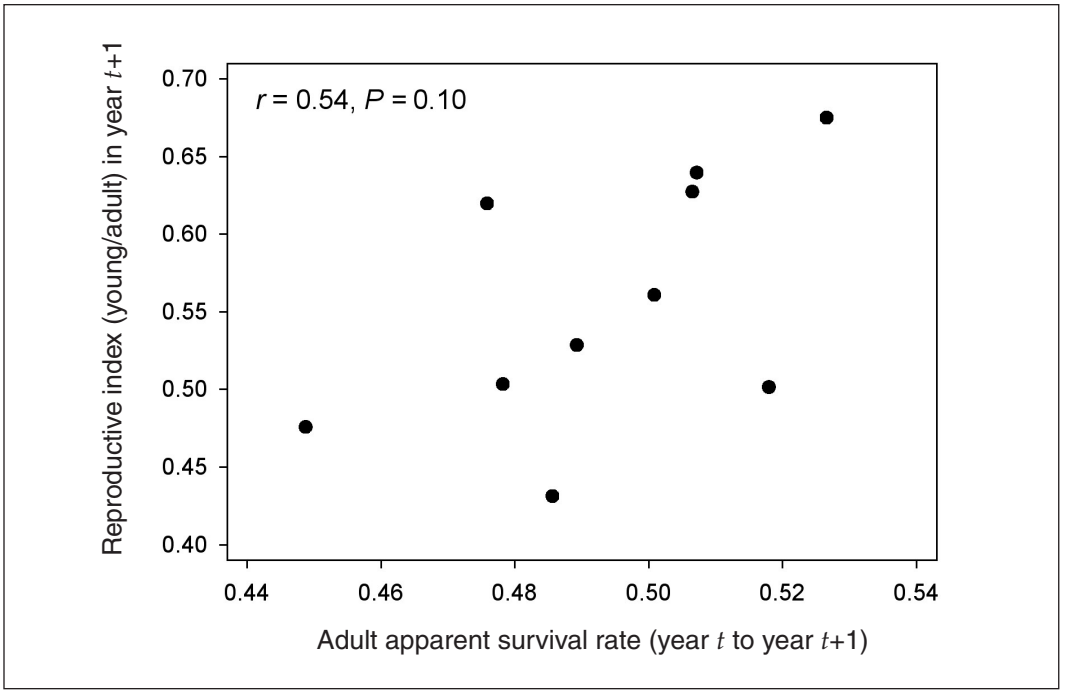

FIGURE 4. Scatterplot of the program-wide correlation between productivity in year *t*+1 and annual adult apparent survival rate from year *t* to year *t* +1 for all species pooled.

DISCUSSION

Useable MAPS data from 2002 and 2003 were received in time to be included in this report from 497 and 444 stations, respectively. Continuity of station operation remained high during 2002 (90.4%) but dropped during 2003 (79.2%). The sharp decrease in stations that occurred in 2003 (the first year ever during which the number of MAPS stations decreased) resulted primarily from the completion of several 8- to 10-yr contracts between IBP and various federal agencies; the number of independent stations (those not operated by IBP under federal contracts) decreased in 2003 by only seven stations. Although coverage of North America north of Mexico during 2002 and 2003 was generally widespread, there still were gaps, most notably in the Great Plains, Great Basin, southwest deserts, and most of Canada.

PATTERNS OF POPULATION SIZE AND PRODUCTIVITY

Adult population sizes for all species pooled and for many individual species *increased* substantially and significantly between 2001 and 2002 at the program-wide scale and in both the Northwest and Southwest regions. Similar, but generally non-significant increases were found in all of the remaining regions except the Alaska/Boreal Canada Region, where adult population sizes generally showed non-significant decreases. In sharp contrast, productivity for all species pooled and for many individual species *decreased* substantially and significantly between 2001 and 2002 at the program-wide scale and in all regions except the Alaska/Boreal Canada and South-central regions, where it tended to increase non-significantly.

The patterns of changes in both adult population size and productivity between 2002 and 2003 were nearly exactly reversed from those between 2001 and 2002. Thus, there were substantial and generally significant *decreases* in adult population size program-wide and in all regions except the Alaska/Boreal Canada and South-central regions, where adult populations tended to increase non-significantly. And, again in contrast to adult populations, there were substantial and significant *increases* in productivity program-wide and in the Southwest

Region, generally non-significant increases in productivity in four of the remaining regions, and generally non-significant decreases in productivity in the South-central and Southeast regions.

Thus, exactly out-of phase alternating patterns of changes in productivity and adult population size occurred program-wide and in the Northwest, Southwest, North-central, and Northeast regions, with increases in adults and decreases in productivity in 2002 followed by decreases in adults and increases in productivity in 2003. The same pattern also occurred in the Southeast Region, except that productivity continued to decline in 2003. Eighteen of the 24 changes in these five regions or at the program-wide scale were significant, either in terms of all species pooled or the proportion of species increasing or decreasing. The opposite pattern (decreases in adults and increases in productivity in 2002 and subsequent increases in adults and decreases in productivity in 2003) tended to occur in the two remaining regions, except that adults increased in 2002 in the South-central Region and productivity continued to increase in the Alaska/Boreal Canada Region in 2003, but none of the eight changes in these two regions were significant.

The pattern of regional changes in productivity often being followed by changes in adult population size of the same sign has been noted in previous MAPS reports (e.g., DeSante and Kaschube 2006). Indeed, 31 of 42 (74%; $P = 0.001$, binomial test) annual changes in reproductive index in the various regions during the 8-yr period 1996-2003 (when the size of the MAPS program was relatively stable at about 474 stations per year) were followed the next year in those regions by changes in adult population size that had the same sign. This same pattern also held at the program-wide scale over the entire 12 years (1992-2003; Fig. 3a-b), where 8 of 10 (80%; $P = 0.044$, binomial test; 6 of 6 since 1996) changes in productivity were followed the next year by changes in adult population size of the same sign. Moreover, the increasing and decreasing changes in productivity seen in MAPS data at the regional level often follow an alternating two-year cycle. These generally alternating, out-of-phase patterns in productivity and population size suggest density-dependent population regulation (Rodenhouse et al. 2003, Sillett et al. 2004) in which (a) increased productivity in a given year leads to increased population sizes the following year through increased recruitment of young birds, and (b) the increased population sizes suppress productivity through increased competition for food or other resources needed for reproduction. That these patterns of changes have not been consistent in all regions in all years suggests that density-independent factors may also drive changes in productivity and that other factors besides productivity (e.g., survival of young and adult birds) also drive year-to-year changes in adult population size.

SURVIVAL-RATE ESTIMATES

Increasing the number of years of data from 10 to 12 provided the following increases, all of which, perhaps, were expected: (a) the mean number of stations per region operated for at least four consecutive years (the minimum number of years necessary to be included in survivorship analyses) increased by an average of 15%, from 68 to 79 stations; (b) the mean number of years per region over which stations were operated increased by 10.5% from 6.97 to 7.70 years; and (c) the mean number of species per region that met selection criteria for survivorship analyses increased by an average of 5.4% from 59 to 62 species. Interestingly, however, the mean total number of adult captures per individual per species per region tended to decrease from 1.41 in the 10-yr data set to 1.38 in the 12-yr data set, as did the mean number of returns per individual adult per species per region, from 0.140 to 0.135. This, perhaps, suggests that survival rates (or recapture rates) might be declining. The increase in the length of the study and in the number of stations available for survivorship analyses (thus producing an increase in the total number of capture histories and the average number of years over which they were captured) resulted in a continued increase in the precision of the parameter estimates obtained from the mark-recapture analyses. Thus, the mean number of species per region with $CV(\varphi)<30\%$, $<20\%$, and $<10\%$ increased by 11% (from 46 species with 10 years of data to 51 species with 12 years of data), by 11% (from 36 to 40 species), and by 31% (from 16 to 21 species), respectively. These were considerably smaller increases than occurred when going

from seven to 10 years of data.

Again, as in previous years, a pattern of survivorship was detected in which mean regional annual adult survival probabilities tended to be lower at more northerly regions. This may well be an expected result due to the longer migration routes of more northerly nesting migratory species and the more severe winter weather faced by more northerly nesting permanent residents. Perhaps also as expected, the lowest survival rates at the highest latitudes (Alaska/Boreal Canada Region) appeared to be compensated by the highest productivity indices (0.747 for all species pooled in 2003), but this compensation did not always continue at lower latitudes where, for example, 2003 reproductive indices for all species pooled were higher in the South-central and Southeast than in the North-central and Northeast regions, respectively. Future analyses of MAPS data will test these hypotheses by modeling survival and productivity using latitude (and perhaps altitude) covariates.

Survival rates for better-estimated species were lower in each of the seven regions for the 12-yr, than for the 10-yr, data set, continuing the pattern noted in previous reports in which survival rates for better-estimated species in each of the seven regions tended to be lower for the 10-yr and 7-yr data sets than for the 7-yr and 5-yr data sets, respectively. The resulting conclusion that regional survival rates tended to be decreasing was confirmed, at least for all species pooled at the program-wide scale, by modeling survival both as time-dependent and as a linear function of time (year).

PROGRAM-WIDE, ALL-SPECIES-POOLED TRENDS IN POPULATION SIZE AND VITAL RATES

Chain indices of adult population size for all species pooled at the program-wide scale (Fig. 3a) have shown a severe and highly significant linear decline of -1.86% per year over the 12 years 1992-2003, resulting in a total decrease in population size of nearly 20%. It is important to note that vital rates (productivity and survival) do not need to be declining to result in a population decline. All that is needed is for productivity to be too low to balance mortality (or, stated alternatively, for survival to be too low to maintain a stable population in the face of a given productivity rate). However, program-wide results for all species pooled suggest that both productivity (Fig. 3b) and adult survival (Fig. 3c) declined, a situation that will make it increasingly difficult to reverse the population declines.

It is also interesting that survival from year t to year t+1 (measured from breeding season to breeding season) tends to be correlated with productivity in year t+1 (Fig.4). It seems likely that variations in annual survival may be driven by weather and habitat conditions on the wintering grounds (especially in late winter when food resources may be at a minimum), even in those situations for migratory species in which most mortality occurs during migration (Sillett and Holmes 2002). If so, then the correlation (albeit weak) shown in Fig. 4 suggests that some of the same factors that drive annual variations in survival might also drive variations in productivity, and that these factors may act during the non-breeding season. This is consistent with analyses of MAPS data that showed that annual variations in productivity of Nearctic-Neotropical migratory species breeding in the Pacific Northwest are driven by late-winter/early-spring weather conditions on their wintering grounds (Nott et al. 2002).

We point out that the results presented in Fig. 3c derive from the modeling of >319,000 individual adult capture histories, while the results presented in Figs. 3a and 3b derive from the analysis of >722,000 captures of >527,000 aged individuals. We hasten to add, however, that these results are based on pooling data from all species over all regions and, as such, likely obscure many important spatial patterns and individual species relationships. Indeed, as is clear from the results on individual species presented in Tables 1-3, there exists considerable variation among the vital rates (productivity and survival) of these many species. This presumably arises in response to such factors as body mass, life history strategy, migration strategy, nest location, and foraging behavior. Moreover the vital rates of these many different species are likely to be affected differently by various weather and habitat conditions, which in turn vary greatly over the different regions of the continent, within which the pool of species itself tends to differ. Considering all these sources of heterogeneity when data from all these species

are pooled over the entire continent, it is remarkable that such a consistent pattern of results emerges.

RECENT RESULTS AND CURRENT DIRECTIONS RELATED TO RESEARCH AND MANAGEMENT GOALS OF MAPS

One of the major goals of MAPS is to determine whether population declines are driven by processes affecting productivity or by processes affecting survival. BBS results demonstrate that the direction and intensity of population trends can vary dramatically from region to region; even species with overall declining populations often show increasing populations in some portions of their ranges (Sauer et al. 2007). This spatial variation in population trends provides a template for determining proximate demographic causes of declines. In a recent paper, Saracco et al. (in press) provide an example of such an analysis using 1992-2003 MAPS data for Yellow Warbler and recently-developed modeling techniques. They show that spatial variation in population trends in this species, as estimated by MAPS capture-recapture data, can largely be explained by spatial variation in adult and first-year survival, rather than by spatial variation in productivity. This inference was also supported by a spatial comparison of MAPS productivity indices and survival-rate estimates with BBS estimates of population trends for 15 BBS Physiographic Strata. We are in the process of completing similar analyses for other species in the MAPS database.

One of the greatest strengths of MAPS is that it provides spatially-explicit data on bird populations from across the continent. Yet, our ability to harness this spatial information has been hindered by a lack of appropriate analytical techniques. Through collaboration with researchers at the USGS Patuxent Wildlife Research Center in Laurel, MD, IBP researchers are making great strides in developing analytical methods that can provide visualizations of spatial patterns in demographic rates across species' ranges, including areas for which we currently have few (or no) MAPS stations. Over the next year we hope to develop these analyses further to incorporate BBS data in a 'joint model' to provide even more robust inferences regarding demographic causes of population trends in landbirds. If we are successful in rigorously linking MAPS and BBS data, we hope to apply similar techniques to link MAPS and the extensive spatially-explicit encounter data being amassed by the Avian Knowledge Network (http://avianknowledge.net).

Other major goals of MAPS are to (1) determine ultimate causes of the observed spatial variation in demographic parameters, by modeling them in relation to spatial variations in habitat and weather characteristics, (2) formulate management strategies based upon those models, and (3) evaluate the effectiveness of management action actually implemented in an adaptive management framework (Nott et al. 2003, 2005). To facilitate these goals in the Pacific Northwest, we have created a website (http://www.birdpop.org/usfsr6/usfspnwr6.htm) which presents results of GIS-based landscape-scale analyses of 16 years (1992-2007) of MAPS data on 45 stations operated on six national forests in Oregon and Washington (based on Nott et al. 2005) and provides decision support tools that allow land managers, in collaboration with GIS specialists, to assess the effects of management on the demographics of 13 landbird species of conservation concern.

Finally, the decrease in stations that occurred in 2003 is cause for concern. We suggest that the optimal way to maintain and grow the MAPS Program is by incorporating it into a comprehensive Coordinated Bird Monitoring (CBM) effort for North America (Bart and Ralph 2005). To begin this process we have begun integrating MAPS into Coordinated Bird Monitoring in the Northeast (USFWS Region 5, comprised of the 13 northeastern states south through West Virginia and Virginia) by a five-step process: (1) identifying target species for each Bird Conservation Region (BCR) based on their being listed as priority or focal species in the various Bird Conservation Plans and their being monitorable by MAPS; (2) determining how well each of the target species are currently being monitored by MAPS; (3) determining the effectiveness of all current and discontinued MAPS stations at monitoring the target species; (4) identifying geographic and habitat gaps in MAPS coverage; and (5) making recommendations for the role of the various federal and state agencies and private sector in continuing current stations, re-establishing discontinued stations, and establishing new stations to effectively monitor the target

species in each BCR. We look forward to implementing this process throughout the United States and southern Canada over the next few years in order to build and maintain an optimally effective continent-wide demographic monitoring program.

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APPENDIX. Summary of 49 MAPS stations newly established in 2002, 52 stations newly established in 2003, and one station established prior to 2002 but not previously summarized in a MAPS annual report.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
I. Stations established before 2002									
SOUTH-CENTRAL REGION									
14518	Cottonwood Levee stand	D.Twedt	USGS/USFWS	MS	Fitler	323-0910	21	pulpwood managed cottonwd forest	94
II. Stations established in 2002									
NORTHWEST REGION									
11221	Jocko River	D.DeSante	USBIA-Flathead IR	MT	Ravalli	471-1141	825	cottonwood-willow riparian corridor	02
11222	Burns Bog	D.Matthews	Private	BC	Ladner	490-1225	10	mixed woodland/peat bog edge	02
11223	Garden Creek Nature Cent.	A.Holloran	Private - Goveners Youth	WY	Casper	424-1062	1609	riparian corr./prairie grassland	02
11224	Devil's Postpile NM	S.Heath	NPS - Small Parks Fund	CA	Mammoth Lakes	373-1190	2350	montane mead./lodgepole forest	02
11225	Wishbone	C.Smith	Parks Canada	AB	Waterton Park	490-1134	1300	cottonwood-wet shrub forest	02
11237	Oregon Caves	J.Alexander	?	OR	Cave Junction	420-1232	1597	riparian alder, mature mixed conifer	02
11238	McCarteney Creek	D.Stephens	TNC	WA	Ephrata	473-1194	503	water birch & aspen ripar. woodland	02
11248	Puget Sound Environ. LC.	D.Norman	Private - PSELC	WA	Winslow	473-1223	74	mature mixed conif decid. forest	02
11256	Ambrose Nature Study Ar.	J.Eidel	Bureau of Reclamation	NV	Carson City	390-1194	1402	cottonwood-willow riparian corridor	02
11257	Dayton State Park	J.Eidel	Bureau of Reclamation	NV	Dayton	391-1193	1341	cottonwood-willow riparian corridor	02
11260	Plaskett Meadows	C.Ralph	?	CA	Elk Creek	394-1225	1838	riparian/meadow	02
11261	Masterson Campground	C.Ralph	?	CA	Elk Creek	394-1225	1841	riparian	02
11262	Salmon Creek	C.Ralph	?	CA	Loleta	404-1241	3	riparian	02
SOUTHWEST REGION									
12321	Virgin River	M.Boyles	USNPS/ Clark County HCP	NV	Overton	363-1142	380	tamarisk-willow riparian corridor	02
12324	Delta (Carson River)	J.Eidel	Bureau of Reclamation	NV	Silver Springs	391-1190	1268	cottonwood-willow riparian corridor	02
12325	Gila River Farm	C.Fugagli	Private - T&E Inc.	NM	Gila	330-1083	1397	cottonwood-willow riparian corridor	02
12329	CO Riv. Delta/Lake Mead	J.Kahl, Jr.	USBR	AZ	Meadview	360-1135	360	willow & salt cedar along CO river	02
12334	Empire Canyon	K.Hughes	USBLM	AZ	Sonoita	314-1103	1384	young cotton-willow rip. w/ mesq.	02
12340	Indian Creek	J.Parrish	?	UT	Monticello	375-1093	1932	cottonwd-will rip. with oak&juniper	02
12341	Elk Ravine	M.van Hattem	Lawrence Livermore NL	CA	Tracy	373-1213	280	willow/elderberry riparian	02
12352	Lagunitas Creek	D.Humple	?	CA	Olema	380-1224	37	red alder-willow riparian	02
12353	Redwood Creek	D.Humple	?	CA	Muir Beach	375-1223	11	red alder-willow rip. -active resto.	02
12362	Leslie Canyon NWR	K.Voget	USFWS	AZ	McNeal	313-1093	1839	desert scrub/mesquite/grassland	02
12363	Ft Bowie Nat. Hist. Site	T.Wood	USNPS	AZ	Dos Cabezas	321-1092	1354	desert scrub/mesquite/grassland	02
NORTH-CENTRAL REGION									
13370	Merry Lea Farmstead	D.Miller	Private - Merry Lea	IN	Wolf Lake	411-0853	277	oldfield/woodlots/thickets/wetland	02
13371	Merry Lea Wilmer Mead.	D.Miller	Private - Merry Lea	IN	Wolf Lake	411-0853	275	oldfield/wet woodland/thickets	02
13375	Mormon Field Eight	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	579	post-hayed meadow	02
13376	Mormon Field Five	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	?	579	tall grass prairie	02
13377	Mormon Field Nine	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	?	579	tall grass prairie	02
13378	Mormon Field Six	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	579	rested native grassland	02
13379	Mormon Field Three	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	579	post-burn wet meadow	02
13380	Mormon Field Seven	F.Chavez-Ramirez	Private - Platte River Wh	NE	Doniphan	404-0982	579	managed mixed grass prairie	02

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
13381	Wild Rose Big Slough	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	579	post-burn meadow	02
13382	Wild Rose Pit Meadow	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	579	hayed meadow	02
SOUTH-CENTRAL REGION									
14491	Cyprus Ford	J.Williamson	Private - Travis Audubon	TX	Austin	301-0973	134	cypress-willow riparian corridor	02
14492	Little Tank	J.Williamson	Private	TX	Refugio	282-0972	77	oak matt/pond/riparian corridor/field	02
NORTHEAST REGION									
15641	Hog Island	S.Weidensaul	?	ME	Round Pond	435-0692	33	mixed forest on island	02
15642	NSVAS - Blandy	R.Salmon	U of VA/Blandy Experim. F	VA	Boyce	390-0780	200	mixed hardwood/farmland/riparian	02
15643	Glendobbin	R.Salmon	Private	VA	Winchester	391-0780	300	mixed hardwood/farmland	02
15644	Purchase Knob	P.Super	USNPS-Great Smokies	NC	Maggie Valley	353-0830	1451	N. hardwood/fraser fir tree farm	02
15645	Ashuelot River Park	J.Atwood	Private	NH	Keene	425-0721	144	riparian deciduous forest	02
15646	Aton For.- Sandisfield Rd	S.Harms	Private - Aton Forest, In	CT	Norfolk	420-0730	435	N. hardwood/hemlock/beaver pond	02
15647	Punkhorn Parklands F. Sta	S.Finnegan	Private - French Foundati	MA	Brewster	414-0700	14	mixed woodland riparian corridor	02
15648	Constitution Marsh Sta. 1	E.Lind	Private - Audubon New Yor	NY	Cold Spring	412-0735	1	tidal wetl./alder swamp/mixed d. for.	02
15649	Kane Station	L.Doss	Marvelwood School/local c	CT	Kent	414-0732	396	swamp woodland/pasture	02
15650	Kaiser	E.Karnatz	Private-Braddock Bay Bird	NY	Hilton	431-0774	270	young ash woodland edge	02
15651	North Blind	E.Karnatz	Private-Braddock Bay Bird	NY	Hilton	431-0774	270	mature ash woodland on lake shore	02
SOUTHEAST REGION									
16702	Chassahowitaka WMA	A.Burrow	State - FL F&W Conservati	FL	Weeki Wachee	284-0823	14	flatwoods/sandhill and hardwd swmp	02
16703	Clemson Exp. Forerst #A	J.Camp	Private - Clemson Univers	SC	Clemson	343-0824	250	pine-hardwood forest	02
III. Stations established in 2003									
NORTHWEST REGION									
11232	Schall	D.DeSante	USBIA-Flathead IR	MT	Ravalli	471-1140	870	cottonwood-willow riparian corridor	03
11233	Spring Creek	D.DeSante	USBIA-Flathead IR	MT	Ravalli	471-1140	853	cottonwood-willow riparian corridor	03
11234	Woodpecker Haven	D.DeSante	USBIA-Flathead IR	MT	Arlee	471-1140	920	cottonwood-willow riparian corridor	03
11235	Jackson Campus	D.Wachob	Teton Science School	WY	Jackson	432-1104	1862	cottonwd-willow woodl./restored pd.	03
11239	Royal Roads University	A.Nightingale	Dept. National Defence fo	BC	Victoria	482-1232	10	2nd growth for.& naturalized ag land	03
11240	Rocky Point Bird Observ.	A.Nightingale	Dept. National Defence fo	BC	Victoria	481-1233	15	2nd growth for.& naturalized ag land	03
SOUTHWEST REGION									
12330	Fort Hunter Liggett #2	D.Woodbury	USARC - Army Reserve Corp	CA	Jolon	355-1210	240	cottonwood-willow riparian corridor	03
12331	Colorado River	O.Hinojosa-Huerta	Pronatura Sonora	SO	San Luis Rio Colorado	321-1150	20	cottonwood-willow riparian corridor	03
12332	Coyote Spring	S.Cox	USE - Department of Energ	NM	Albuquerque	350-1062	2000	open pinyon-juniper woodland	03
12333	Lewis Center	B.Deppe	Lewis Center	CA	Apple Valley	343-1171	885	cottonwood-willow riparian corridor	03
12336	All Saints Schulte	J.Griffiths	Monterey Peninsula Water	CA	Carmel	363-1214	30	restored cottonwd-willow coastal rip.	03
12337	Carmel Middle School	J.Griffiths	Carmel Middle School	CA	Carmel	363-1215	18	coastal scrub/restored willow rip.	03
12338	Rancho San Carlos	J.Griffiths	Monterey Peninsula Water	CA	Carmel	363-1215	16	cottonwd-will. coastal rip.	03
12339	Red Rocks	J.Griffiths	Monterey Peninsula Water	CA	Carmel	363-1214	30	restored cottonwd-willow coastal rip.	03
12342	Cibola NWR - Nat. Trail R	J.Kahl, Jr.	USBR	AZ	Cibola	332-1144	70	restoration cottonwd, willow, mesq.	03
12354	Livermore Marsh	D.Jones	Private - Audubon Canyon	CA	Marshall	381-1225	6	coastal willow riparian	03

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
NORTH-CENTRAL REGION									
13373	Beaver Creek Reserve FRS	B.Steger	County/private - Friends	WI	Fall Creek	444-0911	295	mixed woodl./floodpln/restored prair	03
13383	Field One	F.Chavez-Ramirez	Private - Platte River Wh	NE	Alda	404-0982	602	tallgrass prairie	03
13384	North Meadow	F.Chavez-Ramirez	Private - Platte River Wh	NE	Alda	404-0982	602	tallgrass prairie	03
13385	Crane Meadows	F.Chavez-Ramirez	Private - Platte River Wh	NE	Alda	404-0982	602	tallgrass prairie	03
13386	Mormon Island Fld Eleven	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	602	tallgrass prairie	03
13387	Office Pasture	F.Chavez-Ramirez	Private - Platte River Wh	NE	Alda	404-0982	602	tallgrass prairie	03
13388	Mormon Island Field Four	F.Chavez-Ramirez	Private - Platte River Wh	NE	Grand Island	404-0982	602	tallgrass prairie	03
13390	Goose Island	M.Meier	USGS	WI	La Crosse	434-0911	194	?	03
13391	Governors St. Un. Bird Ob	R.Baisa	State - Governors St.Univ	IL	University Park	412-0874	233	oldfield and dense shrub	03
SOUTH-CENTRAL REGION									
14494	Bradford Cemetery	D.DeSante	USDoD	MO	Big Piney	374-0920	317	black walnut plantation	03
14495	Tilley Bottoms	D.DeSante	USDoD	MO	Waynesville	374-0921	250	oldfield/oak forest	03
14502	Comp.4, patch cut & Thin	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland for.: 2000 harv.	03
14503	Comp.4, thinning Harvest	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland for.: 2000 harv.	03
14504	Comp.4, unharv. control	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland forest	03
14505	Comp.9, patch cut & Thin	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland for.: 2000 harv.	03
14506	Comp.9, thinning Harvest	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland for.: 2000 harv.	03
14507	Comp.9, unharv. control	D.Twedt	USGS/USFWS	LA	Delhi	322-0912	21	oak-gum bottomland forest	03
14508	Choctaw Island WMA	C.Rideout	AR Game & Fish Commission	AR	Arkansas City	333-0911	40	Lower Miss. River batture	03
NORTHEAST REGION									
15654	Golf Course	D.DeSante	USDoD	ME	Brunswick	435-0695	13	balsam fir/boggy deciduous forest	03
15655	Chimney Rock	D.DeSante	USDoD	ME	Brunswick	435-0695	18	maple-oak deciduous forest/riparian	03
15656	Redington Pond	D.DeSante	USDoD	ME	Dallas	445-0702	507	mixed decid.-evergreen forest/pond	03
15657	Potato Nubble	D.DeSante	USDoD	ME	Dallas	445-0703	488	mixed decid.-evergreen for./shrubld	03
15658	Blueline Trail	D.DeSante	USDoD	ME	Dallas	445-0702	515	balsam-red spruce forest/rip./alder	03
15659	Highland	D.DeSante	USDoD	ME	Dallas	450-0702	724	stunted balsam-red spruce for./boggy	03
15660	Pardon Gray	G.Albanese	Private - MA Audubon, Par	RI	Tiverton	413-0711	65	Oak-holly for./maple swamp/grassl.	03
15661	Buffalo Aud. Arboretum	W.Michalek	Private - Buffalo Audubon	NY	North Java	424-0782	442	successional hardwd./manage mead	03
15663	Thousand Acre Swamp	C.Marino	Private	NY	Penfield	431-0772	152	mixed decid. for./swamp/brushy area	03
15668	Holland College	D.Martin	Private - Holland College	PE	Orwell	461-0625	200	mid-successional mixed woodland	03
SOUTHEAST REGION									
16706	Sandstone Hill	D.DeSante	USDoD-Legacy/Fort Bragg	NC	Ashley Heights	350-0791	152	pine savana/mixed woodland	03
16708	Clark's River NWR #1	H.Chambers	USFWS	KY	Benton	365-0882	102	bottomland hardwd/post oak prairie	03
16709	Buford St. Fish Hatchery	R.Trump	Hummer Bird Study Group	GA	Cumming	340-0840	272	Mixed woodland/ Chattahoochee rip.	03
16710	Tibwin Plantation	S.Lohr	USFS	SC	McClellanville	330-0793	3	maritime forest thickets/field edge	03
16711	Powhatan	D.Reilly	Private - Richmond Audubo	VA	Powhatan	373-0780	73	mixed decid. woodland/scrub/field	03
16714	Natural Bridge	J.Weese	State - KY St. Nature Pre	KY	Slade	374-0834	245	hemlock-mixed mesophytic forest	03
16721	Banshee Reeks	M.Koeneke	County - Loudon Co Dept o	VA	Leesburg	390-0773	117	decid. woodlands/successional fields	03
16725	Clemson Exp. Forerst #B	J.Camp	Private - Clemson Univers	SC	Clemson	?	9999	?	03

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THE 2003 AND 2004 NORTH AMERICAN BREEDING BIRD CENSUS WITH ADDITIONS FOR 2001 AND 2002

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Abstract. The Breeding Bird Census (BBC) is the longest, continuously-run bird monitoring program in North America. Here we publish BBC reports for 2003 and 2004, with an additional nine reports from 2001 and 2002 that were not included in the previous publication (Gardali and Lowe 2006) due to late submission. Breeding Bird Censuses were conducted at 21 sites in 2003 and 24 in 2004; for the two years, breeding birds were assessed at 31 different sites, with a few sites in 2004 not visited in 2003 and *vice versa*.

EL CONTEO DE AVES REPRODUCTORAS (BBC) DE NORTEAMÉRICA DE 2003 Y 2004

Resumen. El Conteo de Aves Reproductoras (BBC) es el programa de monitoreo más longevo de Norteamérica. Aquí presentamos informes del BBC para 2003 y 2004, con nueve informes adicionales de 2001 y 2002 que no se incluyeron en la publicación anterior (Gardali y Lowe 2006). Los conteos de BBC fueron realizados en 21 sitios en 2003 y 24 sitios en 2004; para ambos años, se contaron las aves reproductoras en 31 sitios, con varios sitios de 2004 no visitados en 2003 y *vice versa*.

INTRODUCTION

The Breeding Bird Census (BBC) is the breeding season component of the Resident Bird Counts (RBC), which also include the Winter Bird Population Study. The BBC uses the spot- or territory-mapping method to estimate densities of breeding birds. More information on methods, history, and uses of BBC data can be found in Lowe (2006).

A total of 45 BBC reports were submitted for 2003 and 2004, down considerably from 2001 and 2002 (68 reports). This downward trend is likely an artifact of the cessation in publication (or even promise of publication) from 1996 to 2000 – in the past, publication motivated data collection. Thus, when publication stopped, many fewer reports were submitted, with lagged effects perhaps apparent here. It will be interesting to see if the number of reports increases in the near future, responding to the renewed BBC publication in 2006 (Gardali and Lowe 2006).

Nine reports from 2001 and 2002 are also included herein as they were received too late

for publication in *Bird Populations* 7.

Please contact Tom Gardali (tgardali@prbo.org) for BBC instructions and data forms.

UNDERSTANDING THE REPORTS

Here we provide the skeleton of a BBC report with data descriptions inserted where the meat of each report typically goes.

1. DESCRIPTIVE TITLE OF THE AREA
DESCRIPTIVE TITLE IN SPANISH
Author(s)
Address(es)

Site Number: A unique ID number assigned for some older plots. **Location:** State or Province; County; nearest town; latitude and longitude; USGS topographic map or other map name. **Continuity:** Year established; Total number of years census has been done. **Size:** Plot size in hectares. **Description of Plot:** Common names of dominate plant species, topography, elevation, edge, and other features noted as necessary (e.g., buildings, bodies of water, rock outcrops, roads). Established plots will provide the original report citation as well as citations for published updates. **Weather:** Mean temperature in Celsius at the start of visits (temperature range in Celsius) and other comments, as appropriate, such as deviations from long-term averages and amount of precipitation. **Coverage:** Total hours spent; number of visits to plot (time of day); dates of visits; maximum number of observers/visit (if more than 2). **Census:** Species common name, Number of territories rounded to nearest half territory (Number of territories per 40 hectares (for species with at least 3.0 territories); number of nests (N) or fledglings (FL) observed, if applicable). A "+" after a species name indicates that less than one-quarter of the species' territory occurred on the plot. Species are listed in descending order (ties are listed in taxonomic order). **Total:** Total number of species; Total number of territories (Total number of territories / 40 hectares). **Visitors:** Observed species that potentially could nest on plot but which were not counted (listed in taxonomic order). **Remarks:** Comments on factors that may have affected populations on the study plot thus to explain differences from other years in the species' abundances and composition (e.g., predators, parasitism, disturbance, habitat change, large population fluctuations from previous years). **Other Observers:** Full names. **Acknowledgements:** If applicable.

BREEDING BIRD CENSUS RESULTS

2001 AND 2002

Here, for years 2001 and 2002, we add an additional nine reports, which were submitted too late for inclusion in volume 7 of *Bird Populations* (Tables 1, 2). These nine reports are all from Ontario, Canada and they raise the total reports for 2001 and 2002 to 38 and 30, respectively. The addition of these nine reports brings the total for Ontario to 13, which is second only to California (15 reports) for years 2001 and 2002.

2003 AND 2004

A total of 45 Breeding Bird Census reports are included, 21 in 2003 and 24 in 2004 (Tables 3, 4). The counts come from 8 U.S. states, 2 Canadian provinces, and the District of Columbia. Connecticut, California, and Ontario each had the most counts with 10; 5 in 2003 and 5 in 2004 in Connecticut, 3 in 2003 and 7 in 2004 in California, and 6 in 2003 and 4 in 2004 in Ontario. Included here are a total of 6 plots being published for the first time; 1 in 2003 (report # 13) and 5 in 2004 (report #s 15, 16, 17, 18, 23).

LITERATURE CITED

GARDALI, T., AND J. D. LOWE. 2006. Reviving resident bird counts: the 2001 and 2002 Breeding Bird Census. Bird Populations 7:90-95.

LOWE, J. D. 2006. An annotated bibliography of Breeding Bird Census publications. Bird Populations 7:128-135.

TABLE 1. Summary of Breeding Bird Census reports from 2001 for sites not included in Gardali and Lowe (2006).

Habitat	State/ Prov.	Author(s)	Plot Size (ha)	Terr. per 40 ha	Num. spp.	Hrs. Obs.	Yrs. Study
Broadleaf Forests							
35. Dry Cottonwood Sand Dune	ON	V. Brown	10.0	54	6	16.2	6
36. Red Ash–Red Oak Savannah	ON	J. Fischer	10.3	381	22	32.7	4
37. Red Oak–Ironwood Savannah	ON	S. Bublitz	12.2	435	27	39.5	6
Needleleaf Forests							
38. Tamarack Slough	ON	M. J. Hindle	8.8	480	32	19.5	8

TABLE 2. Summary of Breeding Bird Census reports from 2002 for sites not included in Gardali and Lowe (2006).

Habitat	State/ Prov.	Author(s)	Plot Size (ha)	Terr. per 40 ha	Num. spp.	Hrs. Obs.	Yrs. Study
Broadleaf Forests							
26. Red Oak–White Birch Savannah	ON	M. Hindle	10.0	330	27	14.0	5
Needleleaf Forests							
27. White Pine–White Cedar Savannah	ON	M. Hindle	9.3	303	25	14.5	7
Broadleaf/Needleleaf Forests							
28. Red Oak–White Pine Savannah	ON	R. Fuentes	11.0	285	22	18.2	3
Non-forested Wetlands							
29. Sedge–Rush Swale I	ON	R. Fuentes	9.3	41	4	10.5	5
30. Sedge–Rush Swale II	ON	R. Fuentes	9.3	41	5	9.0	3

TABLE 3. Summary of Breeding Bird Census reports from 2003.

Habitat	State/ Prov.	Author(s)	Plot Size (ha)	Terr. per 40 ha	Num. spp.	Hrs. Obs.	Yrs. Study
Broadleaf Forests							
1. Mixed Hardwood Poletimber	CT	D. Rosgen	8.5	574	50	22.0	37
2. Second-Growth Hardwood Forest	CT	D. Rosgen	10.1	394	41	18.5	37
3. Mixed Upland Broadleaf Forest	DC	M.E. D'Imperio	14.2	358	29	50.0	45
4. Mature Broadleaf Forest	OH	C.W. Saunders et al.	16.0	220	26	21.4	9
5. White Oak Savannah	ON	M.F.G. Clark	10.4	238	17	13.9	9
6. Oak-Maple-Poplar Hollow	PA	L. Ingram	11.3	96	12	18.2	11
7. Virgin Hardwood Swamp Forest	SC	M. Dawson	8.9	474	19	15.8	13
8. Mature Maple-Beech-Birch Forest	TN	H. Wilson, L.M. Lewis	10.2	182	7	16.7	11
Needleleaf Forests							
9. White Pine-White Cedar Savannah	ON	M. Timpf	9.3	353	26	40.3	8
Broadleaf/Needleleaf Forests							
10. Climax Hemlock-White Pine Forest with Transition Hardwoods	CT	D. Rosgen	10.5	520	40	22.5	37
11. Young Mixed Hardwood-Conifer Stand	CT	D. Rosgen	8.5	442	43	13.5	26
12. Riparian Woodland	ID	S.R. Robinson	8.9	209	23	13.3	7
13. Hemlock-Mixed Broadleaf Riparian Forest	NY	L. Bowdery et al.	12.1	149	18	23.0	3
14. Intergrading Dune-Swale Savannah	ON	M.A. Kurcz	11.0	171	16	25.8	7
Mixed Habitats							
15. Field, Ridge, Shrubby Trees, and Woods	ON	M.F.G. Clark	5.8	814	15	12.7	10
16. Sedge-Tamarack Dune Pond	ON	M. Timpf	10.0	270	17	28.8	4
Non-forested Wetlands							
17. Shrubby Swamp and Sedge Hummocks	CT	D. Rosgen	8.1	993	48	25.5	37
Shrublands							
18. Coastal Scrub	CA	P. Abbaspour, E. Porzig	8.1	301	27	268.7	29
19. Disturbed Coastal Scrub A	CA	A. Shults, E. Porzig	4.7	357	29	164.6	29
20. Disturbed Coastal Scrub B	CA	G. Jayabose, E. Porzig	8.1	351	25	401.5	29
Grasslands							
21. Bluegrass-Milkweed Grassland	ON	M.A. Kurcz	10.5	162	16	28.0	5

TABLE 4. Summary of Breeding Bird Census reports from 2004.

Habitat	State/ Prov.	Author(s)	Plot Size (ha)	Terr. per 40 ha	Num. spp.	Hrs. Obs.	Yrs. Study
Broadleaf Forests							
1. Mixed Hardwood Poletimber	CT	D. Rosgen	8.5	649	47	19.5	38
2. Second-Growth Hardwood Forest	CT	D. Rosgen	10.1	307	42	17.5	38
3. Mixed Upland Broadleaf Forest	DC	M.E. D'Imperio	14.2	265	26	32.0	46
4. Mature Broadleaf Forest	OH	C.W. Saunders et al.	16.0	236	29	25.2	10
5. Red Oak-Sugar Maple Forest	ON	C. Friis	11.0	689	39	38.2	7
6. Red Oak-Sugar Maple Savannah	ON	C. Friis	10.5	667	32	44.8	5
7. Oak-Maple-Poplar Hollow	PA	L. Ingram	11.3	85	11	16.5	12
8. Hardwood Swamp Forest	SC	M.R. Dawson	8.1	440	17	14.7	13
9. Mature Maple-Beech-Birch Forest	TN	D.F. Vogt, L.M. Lewis	10.2	225	9	19.8	12
Broadleaf/Needleleaf Forests							
10. Climax Hemlock-White Pine Forest with Transition Hardwoods	CT	D. Rosgen	10.5	470	43	24.5	38
11. Young Mixed Hardwood-Conifer Stand	CT	D. Rosgen	8.5	334	40	13.5	27
12. Riparian Woodland	ID	S.R. Robinson	8.9	189	19	11.5	8
13. Dry Cottonwood-Juniper Savannah	ON	J. Ethelberg	10.5	135	15	34.0	4
14. Intergrading Dune-Swale Savannah	ON	J. Ethelberg	11.0	131	12	34.8	8
Mixed Habitats							
15. Riparian Scrub Basin	CA	M. Aimar	12.7	288	27	23.2	New
16. Streamside Riparian Woodland I	CA	T. Reeser	16.4	557	28	36.8	New
17. Streamside Riparian Woodland II	CA	B. Nash	10.3	406	30	13.4	New
18. Streamside Riparian Woodland III	CA	T. Barbee, A. Beckman	13.0	415	35	21.5	New
Non-forested Wetlands							
19. Shrubby Swamp and Sedge Hummocks	CT	D. Rosgen	8.1	1064	43	24.5	38
Shrublands							
20. Coastal Scrub	CA	G. Epke, E. Porzig	8.1	254	25	170.5	30
21. Disturbed Coastal Scrub A	CA	E. Kramer-Wilt, E. Porzig	4.7	277	31	136.1	30
22. Disturbed Coastal Scrub B	CA	L. Kaplan, E. Porzig	8.1	267	23	204.2	30
23. Red Osier Dogwood Shrubland	BC	R. Mader	10.0	452	21	12.2	New
Successional Fields							
24. Abandoned Upland Pasture II	NY	L. Bowdery et al.	30.0	263	52	33.0	3

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BREEDING BIRD CENSUS: 2001

Note: These reports complete the set for 2001, the others having been published in Volume 7 of *Bird Populations*

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°32'N, 80°9'W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1973; 6 yr. **Size:** 10.0 ha. **Description of Plot:** See *Am. Birds* 27:986–987 (1973), *J. Field Ornithol.* 63(Suppl.):54–55 (1992) and 64(Suppl.):51 (1993). **Weather:** Mean start temp., 19.3ºC (range 14–25ºC). **Coverage:** 16.2 h; 10 visits (9 sunrise, 1 sunset); 8, 10, 13, 18, 23, 24, 25, 26, 27, 28 June, 2001. **Census:** Chipping Sparrow, 5.5 (22); Eastern Kingbird, 3.0 (12; 1N); Tree Swallow, 3.0 (2N); Song Sparrow, 1.0; Northern Mockingbird, 0.5; Field Sparrow, 0.5. **Total:** 6 species; 13.5 territories (54/40 ha). **Visitors:** Killdeer, Spotted Sandpiper, Mourning Dove, Yellow-billed Cuckoo, Great Crested Flycatcher, House Wren, Blue-gray Gnatcatcher, Brown Thrasher, European Starling, Cedar Waxwing, Yellow Warbler, Red-winged Blackbird, Common Grackle, Brown-headed Cowbird, Baltimore Oriole. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observers:** Matt Hindle and Miguel Demeulemeester. **Acknowledgments:** I thank Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

36. RED ASH–RED OAK SAVANNAH
SAVANA DE FRESNO ROJO–ROBLE ROJO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°33'N, 80°14'W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1991; 4 yr. **Size:** 10.3 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl):55–56 (1992) and 64(Suppl):52 (1993). **Weather:** Mean start temp., 18.8ºC (range 13–26ºC). **Coverage:** 32.7 h; 10 visits (9 sunrise, 1 sunset); 8, 10, 12, 17, 21, 23, 24, 25, 26, 27 June, 2001. **Census:** House Wren, 19.0 (74); Red-winged Blackbird, 10.0 (39); Eastern Wood-Pewee, 7.0 (27); Song Sparrow, 7.0; Baltimore Oriole, 7.0; Tree Swallow, 6.0 (23); Common Yellowthroat, 6.0; Eastern Kingbird, 5.5 (21); Field Sparrow, 4.5 (17); Yellow Warbler, 4.0 (16); European Starling, 2.5; American Woodcock, 2.0; Downy Woodpecker, 2.0; Warbling Vireo, 2.0; Red-eyed Vireo, 2.0; Blue Jay, 2.0; Gray Catbird, 2.0; Eastern Towhee, 2.0; Brown-headed Cowbird, 2.0; Northern Flicker, 1.5; Yellow-billed Cuckoo, 1.0; Common Grackle, 1.0. **Total:** 22 species; 98.0 territories (381/40 ha). **Visitors:** Wood Duck, Red-tailed Hawk, Mourning Dove, Black-billed Cuckoo, Whip-poor-will, Hairy Woodpecker, Willow Flycatcher, Least Flycatcher, Great Crested Flycatcher, American Crow, Black-capped Chickadee, American Robin, Indigo Bunting. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observers:** Sindy Bublitz. **Acknowledgments:** I thank Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

37. RED OAK–IRONWOOD SAVANNAH
SAVANA DE ROBLE ROJO–PALO DE HIERRO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point Company-Courtright Ridge; 42°34'N, 80°17'W; Big Rice Bay Quadrangle, DEMR. **Continuity:** Established 1979; 6 yr. **Size:** 12.0 ha. **Description of Plot:** See *Am. Birds*

34:65 (1980), *J. Field Ornithol.* 63(Suppl.):56–57 (1992) and 64(Suppl.):52–53 (1993). **Weather:** Mean start temp., 18.6ºC (range 13–26ºC). **Coverage:** 39.5 h; 10 visits (9 sunrise, 1 sunset); 8, 10, 12, 15, 18, 23, 24, 25, 26, 27 June, 2001. **Census:** Red-winged Blackbird, 26.0 (87; 1N); Yellow Warbler, 17.5 (58; 1FL); Eastern Wood-Pewee, 10.5 (35); House Wren, 8.5 (28); Common Yellowthroat, 8.5; Song Sparrow, 8.5; Tree Swallow, 8.0 (27; 6N); Warbling Vireo, 6.0 (20); Red-eyed Vireo, 4.0 (13); Gray Catbird, 4.0; American Redstart, 4.0; Eastern Kingbird, 3.0 (10); Baltimore Oriole, 3.0 (1FL); Black-capped Chickadee, 2.0; European Starling, 2.0; Swamp Sparrow, 2.0; Brown-headed Cowbird, 2.0; Mourning Dove, 1.5; American Robin, 1.5 (1FL); American Woodcock, 1.0; Red-bellied Woodpecker, 1.0; Northern Flicker, 1.0; Great Crested Flycatcher, 1.0; Blue-gray Gnatcatcher, 1.0; Northern Cardinal, 1.0; Common Grackle, 1.0; American Goldfinch, 1.0. **Total:** 27 species; 130.5 territories (435/40ha). **Visitors:** Red-tailed Hawk, Yellow-billed Cuckoo, Downy Woodpecker, Blue Jay, White-breasted Nuthatch, Cedar Waxwing, Indigo Bunting. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. Other Observer: Jerome Fischer. **Acknowledgments:** I thank Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

38. TAMARACK SLOUGH

PANTANO DE LARICE AMERICANO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42º33'N, 80º5'W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1973; 8 yr. **Size:** 8.8 ha. **Description of Plot:** See *Am. Birds* 28:1017–1018 (1974), *J. Field Ornithol.* 63(Suppl.):68–69 (1992) and 64(Suppl.):66–67 (1993). **Weather:** Mean start temp., 18.6ºC (range 16–21ºC). **Coverage:** 19.5 h; 10 visits (9 sunrise, 1 sunset); 9, 12, 15, 18, 23, 24, 25, 26, 27 June, 2001. **Census:** Yellow Warbler, 16.0 (73; 1N); Red-winged Blackbird, 14.0 (64); Gray Catbird, 9.0 (41); House Wren, 6.0 (27); Common Yellowthroat, 5.0 (23); Tree Swallow, 4.0 (18; 1N); Cedar Waxwing, 4.0; Eastern Towhee, 4.0; Common Grackle, 4.0; Mourning Dove, 3.5 (16; 1N); Black-capped Chickadee, 3.0 (14); Chipping Sparrow, 3.0; Song Sparrow, 3.0; American Woodcock, 2.0; Whip-poor-will, 2.0; Least Flycatcher, 2.0; Great Crested Flycatcher, 2.0; Eastern Kingbird, 2.0; American Robin, 2.0; Brown Thrasher, 2.0; Brown-headed Cowbird, 2.0; Yellow-billed Cuckoo, 1.0; Northern Flicker, 1.0; Eastern Wood-Pewee, 1.0; Willow Flycatcher, 1.0; White-eyed Vireo, 1.0 (2FL); Blue Jay, 1.0; Carolina Wren, 1.0; Blue-gray Gnatcatcher, 1.0; European Starling, 1.0; Northern Cardinal, 1.0; American Goldfinch, 1.0. **Total:** 32 species; 105.5 territories; (480/40ha). **Visitors:** Wood Duck, Mallard, Great Horned Owl, Belted Kingfisher, Red-eyed Vireo, Black-and-white Warbler, American Redstart, Field Sparrow, Baltimore Oriole, House Finch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observers:** Miguel Demeulemeester and Jody Allair. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

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BREEDING BIRD CENSUS: 2002

Note: These reports complete the set for 2002, the others having been published in Volume 7 of *Bird Populations*

26. RED OAK–WHITE BIRCH SAVANNAH

SAVANA DE ROBLE ROJO–ABEDUL BLANCO

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P.O. Box 160
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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 9.4 km W of Long Point Lighthouse; 42º33'10"N, 80º9'50"W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1978; 5 yr. **Size:** 10.0 ha. **Description of Plot:** See *Am. Birds* 33:75–76 (1979), *J. Field Ornithol.* 63(Suppl.):59–60 (1992) and 66(Suppl.):52–53 (1995). **Weather:** Mean start temp., 16.6ºC (range 12–22ºC). **Coverage:** 14.0 h.; 10 visits (9 sunrise, 1 sunset); 8, 10, 12, 14, 16, 18, 20, 22, 24 June, 2002. **Census:** Red-winged Blackbird, 12.0 (48); House Wren, 10.5 (42); Tree Swallow, 8.0 (32; 3N); Yellow Warbler, 7.0 (28); Gray Catbird, 5.0 (20); Whip-poor-will, 4.0 (16); Common Yellowthroat, 4.0; Baltimore Oriole, 4.0; Eastern Wood-Pewee, 3.0 (12); Eastern Kingbird, 3.0 (1N); Song Sparrow, 3.0; Great Crested Flycatcher, 2.0; European Starling, 2.0 (1N); Common Grackle, 2.0; Hooded Merganser, 1.0; Yellow-billed Cuckoo, 1.0; Downy Woodpecker, 1.0; Northern Flicker, 1.0 (1N); Warbling Vireo, 1.0; Red-eyed Vireo, 1.0; Black-capped Chickadee, 1.0; Blue-gray Gnatcatcher, 1.0; American Robin, 1.0; Eastern Towhee, 1.0; Chipping Sparrow, 1.0; Northern Cardinal, 1.0; Brown-headed Cowbird, 1.0. **Total:** 27 species; 82.5 territories (330/40 ha). **Visitors:** Mourning Dove, Red-bellied Woodpecker, Blue Jay, Cedar Waxwing, Ovenbird, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

27. WHITE PINE–WHITE CEDAR SAVANNAH

SAVANA DE PINO BLANCO–CEDRO BLANCO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42º32'45"N, 80º6'45"W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1973; 7 yr. **Size:** 9.3 ha. **Description of Plot:** See *Am. Birds* 28:1018–1019 (1974), *J. Field Ornithol.* 63(Suppl.):69–70 (1992), 65(Suppl.):72–73 (1994), and 67(Suppl.):57–58 (1996). **Weather:** Mean start temp., 17.5ºC (range 13–23ºC). **Coverage:** 14.5 h; 10 visits (9 sunrise, 1 sunset); 9, 11, 13, 15, 17, 19, 20, 21, 23, 25 June, 2002. **Census:** Yellow Warbler, 14.0 (60); House Wren, 8.0 (34); Gray Catbird, 6.0 (26); Chipping Sparrow, 6.0; Eastern Wood-Pewee, 5.0 (22); Eastern Towhee, 4.0 (17); Tree Swallow, 3.0 (13); Brown-headed Cowbird, 3.0; Mourning Dove, 2.0; Black-capped Chickadee, 2.0; American Robin, 2.0; Common Yellowthroat, 2.0 (1N); Baltimore Oriole, 2.0; Red-winged Blackbird, 1.5; Whip-poor-will, 1.0; Great Crested Flycatcher, 1.0; Red-eyed Vireo, 1.0; Blue Jay, 1.0; Cedar Waxwing, 1.0; Field Sparrow, 1.0; Song Sparrow, 1.0; Northern Cardinal, 1.0; Common Grackle, 1.0; Least Flycatcher, 0.5; Eastern Kingbird, 0.5. **Total:** 25 species, 70.5 territories (303/40 ha). **Visitors:** Northern Saw-whet Owl, Downy Woodpecker, Northern Flicker, Carolina Wren, Blue-gray Gnatcatcher, Brown Thrasher, European Starling. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

28. RED OAK–WHITE PINE SAVANNAH

SAVANA DE ROBLE ROJO–PINO BLANCO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 6.7 km NW of Long Point Lighthouse; 42º33'50"N, 80º7'45"W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1991; 3 yr. **Size:** 11.0 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl.):83–84 (1992) and 66(Suppl.):80 (1995). **Weather:** Mean start temp., 17.1ºC (range 12–22ºC). **Coverage:** 18.2 h; 10 visits (9 sunrise, 1 sunset); 8, 10, 12, 14, 16, 18, 20, 22, 24 June, 2002. **Census:** Red-winged Blackbird, 16.0 (58); Yellow Warbler, 12.0 (44; 2N); Common Yellowthroat, 7.5 (27); Eastern Wood-Pewee, 6.0 (22; 1N); Tree Swallow, 6.0 (3N); Song Sparrow, 5.0 (18); Eastern Kingbird, 3.0 (11; 1N); Gray Catbird, 3.0; Baltimore Oriole, 3.0; Warbling Vireo, 2.0; Carolina Wren, 2.0; European Starling, 2.0; Northern Cardinal, 2.0; Wood Duck, 1.0; American Woodcock, 1.0; Northern Flicker, 1.0; Willow Flycatcher, 1.0; House Wren, 1.0; Marsh Wren, 1.0; Chipping Sparrow, 1.0; Common Grackle, 1.0, Brown-headed Cowbird, 1.0. **Total:** 22 species; 78.5 territories (285/40 ha). **Visitors:** Mallard, Great Blue Heron, Killdeer, Mourning Dove, Yellow-billed Cuckoo, Red-headed Woodpecker, Downy Woodpecker, Red-eyed Vireo, Blue Jay, Black-capped Chickadee, American Robin, Brown Thrasher, Cedar Waxwing, Ovenbird, Eastern Towhee, Orchard Oriole, House Finch, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

29. SEDGE–RUSH SWALE I

ANEGADO DE ESPARGANIO–JUNQUILLOS I

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42º33'N, 80º7'W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1973; 5 yr. **Size:** 9.3 ha. **Description of Plot:** See *Am. Birds* 27:1012 (1973), *J. Field Ornithol.* 63(Suppl.):98–99 (1992) and 65(Suppl.):110 (1994). **Weather:** Mean start temp., 17.4ºC (range 13–23ºC). **Coverage:** 10.5 h; 10 visits (9 sunrise, 1 sunset); 9, 11, 13, 15, 17, 19, 20, 21, 23, 24 June, 2002. **Census:** Red-winged Blackbird, 5.0 (22); Killdeer, 2.0; Eastern Kingbird, 2.0; Chipping Sparrow, 0.5. **Total:** 4 species; 9.5 territories (41/40 ha). **Visitors:** Wood Duck, Mallard, Spotted Sandpiper, Mourning Dove, Tree Swallow, American Robin, Brown Thrasher, European Starling, Song Sparrow, Common Grackle. **Remarks:** This study is part of a long-term project designed to monitor the response of vegetational and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

30. SEDGE–RUSH SWALE II

ANEGADO DE ESPARGANIO–JUNQUILLOS II

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Port Rowan ON N0E 1M0

Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42º33'N, 80º6'W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1991; 3 yr. **Size:** 9.3 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl.):99–100 (1992) and 65(Suppl.):110–111 (1994). **Weather:** Mean start temp., 17.4ºC (range 13–23ºC). **Coverage:** 9.0 h; 10 visits (9 sunrise, 1 sunset); 9, 11, 13, 15, 17, 19, 20, 21, 23, 25 June, 2002. **Census:** Killdeer, 3.0 (13); Red-winged Blackbird, 3.0; Spotted Sandpiper, 2.0 (1N); Eastern Kingbird, 1.0; Chipping Sparrow, 0.5. **Total:** 5 species; 9.5 territories (41/40 ha). **Visitors:** Mallard, Blue-winged Teal, Tree Swallow, American Robin, Brown Thrasher, European Starling, Field Sparrow, Song Sparrow, Common Grackle, Brown-headed Cowbird. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken and Matt Hindle for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

Bird Populations 8:125-135

BREEDING BIRD CENSUS: 2003

1. MIXED HARDWOOD POLETIMBER

BOSQUE MIXTO MADERERO

DAVID ROSGEN
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Site Number: CT1265009. **Location:** Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–Wheeler Hill; 41°42'N, 73°13'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 37 yr. **Size:** 8.5 ha. **Description of Plot:** See *Aud. Field Notes* 19:609–610 (1965) and *J. Field Ornithol.* 64(Suppl.):36 (1993). The plot suffered some tree damage from the November, 2002 ice storm. In addition, a small portion of the plot received a carefully managed hardwood saw timber harvest. The area to the west of the plot also had hardwoods harvested from it during the winter. The entire plot suffered from noticeable browsing by deer throughout the breeding season, which stripped away some of the ground cover that would have otherwise protected some nesting birds. **Weather:** Mean start temp., 23.5°C (range 16–32°C). During May, the weather was awful. Rain fell on all, or part of, 20 days, amounting to a total of 13.6 cm. This is 2.8 cm above normal. Temperatures were cooler than normal, with a mean of 12.4°C. Flooding was a problem. During June, there were 18 days with at least some rainfall. The total of 20 cm of rain was well above average. June's average mean temperature was 17.9°C, which is near normal. Flooding continued to be a problem through the 22nd, when it subsided. July had only 12 days with rain or showers. Total rainfall was 9.7 cm, which is less than normal. The average mean temperature was 20.7°C. **Coverage:** 22.0 h; 12 visits (1 sunrise, 5 sunset); 2, 15, 27 May; 3, 10, 17, 24 June; 1, 8, 15, 24, 31 July, 2003. Maximum number of observers/visit, 3. **Census:** Red-eyed Vireo, 12.5 (59; 23FL); Ovenbird, 12.0 (56; 16FL); Gray Catbird, 11.0 (52; 5N,28FL); Veery, 10.5 (49; 23FL); Eastern Towhee, 9.0 (42; 1N,25FL); Wood Thrush, 6.0 (28; 14FL); American Redstart, 5.0 (24; 1N,17FL); Common Yellowthroat, 4.5 (21; 5FL); Tufted Titmouse, 4.0 (19; 17FL); American Robin, 4.0 (2N,15FL); Scarlet Tanager, 4.0 (9FL); Black-capped Chickadee, 3.5 (16; 17FL); Black-and-white Warbler, 3.5 (8FL); Chestnut-sided Warbler, 3.0 (14; 4FL); Northern Cardinal, 3.0 (1N,8FL); Blue Jay, 2.5 (5FL); American Crow, 2.0 (2N,8FL); Yellow Warbler, 2.0 (6FL); Wild Turkey, 1.5 (9FL); Downy Woodpecker, 1.5 (1N,5FL); Eastern Wood-Pewee, 1.5; Great Crested Flycatcher, 1.5; American Goldfinch, 1.5; Mourning Dove, 1.0; Barred Owl, 1.0 (3FL); Red-bellied Woodpecker, 1.0 (3FL); Eastern Phoebe, 1.0 (4FL); White-breasted Nuthatch, 1.0 (5FL); Blue-gray Gnatcatcher, 1.0 (2FL); Rose-breasted Grosbeak, 1.0; Cooper's Hawk, 0.5 (3FL); Hairy Woodpecker, 0.5; Pileated Woodpecker, 0.5; Eastern Kingbird, 0.5; Warbling Vireo, 0.5 (3FL); Cedar Waxwing, 0.5 (2FL); Song Sparrow, 0.5; Common Grackle, 0.5 (2FL); Brown-headed Cowbird, 0.5 (2FL); Baltimore Oriole, 0.5 (1N,3FL); House Finch, 0.5; Broad-winged Hawk, +; Red-tailed Hawk, +; Northern Flicker, +; Yellow-throated Vireo, +; Blue-winged Warbler, +; Magnolia Warbler, +; Black-throated Green Warbler, +; Chipping Sparrow, +; Purple Finch, +. **Total:** 50 species; 122.0 territories (574/40 ha). **Visitors:** Fish Crow, House Wren, Hermit Thrush. **Remarks:** The number of species breeding in the plot remained at last year's record high of 50. Species composition was similar to last year, except for the loss of Ruffed Grouse and Hermit Thrush and the addition of Magnolia Warbler and Purple Finch. The number of territories in the plot declined to 122.0 this year. Though this is 17.5 fewer than last year, it is still well above the 10-year average of 101.5 territories, and it is the second highest number ever recorded in this plot. Species that increased by one-half or more territories this year included Gray Catbird (+ 3.0), Scarlet Tanager (+ 1.0), Red-eyed Vireo, Veery, Common Yellowthroat, and American Goldfinch (each + 0.5). Northern Cardinal and Chestnut-sided Warbler each declined sharply for no apparent reason. The former was down 3.5 territories from last year, while the latter was down by 3.0 territories. On most of our visits, we saw at least seven deer. Evidence of bobcat and coyote was apparent. Coupled with the territorial raptors in the plot, these predators probably took a toll on nesting songbirds. **Other Observers:** Eric Adam, John Eykelhoff, Rich Kania, Marie Kennedy, and Leann Marshal.

2. SECOND-GROWTH HARDWOOD FOREST
BOSQUE SECUNDARIO DE MADERAS DURAS

DAVID ROSGEN
White Memorial Conservation Center
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Site Number: CT2765006. **Location:** Connecticut; Litchfield Co.; Morris; White Memorial Foundation–Van Winkle Road; 41°42'N, 73°12'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 37 yr. **Size:** 10.1 ha. **Description of Plot:** See *Aud. Field Notes* 19:590–591 (1965) and *J. Field Ornithol.* 64(Suppl.):37–38 (1993). Small stream flooding caused some damage to vegetation this year. Seven trees were blown down, also. **Weather:** Mean start temp., 23.5°C (range 18–30°C). During May, the weather was awful. Rain fell on all, or part of, 20 days, amounting to a total of 13.6 cm. This is 2.8 cm above normal. Temperatures were cooler than normal, with a mean of 12.4°C. Flooding was a problem. During June, there were 18 days with at least some rainfall. The total of 20 cm of rain was well above average. June's average mean temperature was 17.9°C, which is near normal. Flooding continued to be a problem through the 22nd, when it subsided. July had only 12 days with rain or showers. Total rainfall was 9.7 cm, which is less than normal. The average mean temperature was 20.7°C. **Coverage:** 18.5 h; 10 visits (1 sunrise, 6 sunset); 9, 20, 30 May; 9, 19 June; 1, 10, 17, 26, 31 July, 2003. Maximum number of observers/visit, 3. **Census:** Red-eyed Vireo, 15.0 (59; 2N,19FL); Ovenbird, 13.5 (53; 20FL); Veery, 12.5 (50; 1N,23FL); Wood Thrush, 3.5 (14; 1N,4FL); American Robin, 3.5 (1N,15FL); American Redstart, 3.5 (10FL); Scarlet Tanager, 3.5 (5FL); Yellow-bellied Sapsucker, 3.0 (12; 1N,7FL); Eastern Wood-Pewee, 3.0 (4FL); American Crow, 3.0 (3N,12FL); Tufted Titmouse, 3.0 (18FL); Black-capped Chickadee, 2.5 (13FL); Wild Turkey, 2.0 (7FL); Downy Woodpecker, 2.0 (1N,6FL); Great Crested Flycatcher, 2.0 (2FL); White-breasted Nuthatch, 2.0 (9FL); Gray Catbird, 2.0 (1N,3FL); Northern Cardinal, 2.0 (1N,5FL); Red-bellied Woodpecker, 1.5 (1N,5FL); Blue Jay, 1.5 (4FL); Blue-gray Gnatcatcher, 1.5 (1N,3FL); Black-and-white Warbler, 1.5; American Goldfinch, 1.5; Hairy Woodpecker, 1.0 (2FL); Eastern Phoebe, 1.0 (8FL); Cedar Waxwing, 1.0; Eastern Towhee, 1.0 (2FL); Chipping Sparrow, 1.0; Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0 (2FL); Barred Owl, 0.5 (1FL); Eastern Kingbird, 0.5; Yellow-throated Vireo, 0.5; Brown Creeper, 0.5; Louisiana Waterthrush, 0.5; Common Yellowthroat, 0.5; Baltimore Oriole, 0.5; Broad-winged Hawk, +; Mourning Dove, +; Ruby-throated Hummingbird, +; Chestnut-sided Warbler, +. **Total:** 41 species; 99.5 territories (394/40 ha). **Visitors:** Northern Flicker, Pileated Woodpecker, Blue-winged Warbler, Black-throated Blue Warbler, Pine Warbler. **Remarks:** The number of breeding species declined to 41 (from 46 last year, 42 in 2001, and 47 in 2000). This is three less than the 10-y average of 44. Species found this year but not last year included Broad-winged Hawk, Ruby-throated Hummingbird, and Brown Creeper. Most of the species found in very limited numbers last year (such as Cooper's Hawk and Hermit Thrush) were missed this year. The number of territorial males increased slightly this year to 99.5; last year, the number was 99.0. These figures are very close to the 10-yr average of 101.0 territorial males. During this time, there has been little deviation from this number. Nor has there been much of a change among the top three most abundant species (Red-eyed Vireo, Ovenbird, and Veery); all three increased in abundance . Other species that increased included American Crow (which doubled in number), White-breasted Nuthatch, Northern Cardinal, and Blue-gray Gnatcatcher. Species that declined by one or more territories included American Robin, Great Crested Flycatcher, and Gray Catbird. **Other Observers:** Eric Adam, John Eykelhoff, Lukas Hyder, Marie Kennedy, and Ed Yescott.

3. MIXED UPLAND BROADLEAF FOREST
BOSQUE MIXTO DE HOJA ANCHA DE ALTURAS

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4000 Cathedral Ave. NW, #106B
Washington DC 20016

Site Number: DC1060009. **Location:** District of Columbia; Washington; Glover-Archbold Park; 38°55'N, 77°5'W; Washington West Quadrangle, USGS. **Continuity:** Established 1959; 45 yr. **Size:** 14.2 ha. **Description of Plot:** See *Aud. Field Notes* 14:502–503 (1960). **Weather:** Mean start temp., 16.7°C (range 7–21°C). Nine days were clear, eight were partly cloudy, and eight were cloudy. There was light drizzle during one visit and some fog during another. May and June were very rainy and cold in general with standing water in many places in the woods and many mosquitoes. **Coverage:** 50.0 h; 25 visits (25 sunrise); 29 Mar; 2, 6, 12, 19, 27, 30 Apr; 4, 7, 12, 19, 22, 25, 30 May; 3, 6, 9, 12, 15, 21, 25, 28 June; 4, 9, 13 July, 2003. **Census:** Red-bellied Woodpecker, 12.0 (34); Veery, 11.0 (31; 3FL); Gray Catbird, 11.0 (4FL); Northern Cardinal, 10.0 (28; 6FL); Red-eyed Vireo, 9.0 (25); Carolina Wren, 9.0 (8FL); White-breasted Nuthatch, 8.0 (23; 3FL); Downy Woodpecker, 7.0 (20; 29FL); Tufted Titmouse, 7.0 (2FL); Northern Flicker, 6.0 (17); Acadian Flycatcher, 6.0; Eastern Wood-Pewee, 4.0 (11); Hairy Woodpecker, 3.0 (8; 1FL); House Finch, 3.0 (1N); Song Sparrow, 2.5; Pileated Woodpecker, 2.0; Great Crested Flycatcher, 2.0; American Crow, 2.0; House Wren, 2.0 (2FL); Eastern Towhee, 2.0 (6FL); Common Grackle, 2.0; House

Sparrow, 2.0 (2N,1FL); Chimney Swift, 1.0; Blue-gray Gnatcatcher, 1.0 (2FL); Wood Thrush, 1.0; Red-shouldered Hawk, 0.5; Northern Mockingbird, 0.5 (3FL); European Starling, 0.5 (2N,7FL); Mourning Dove, +. **Total:** 29 species; 127.0 territories (358/40 ha). **Visitors:** Mallard, Green Heron, Yellow-billed Cuckoo, Barred Owl, Ruby-throated Hummingbird, White-eyed Vireo, Blue Jay, Fish Crow, Carolina Chickadee, American Robin, American Redstart, Ovenbird, Louisiana Waterthrush, Common Yellowthroat, Scarlet Tanager, Field Sparrow, Indigo Bunting, Brown-headed Cowbird, American Goldfinch. **Remarks:** An unusual year, in terms of weather, following a very severe winter. There were consistently fewer birds in general. Very few crows were seen, with only two possible territories compared to the usual 5-7, and no evidence of nests or young. There were relatively few Blue Jays or Carolina Chickadees. These birds may have been lost due to West Nile Virus. Carolina Wrens were greatly reduced (9.0 territories this year compared to 30.0 last year), probably due to the severe winter. Wood Thrushes were also reduced (1.0 territory this year compared to 6.0 last year). Resurfacing on 42nd Street all spring and early summer and masonry work on an apartment building on W Street seemed to drive away many birds trying to set up territories along the woodland edge there. **Other Observers:** Neal Fitzpatrick and Bob Norris.

4. MATURE BROADLEAF FOREST
BOSQUE DE HOJA ANCHA MADURA

CHARLES W. SAUNDERS*, STEVE PELIKAN &
LAUREN P. SAUNDERS
**5561 Carlsbad Court*
Fairfield OH 45014

Site Number: OH1591043. **Location:** Ohio; Hamilton Co.; Hooven; Miami Whitewater Forest; 39°14'42"N, 84°45'38"W; Hooven Quadrangle, USGS. **Continuity:** Established 1991; 9 yr. **Size:** 16.0 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl.):52 (1992) and 65(Suppl.):59 (1994). **Weather:** Mean start temp., 15.0°C (range 9–22°C). Six days were calm (0 on Beaufort scale), three days had light winds (1 or 2 on Beaufort), and one day was breezy (3 on Beaufort). **Coverage:** 21.4 h; 10 visits (10 sunrise); 24, 25, 31 May; 1, 7, 20, 21, 26, 28 June; 3 July, 2003. Maximum number of observers/visit, 3. **Census:** Wood Thrush, 14.0 (35; 2FL); Red-eyed Vireo, 11.5 (29); Acadian Flycatcher, 9.5 (24); Eastern Wood-Pewee, 5.5 (14); Red-bellied Woodpecker, 4.5 (11); Scarlet Tanager, 4.0 (10); Brown-headed Cowbird, 4.0 (3FL); Tufted Titmouse, 3.5 (9); White-breasted Nuthatch, 3.5; Northern Cardinal, 3.5 (3FL); Blue Jay, 3.0 (8); Carolina Chickadee, 2.5; Downy Woodpecker, 2.0; Hairy Woodpecker, 2.0; Great Crested Flycatcher, 2.0; Ovenbird, 2.0; Blue-gray Gnatcatcher, 1.5; American Robin, 1.5 (11FL); Kentucky Warbler, 1.5; Ruby-throated Hummingbird, 1.0; Northern Flicker, 1.0; Pileated Woodpecker, 1.0 (1FL); Yellow-throated Vireo, 1.0; Carolina Wren, 1.0; Louisiana Waterthrush, 1.0; Rose-breasted Grosbeak, 0.5. **Total:** 26 species; 88.0 territories (220/40 ha). **Visitors:** Wild Turkey, Yellow-billed Cuckoo, American Redstart, Hooded Warbler, Summer Tanager, American Goldfinch. **Remarks:** By comparing 2003 populations with historical data (1991–98), we observed decreases in the populations of more species than expected by chance. In contrast, few species showed a population increase. Regardless of the cause(s) of these declines, we have measured the amount of decline of the woodland birds in the plot, with the total number of territorial males 12% below the 1991-98 average. See Saunders et al. (2005) Ohio Journal of Science 105(3):43–45. **Other Observers:** Lester Peyton and Mary Saunders. **Acknowledgments:** We thank John Klein and the Hamilton County Park District for the use of the land.

5. WHITE OAK SAVANNAH
SAVANA DE ROBLE BLANCO

MICHAEL F. G. CLARK
101 Governor's Road, #708
Dundas ON L9H 6L7

Site Number: ON2893110. **Location:** Ontario; Municipality of Muskoka; Torrance; Southwood Shield Plateau; 44°56'N, 79°30'W. **Continuity:** Established 1993; 9 yr. **Size:** 10.4 ha. **Description of Plot:** See *J. Field Ornithol.* 65(Suppl.):60–61 (1994). The recent die-off of a considerable number of large white oaks (the plot's dominant species) plus some smaller trees and shrubs likely continues to affect breeding bird numbers. Grass and herbal ground cover were uncharacteristically abundant throughout the plot this year. **Weather:** Mean start temp., 24.1°C (range 19.0–29.5°C). Monthly temperatures were at or very near the norm from May through July. Precipitation was 9% below the norm overall; rainfall was 14% above the 30-year norm in May and 20% below the norm for June and July combined. Source: Environment Canada. **Coverage:** 13.9 h; 8 visits (8 sunset); 18 May; 4, 17, 27, 30 June; 3, 4, 13 July, 2003. **Census:** Chipping Sparrow, 10.0 (38); American Robin, 8.0 (31); Field Sparrow, 7.0 (27); Chestnut-sided Warbler, 6.0 (23); Red-eyed Vireo, 4.5 (17); Eastern Towhee, 4.5; Hermit Thrush, 4.0 (15); Yellow-rumped Warbler, 3.0 (12); Common Yellowthroat, 3.0; Song Sparrow, 3.0; Least Flycatcher, 2.0; Cedar Waxwing, 2.0; Common Nighthawk, 1.0; Northern Flicker, 1.0; Brown Thrasher, 1.0; American Redstart, 1.0; White-throated Sparrow, 1.0. **Total:** 17 species; 62.0 territories (238/40 ha). **Visitors:** Ruffed Grouse, Mourning

Dove, Yellow-billed Cuckoo, Hairy Woodpecker, Eastern Wood-Pewee, Yellow-bellied Flycatcher, Great Crested Flycatcher, Black-capped Chickadee, Brown Creeper, Eastern Bluebird, Veery, Vesper Sparrow, Brown-headed Cowbird, Purple Finch, American Goldfinch. **Remarks:** The much lower precipitation in June and July may have resulted in the marked dwindling of late spring-early summer breeding activity. Total territorial males and total species may have "bottomed out" over the past four years at roughly 59 and 18, respectively. In 1995 there were 131.5 territorial males and 25 breeding species. Seedeaters (25.5 territorial males and 5 species) were dominant again this year. The 13 warbler territories (4 species) tied the lowest breeding total over nine years. Despite the sharp overall declines in breeding numbers, thrush (2 species) and vireo (1 species) totals were above their 9-yr averages. The one breeding thrasher, a low for this plot, is 6 territorial males below the average for mimids.

6. OAK–MAPLE–POPLAR HOLLOW
BOSQUE DE ROBLE–ARCE–ALAMO HUECO

LINDA INGRAM
Nolde Forest Environmental Education Center
2910 New Holland Road
Reading PA 19607

Site Number: PA1093123. **Location:** Pennsylvania; Berks Co.; Reading; Nolde Forest, Buck Hollow; 40°17'N, 75°57'W; Reading Quadrangle, USGS. **Continuity:** Established 1993; 11 yr. **Size:** 11.3 ha. **Description of Plot:** See *J. Field Ornithol.* 65(Suppl.):61 (1994). **Weather:** Mean start temp., 11.8°C (range 7–18°C). There were some sprinkles during two visits. Grounds were damp with winds calm to light. May 2003 received near normal precipitation; observers avoided days with heavy rain. Temperatures in May were normal: mean 16.7°C (range 11.1°–22.2°C). Source: National Climatic Data Center, Asheville, NC (2000). **Coverage:** 18.2 h; 10 visits (10 sunrise, 0 sunset); 27, 28, 30 April; 6, 11, 18, 21, 29, 31 May; 11 June, 2003. **Census:** Ovenbird, 6.0 (21); Wood Thrush, 5.0 (18); Red-eyed Vireo, 3.0 (11); Tufted Titmouse, 3.0; Veery, 2.5; American Crow, 1.5; Red-bellied Woodpecker, 1.0; Hairy Woodpecker, 1.0; Pileated Woodpecker, 1.0 (1N); Blue Jay, 1.0; chickadee species, 1.0; Northern Cardinal, 1.0. **Total:** 12 species; 27.0 territories (96/40 ha). **Visitors:** Mourning Dove, Downy Woodpecker, Northern Flicker, Eastern Wood-Pewee, Great Crested Flycatcher, White-breasted Nuthatch, American Robin, Gray Catbird, Scarlet Tanager, Chipping Sparrow, Rose-breasted Grosbeak, American Goldfinch. **Other Observers:** Richard Bonnett, Edward Barrell, Patricia Mangas, Barry Pounder, Phyllis Reynolds, and David Reynolds.

7. VIRGIN HARDWOOD SWAMP FOREST
BOSQUE PANTANOSO VIRGEN DE MADERAS DURAS

MICHAEL DAWSON
Francis Beidler Forest
336 Sanctuary Road
Harleyville SC 29448

Location: South Carolina; Berkeley Co.; Harleyville; Francis Beidler Forest Sanctuary; 33°13'N, 80°20'W; Pringletown Quadrangle, USGS. **Continuity:** Established 1979; 13 yr. **Size:** 8.9 ha. **Description of Plot:** See *Am. Birds* 34:50 (1980) and *J. Field Ornithol.* 65(Suppl.):64 (1994). The plot is continuing to recover from the damage caused by hurricane Hugo in 1989. Scrubby areas are beginning to thin out as saplings increase in height and shade the forest floor. **Weather:** Mean start temp., 15.2°C (range 13–19°C). March, April and May were extremely wet. All surveys were conducted during times without wind.. **Coverage:** 15.8 h; 10 visits (10 sunrise, 0 sunset); 22, 29 April; 2, 3, 9, 12, 16, 21, 24, 30 May, 2003. Maximum number of observers/visit, 3. **Census:** Blue-gray Gnatcatcher, 28.0 (126); Northern Parula, 11.5 (52); Tufted Titmouse, 9.0 (40); Carolina Wren, 8.5 (38); Red-eyed Vireo, 7.5 (34); Prothonotary Warbler, 7.0 (31); Northern Cardinal, 7.0; Great Crested Flycatcher, 5.0 (22); White-eyed Vireo, 5.0; Red-bellied Woodpecker, 4.5 (20); Acadian Flycatcher, 3.0 (13); Yellow-billed Cuckoo, 2.0; Hooded Warbler, 2.0; Red-shouldered Hawk, 1.0; Barred Owl, 1.0; Downy Woodpecker, 1.0; Pileated Woodpecker, 1.0; American Crow, 1.0; Swainson's Warbler, 0.5. **Total:** 19 species; 105.5 territories (474/40 ha). **Visitors:** White Ibis, Eastern Screech-Owl, Chimney Swift, Yellow-throated Vireo, Fish Crow, Carolina Chickadee, White-breasted Nuthatch, Wood Thrush, Black-throated Blue Warbler, Yellow-throated Warbler, Common Yellowthroat, Summer Tanager. **Other Observers:** Norman Brunswig, Bettina Miller, and Julia Noran.

8. MATURE MAPLE–BEECH–BIRCH FOREST
BOSQUE MADURO DE ARCE–HAYA–ABEDUL

HAYDEN WILSON & LAURA M. LEWIS*
**Cherokee National Forest*
2800 N. Ocoee Street
Cleveland TN 37312

Site Number: TN2392102. **Location:** Tennessee; Monroe Co.; Whigg Ridge, Cherokee National Forest; 35°19'N, 84°2'W; Big Junction Quadrangle, USGS. **Continuity:** Established 1992; 11 yr. **Size:** 10.2 ha. **Description of Plot:** See *J. Field Ornithol.* 64(Suppl.):57–58 (1993) and 66(Suppl.):63 (1995). **Weather:** Mean start temp., 16.6°C (range 9–25°C). **Coverage:** 16.7 h; 9 visits (5 sunrise, 4 sunset); 1, 2, 10,

11, 15(2), 16 June; 2, 3 July, 2003. **Census:** Veery, 13.5 (53); Dark-eyed Junco, 12.0 (47); Blue-headed Vireo, 5.5 (22); Blackburnian Warbler, 5.5; Ovenbird, 5.0 (20); Black-throated Blue Warbler, 4.0 (16); Hairy Woodpecker, 1.0. **Total:** 7 species; 46.5 territories (182/40 ha). **Visitors:** Ruffed Grouse, Red-eyed Vireo, Tufted Titmouse, Red-breasted Nuthatch, Chestnut-sided Warbler, Rose-breasted Grosbeak. **Remarks:** Flyovers included Chimney Swift and American Goldfinch. **Acknowledgments:** We wish to acknowledge the logistical and financial support of the USDA Forest Service, Cherokee National Forest.

9. WHITE PINE–WHITE CEDAR SAVANNAH

SAVANA DE PINO BLANCO–CEDRO BLANCO

MATT TIMPF
Bird Studies Canada
P.O. Box 160
Port Rowan ON N0E 1M0

Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°32'45"N, 80°6'45"W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1973; 8 yr. **Size:** 9.3 ha. **Description of Plot:** See *Am. Birds* 28:1018–1019 (1974), *J. Field Ornithol.* 63(Suppl.):69–70 (1992), 65(Suppl.):72–73 (1994), and 67(Suppl.):57–58 (1996). **Weather:** Mean start temp., 16.3°C (range 12–20°C). **Coverage:** 40.3 h; 10.5 visits (7.5 sunrise, 3 sunset); 6, 7, 10, 15, 17, 20, 22, 24, 25, 26 June, 2003. **Census:** Yellow Warbler, 14.0 (60); House Wren, 8.5 (37); Chipping Sparrow, 7.0 (30; 2FL); Common Yellowthroat, 6.5 (28); Gray Catbird, 5.5 (24); Eastern Towhee, 5.0 (22; 1N,1FL); Eastern Wood-Pewee, 4.5 (19; 3N); Red-eyed Vireo, 4.0 (17; 1N); Northern Cardinal, 2.5; Baltimore Oriole, 2.5 (1N); Great Crested Flycatcher, 2.0; Eastern Kingbird, 2.0 (1N); White-eyed Vireo, 2.0 (1N); Black-capped Chickadee, 2.0 (1FL); Song Sparrow, 2.0; Red-winged Blackbird, 2.0; Carolina Wren, 1.5; Cooper's Hawk, 1.0; Mourning Dove, 1.0; Whip-poor-will, 1.0; Blue Jay, 1.0; Pine Warbler, 1.0; American Redstart, 1.0; Field Sparrow, 1.0; Brown-headed Cowbird, 1.0; American Robin, 0.5 (1FL). **Total:** 26 species, 82.0 territories (353/40 ha). **Visitors:** American Woodcock, Yellow-billed Cuckoo, Red-breasted Nuthatch, Veery, Brown Thrasher, Cedar Waxwing, Nashville Warbler, Black-and-white Warbler, Ovenbird, White-throated Sparrow, Common Grackle, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observers:** Taeko Knockaert, John Brett, and Crissy Ranelucci. **Acknowledgments:** Thanks to Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

10. CLIMAX HEMLOCK–WHITE PINE FOREST WITH TRANSITION HARDWOODS

BOSQUE CLIMAX DE PICEA–PINO BLANCO EN TRANSICION A MADERAS DURAS

DAVID ROSGEN
White Memorial Conservation Center
P.O. Box 368
Litchfield CT 06759

Site Number: CT2765008. **Location:** Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–Catlin Woods; 41°43'N, 73°12'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 37 yr. **Size:** 10.5 ha. **Description of Plot:** See *Aud. Field Notes* 19:594–595 (1965) and *J. Field Ornithol.* 67(Suppl.):60 (1996). The plot suffered significant tree damage from an ice storm in November 2002 and several subsequent snowstorms. Coupled with blow-downs from storms in previous years, there is now much more undergrowth and regeneration, which is improving habitat diversity. Though the old-growth trees are fewer in number, there are still plenty of them in the plot. Hemlock woolly adelgid has not spread into the forest any further than the edge of Webster Road, and only two additional trees died from it this year. **Weather:** Mean start temp., 21.8°C (range 14–27°C). During May, the weather was awful. Rain fell on all, or part of, 20 days, amounting to a total of 13.6 cm. This is 2.8 cm above normal. Temperatures were cooler than normal, with a mean of 12.4°C. Flooding was a problem. During June, there were 18 days with at least some rainfall. The total of 20 cm of rain was well above average. June's average mean temperature was 17.9°C, which is near normal. Flooding continued to be a problem through the 22nd, when it subsided. July had only 12 days with rain or showers. Total rainfall was 9.7 cm, which is less than normal. The average mean temperature was 20.7°C. **Coverage:** 22.5 h; 10 visits (1 sunrise, 5 sunset); 5, 19, 29 May; 5, 16, 24 June; 3, 12, 18, 25 July, 2003. Maximum number of observers/visit, 3. **Census:** Black-throated Green Warbler, 18.5 (70; 4N,34FL); Ovenbird, 16.0 (61; 2N,22FL); Veery, 14.5 (55; 21FL); Blackburnian Warbler, 14.0 (53; 2N,28FL); Red-eyed Vireo, 13.5 (51; 18FL); Hermit Thrush, 6.0 (23; 14FL); Pine Warbler, 4.5 (17; 9FL); Scarlet Tanager, 4.5 (5FL); Black-capped Chickadee, 4.0 (15; 17FL); Great Crested Flycatcher, 3.5 (13; 7FL); Wood Thrush, 3.5 (2FL); Black-and-white Warbler, 3.5 (3FL); Blue-headed Vireo, 3.0 (11; 3FL); Brown Creeper, 2.5 (9FL); Yellow-rumped Warbler, 2.5 (5FL); Eastern Wood-Pewee, 2.0 (2FL); Blue Jay, 2.0 (7FL); Tufted Titmouse, 2.0 (8FL); Mourning Dove, 1.5; Yellow-bellied Sapsucker, 1.5

(2FL); Northern Cardinal, 1.5 (2FL); Wild Turkey, 1.0; Hairy Woodpecker, 1.0 (2FL); Pileated Woodpecker, 1.0 (2FL); American Crow, 1.0 (1N,4FL); White-breasted Nuthatch, 1.0 (4FL); American Robin, 1.0 (1N,4FL); Common Yellowthroat, 1.0; Canada Warbler, 1.0; Brown-headed Cowbird, 1.0 (1FL); Broad-winged Hawk, 0.5; Great Horned Owl, 0.5 (2FL); Ruby-throated Hummingbird, 0.5 (3FL); Gray Catbird, 0.5 (3FL); Chipping Sparrow, 0.5 (2FL); Purple Finch, 0.5; Downy Woodpecker, +; Red-breasted Nuthatch, +; Louisiana Waterthrush, +; Rose-breasted Grosbeak, +. **Total:** 40 species; 136.5 territories (520/40 ha). **Visitors:** Barred Owl, Northern Flicker, Eastern Phoebe, Yellow-throated Vireo, Blue-gray Gnatcatcher, American Redstart, American Goldfinch. **Remarks:** In spite of increasing habitat diversity in the plot, the number of breeding species dropped back to 40 this year. It hasn't been this low since 1999. Last year 46 species bred here, and the 10-yr average is 43 species. Species found on territory last year but not this year included Magnolia Warbler, Cedar Waxwing, Eastern Kingbird, and Song Sparrow. The only species found this year but not last year were Ruby-throated Hummingbird and Louisiana Waterthrush. This latter species is a new one for the plot. The number of territorial males decreased slightly from 137.0 last year to 136.5 this year, but the total was the third highest ever recorded. The 10-yr average is 123.0 territories. Species that increased by more than one territory this year included Black-throated Green Warbler, Ovenbird, Veery, and Blackburnian Warbler. Species that decreased included Pine Warbler and American Robin. **Other Observers:** Eric Adam, John Eykelhoff, Kathy Hall, Lukas Hyder, Rich Kania, Marie Kennedy, Russ Naylor, and Ed Yescott.

11. YOUNG MIXED HARDWOOD–CONIFER STAND

BOSQUE JOVEN–MIXTO DE MADERAS DURAS/RODAL DE CONIFEROS

DAVID ROSGEN
White Memorial Conservation Center
P.O. Box 368
Litchfield CT 06759

Site Number: CT2778262. **Location:** Connecticut; Litchfield Co.; Morris; White Memorial Foundation–Pitch Road; 41°42'N, 73°10'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1978; 26 yr. **Size:** 8.5 ha. **Description of Plot:** See *Am. Birds* 33:72 (1979). **Weather:** Mean start temp., 18.5°C (range 13–24°C). During May, the weather was awful. Rain fell on all, or part of, 20 days, amounting to a total of 13.6 cm. This is 2.8 cm above normal. Temperatures were cooler than normal, with a mean of 12.4°C. Flooding was a problem. During June, there were 18 days with at least some rainfall. The total of 20 cm of rain was well above average. June's average mean temperature was 17.9°C, which is near normal. Flooding continued to be a problem through the 22nd, when it subsided. July had only 12 days with rain or showers. Total rainfall was 9.7 cm, which is less than normal. The average mean temperature was 20.7°C. **Coverage:** 13.5 h; 8 visits (2 sunrise, 4 sunset); 20, 30 May; 8, 17, 27 June; 8, 17, 29 July, 2003. **Census:** Red-eyed Vireo, 12.0 (56; 1N,13FL); Veery, 11.5 (54; 17FL); Ovenbird, 11.5 (23FL); Wood Thrush, 6.0 (28; 1N,11FL); Hermit Thrush, 4.5 (21; 9FL); Scarlet Tanager, 4.5 (8FL); American Redstart, 3.0 (14; 8FL); Yellow-bellied Sapsucker, 2.5 (3FL); Black-capped Chickadee, 2.5 (9FL); Tufted Titmouse, 2.5 (13FL); American Robin, 2.5 (1N,8FL); Eastern Wood-Pewee, 2.0; Gray Catbird, 2.0 (1N,5FL); Black-and-white Warbler, 2.0 (3FL); Northern Cardinal, 2.0 (5FL); Downy Woodpecker, 1.5 (2FL); Great Crested Flycatcher, 1.5; Blue Jay, 1.5; White-breasted Nuthatch, 1.5 (5FL); Louisiana Waterthrush, 1.5 (3FL); Common Yellowthroat, 1.5 (2FL); Wild Turkey, 1.0; Barred Owl, 1.0 (3FL); Blue-headed Vireo, 1.0 (3FL); Blue-gray Gnatcatcher, 1.0 (2FL); Black-throated Blue Warbler, 1.0; Brown-headed Cowbird, 1.0 (2FL); American Goldfinch, 1.0; Broad-winged Hawk, 0.5; Mourning Dove, 0.5; Ruby-throated Hummingbird, 0.5; Red-bellied Woodpecker, 0.5; Pileated Woodpecker, 0.5; Eastern Phoebe, 0.5; American Crow, 0.5; Cedar Waxwing, 0.5; Chestnut-sided Warbler, 0.5; Blackburnian Warbler, 0.5; Eastern Towhee, 0.5; Rose-breasted Grosbeak, 0.5; Baltimore Oriole, 0.5; Purple Finch, 0.5; Black-throated Green Warbler, +. **Total:** 43 species; 94.0 territories (442/40 ha). **Visitors:** Hairy Woodpecker, Northern Flicker, Yellow-throated Vireo, Canada Warbler. **Remarks:** This plot suffered ongoing problems throughout the year from illegal dumping, parties, ATVs, and dirt bikes. Whether or not these activities contributed to the sharp decrease in species diversity this year is unknown. Likely contributing was the persistent wet weather and resultant flooding. Whatever the cause, a drop from 50 species last year to 43 this year is significant, even though this latter figure is closer to the long-term average. Broad-winged Hawk was the only species found this year and not last year. The number of territorial males found this year was 94.0, which is 1.5 more than were found last year, and 2 more than the 10-yr average. This increase is largely due to significant increases in the numbers of Red-eyed Vireos (from 9.0 territories last year to 12.0 this year), Veeries (from 9.5 to 11.5), and Ovenbirds (from 10.0 to 11.5). These have been the most abundant species in this plot for the past several years, but they were more abundant than ever this year. **Other Observers:** Lukas Hyder, Russ Naylor, Ed Yescott, and John Eykelhoff.

12. RIPARIAN WOODLAND

ARBOLADO RIVEREÑO

SCOTT R. ROBINSON
Bureau of Land Management
3815 N. Schreiber Way
Coeur d'Alene ID 83815

Location: Idaho; Kootenai Co.; Coeur d'Alene; Blackwell Island; 47°41'N, 116°48'W; Coeur d'Alene Quadrangle, USGS. **Continuity:** Established 1997; 7 yr. **Size:** 8.9 ha. **Description of Plot:** See 1997 BBC report (unpublished) and Bird Populations 7:106 (2006) and 7:123 (2006). Construction of the day-use recreation area with boat launch, picnic area, and boardwalk for birdwatchers was completed and it was opened to the public for Memorial Day weekend. **Weather:** Mean start temp., 8.6°C (range 3–13°C). The seven sunrise visits explain the lower starting temperatures than during the first five years of the census. No flooding this year. The mosquito hatch between visits five and six provided a good food source for bird chicks. **Coverage:** 13.3 h; 7 visits (7 sunrise); 13, 20, 28 May; 3, 10, 24 June; 2 July, 2003. **Census:** Song Sparrow, 6.0 (27); American Robin, 5.5 (25); Tree Swallow, 5.0 (22; 5N); Yellow Warbler, 5.0; Spotted Sandpiper, 2.0; European Starling, 2.0; Black-headed Grosbeak, 2.0; Red-winged Blackbird, 2.0; Brown-headed Cowbird, 2.0; House Finch, 2.0; Canada Goose, 1.0 (3FL); Mallard, 1.0; California Quail, 1.0; Killdeer, 1.0; Calliope Hummingbird, 1.0; Hairy Woodpecker, 1.0; Northern Flicker, 1.0; Willow Flycatcher, 1.0; Violet-green Swallow, 1.0; Pygmy Nuthatch, 1.0; Gray Catbird, 1.0; Cedar Waxwing, 1.0; Yellow-rumped Warbler, 1.0. **Total:** 23 species; 46.5 territories (209/40 ha). **Visitors:** Common Merganser, Osprey, Bald Eagle, Ring-billed Gull, Mourning Dove, Rufous Hummingbird, Red-naped Sapsucker, Downy Woodpecker, Western Wood-Pewee, American Crow, Common Raven, Barn Swallow, Black-capped Chickadee, Nashville Warbler, Common Yellowthroat, Brewer's Blackbird, Bullock's Oriole. **Remarks:** One artificial nest box was removed from the census plot. Swallows and flickers have continually occupied these nest boxes in place of Wood Ducks. A visiting Bald Eagle took at least two goslings and left three to fledge.

13. HEMLOCK–MIXED BROADLEAF RIPARIAN FOREST

BOSQUE RIVEREÑO MIXTO DE ESPECIES DE HOJA ANCHA Y PINABETO

LYNN BOWDERY, ALLAN BOWDERY, TOM SARRO, & LIN FAGAN
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Location: New York; Ulster Co.; Gardiner; Upper Coxing Clove; 41°44'N, 74°12'W; Gardiner Quadrangle, USGS. **Continuity:** Established 1993; 3 yr. **Size:** 12.1 ha. **Description of Plot:** A rectangular plot (shortest side 152 m, longest 794 m) with a closed canopy dominated by eastern hemlock, red oak, black birch, and sugar maple. The stand is 61–100 years of age with a mean canopy height of 20 m (range 15–25 m). The understory is dominated by striped maple, witch-hazel, and mountain laurel. The ground cover is dominated by hay-scented fern, partridge berry, and New York fern. There is one permanent stream (the Coxing Kill) with a maximum width of 10 m and a maximum depth of 1 m, and there are also a few ephemeral streams and pools. This area has suffered from an infestation of woolly adelgids since 1998, and a noticeable number of hemlocks, ~10%, in this ravine have died or are in poor condition. In November 2002, there was a severe ice storm that broke many branches and tops of hardwood trees and even felled a few. Edge: More than 75% of the plot's perimeter is bordered by the same habitat, and the plot lies within a tract of similar habitat 51–100 ha in size. Topography and Elevation: The plot has a NE-facing slope of 11–16% grade. Minimum elevation 279 m, maximum 320 m. **Weather:** Mean start temp., 14.3°C (range 9–26°C). The average temperature for May was 0.5°C below normal, and precipitation was 27% above average. The average temperature for June was 0.5°C above normal, and precipitation was 52% above average. The frequent rains kept the Coxing Kill unusually full, causing it to be quite noisy during visits 4–12, and making faint or very high-pitched sounds inaudible. **Coverage:** 23.0 h; 12 visits (11 sunrise, 1 sunset); 16, 19, 22, 27 May; 2, 6, 10, 12, 16, 19, 23, 27 June, 2003. Maximum number of observers/visit, 6. **Census:** Red-eyed Vireo, 12.0 (40); Ovenbird, 6.0 (20; 1N); Black-throated Green Warbler, 4.5 (15); Louisiana Waterthrush, 4.0 (13); Wood Thrush, 3.5 (12); Scarlet Tanager, 3.5; Acadian Flycatcher, 3.0 (10); Eastern Wood-Pewee, 2.0; Black-and-white Warbler, 1.5; Blue Jay, 1.0 (2FL); Black-throated Blue Warbler, 1.0; Blackburnian Warbler, 1.0; Red-bellied Woodpecker, 0.5; Pileated Woodpecker, 0.5; Black-capped Chickadee, 0.5; Hooded Warbler, 0.5; Great Crested Flycatcher, +; Yellow-throated Vireo, +. **Total:** 18 species; 45.0 territories (149/40 ha). **Visitors:** Downy Woodpecker, Hairy Woodpecker, American Crow, Tufted Titmouse, American Robin, Worm-eating Warbler, American Goldfinch. **Remarks:** Inspection of the original data sheets confirmed that fewer birds were detected this year (compared with 63+ territories of 27 species). In addition to the loss of hemlocks and ice damage resulting in fewer caterpillars, the West Nile virus has been found in Ulster County for several years. **Other Observers:** David Arner, Lisa Daddona, Ruth Elwell, Ethan

Pierce, Barbara Rubin, John Thompson, and Jane Vecchione. **Acknowledgments:** Thanks to the Mohonk Preserve for its cooperation and support.

14. INTERGRADING DUNE–SWALE SAVANNAH

SAVANA CON GRADIENTE DE DUNA A CIENAGA

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42º32'45"N, 80º4'0"W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1965; 7 yr. **Size:** 11.0 ha. **Description of Plot:** See *Aud. Field Notes* 19:630 (1965), *J. Field Ornithol.* 63(Suppl.):82–83 (1992), 65(Suppl.):85–86 (1994), and 67(Suppl.):65–66 (1996). **Weather:** Mean start temp., 15.7ºC (range 10–21ºC). **Coverage:** 25.8 h; 9 visits (7 sunrise, 2 sunset); 5, 13, 15, 17, 18, 20, 22, 24, 25 June, 2003. **Census:** Tree Swallow, 10.5 (38; 7N); Chipping Sparrow, 6.0 (22; 1N); Killdeer, 5.0 (18); Brown Thrasher, 5.0 (3N,1FL); Eastern Kingbird, 3.0 (11; 1N); Song Sparrow, 3.0; Northern Mockingbird, 2.5; Mourning Dove, 2.0; Warbling Vireo, 2.0 (1N); European Starling, 2.0 (1N); Common Grackle, 2.0 (2FL); House Wren, 1.0; Red-winged Blackbird, 1.0; Brown-headed Cowbird, 1.0; Yellow Warbler, 0.5, Common Yellowthroat, 0.5. **Total:** 16 species, 47.0 territories (171/40 ha). **Visitors:** Spotted Sandpiper, Yellow-billed Cuckoo, Ruby-throated Hummingbird, Belted Kingfisher, Northern Flicker, Eastern Wood-Pewee, Great Crested Flycatcher, Red-eyed Vireo, American Robin, Field Sparrow, Savannah Sparrow, Bobolink, Baltimore Oriole, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observers:** Matt Timpf and John Brett. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

15. FIELD, RIDGE, SHRUBBY TREES, AND WOODS

CAMPOS, COLINAS, ARBUSTOS Y BOSQUES

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Location: Ontario; Municipality of Hamilton-Wentworth; Dundas; Dundas Valley Plot #1; 43°15'N, 79°54'W. **Continuity:** Established 1994; 10 yr. **Size:** 5.8 ha. **Description of Plot:** See *J. Field Ornithol.* 60(Suppl.):14 (1989), 66(Suppl.):27–28 (1995), and 67(Suppl.):73–74 (1996). **Weather:** Mean start temp., 18.1°C (range 11.5–24.0°C). Precipitation was 15% above the 30-year norm from April through June. May rainfall was 63% above the norm and June rainfall was 25% below. Temperatures averaged roughly 2° below the norm for all three months. Source: Environment Canada. **Coverage:** 12.7 h; 8 visits (0 sunrise, 3 sunset); 29 April; 10, 14, 22 May; 6, 13, 19, 24 June, 2003. **Census:** Yellow Warbler, 45.0 (310); Gray Catbird, 21.0 (145); Song Sparrow, 11.0 (76); Northern Cardinal, 8.0 (55); Blue-winged Warbler, 5.0 (34); Common Grackle, 5.0; Field Sparrow, 4.0 (28); Rose-breasted Grosbeak, 4.0; American Robin, 3.0 (21); Indigo Bunting, 3.0; American Goldfinch, 3.0; Northern Flicker, 2.0; Brown Thrasher, 2.0; Wood Thrush, 1.0; Brown-headed Cowbird, 1.0. **Total:** 15 species; 118.0 territories (814/40 ha). **Visitors:** Ruby-throated Hummingbird, Downy Woodpecker, Great Crested Flycatcher, Blue Jay, Black-capped Chickadee, Cedar Waxwing, Common Yellowthroat, Eastern Towhee, Orchard Oriole, Baltimore Oriole. **Remarks:** This revised plot's top three breeders (Yellow Warbler, Gray Catbird, Song Sparrow) accounted for 65% of all territorial males. May's abnormally high rainfall and below normal temperatures may have adversely affected breeding success. Ongoing vegetative succession was likely responsible for record numbers of breeding Common Grackles and Rose-breasted Grosbeaks, as well as the notable continuing decline or absence of several smaller species. The total of 118 breeding pairs was 10 pairs below the 10-yr average; the total of 15 breeding species (the lowest total to date) was 4 species below average.

16. SEDGE–TAMARACK DUNE POND

DUNA DE ESPARGANIO–LARICE AMERICANO

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 9.0 km W of Long Point Lighthouse; 42°32'54"N, 80º9'45"W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1978; 4 yr. **Size:** 10.0 ha. **Description of Plot:** See *Am. Birds* 33:103–104 (1979), *J. Field Ornithol.* 63(Suppl.):93–94 (1992) and 65(Suppl.):103 (1994). **Weather:** Mean start temp., 14.6°C (range 10–18°C). **Coverage:** 28.8 h; 8 visits (6 sunrise, 2 sunset); 2, 8, 11, 14, 16, 18, 21, 23 June, 2003. **Census:** Red-winged Blackbird, 31.0 (124; 14N,16FL); Yellow Warbler, 8.0 (32; 2N); Common Yellowthroat, 7.5 (30; 2N,2FL); Eastern Kingbird, 5.0 (20; 4N); Song Sparrow, 3.5 (14); Tree Swallow, 2.0;

Swamp Sparrow, 2.0; Baltimore Oriole, 2.0 (2N); Chipping Sparrow, 1.5 (1N); Mallard, 1.0 (3FL); Sora, 1.0; Eastern Wood-Pewee, 1.0; Cedar Waxwing, 1.0; Field Sparrow, 1.0 (1N); Whip-poor-will, +; Gray Catbird, +; Brown Thrasher, +. **Total:** 17 species, 67.5 territories (270/40 ha). **Visitors:** Wood Duck, Hooded Merganser, Pied-billed Grebe, Killdeer, Black Tern, Mourning Dove, Yellow-billed Cuckoo, Belted Kingfisher, Northern Flicker, Red-eyed Vireo, Black-capped Chickadee, House Wren, Marsh Wren, American Robin, European Starling, Eastern Towhee, Common Grackle, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

17. SHRUBBY SWAMP AND SEDGE HUMMOCKS

PANTANO ARBUSTIVO–MOGOTE

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Location: Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–North Shore Marsh; 41°43'N, 73°13'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 37 yr. **Size:** 8.1 ha. **Description of Plot:** See *Aud. Field Notes* 19:625–627 (1965) and Bird Populations 7:125–126 (2006). Habitat succession continued in spite of persistent, and sometimes severe flooding. Red maple and other sapling-sized trees withstood the flooding fairly well, as did most of the shrubs. Herbaceous vegetation, however, was adversely affected. Beavers have now girdled enough trees that there is an ample supply of snags to serve as homes for cavity nesters. **Weather:** Mean start temp., 21.5°C (range 13–30°C). During May, the weather was awful. Rain fell on all, or part of, 20 days, amounting to a total of 13.6 cm. This is 2.8 cm above normal. Temperatures were cooler than normal, with a mean of 12.4°C. Flooding was a problem. During June, there were 18 days with at least some rainfall. The total of 20 cm of rain was well above average. June's average mean temperature was 17.9°C, which is near normal. Flooding continued to be a problem through the 22nd, when it subsided. July had only 12 days with rain or showers. Total rainfall was 9.7 cm, which is less than normal. The average mean temperature was 20.7°C. **Coverage:** 25.5 h; 12 visits (1 sunrise, 3 sunset); 1, 9, 19, 27 May; 2, 9, 17, 23 June; 1, 8, 15, 25 July, 2003. Maximum number of observers/visit, 3. **Census:** Red-winged Blackbird, 33.0 (163; 7N,104FL); Yellow Warbler, 30.0 (148; 9N,72FL); Swamp Sparrow, 29.0 (143; 3N,74FL); Common Yellowthroat, 22.0 (109; 44FL); Gray Catbird, 20.0 (99; 6N,48FL); Common Grackle, 7.0 (35; 5N,18FL); Song Sparrow, 4.5 (22; 10FL); American Goldfinch, 4.0 (20; 9FL); Eastern Kingbird, 3.5 (17; 3N,14FL); Cedar Waxwing, 3.5 (1N,7FL); Black-capped Chickadee, 3.0 (15; 2N,14FL); Blue-gray Gnatcatcher, 3.0 (2N,5FL); Willow Flycatcher, 2.5 (1N,3FL); Tree Swallow, 2.5 (2N,13FL); Veery, 2.5 (7FL); American Robin, 2.5 (2N,11FL); Baltimore Oriole, 2.5 (2N,9FL); Great Crested Flycatcher, 2.0 (5FL); Warbling Vireo, 2.0 (1N,3FL); Northern Cardinal, 2.0 (5FL); Mallard, 1.5 (9FL); Alder Flycatcher, 1.5 (4FL); Least Flycatcher, 1.5 (2FL); Chestnut-sided Warbler, 1.5 (2FL); Black-and-white Warbler, 1.5 (6FL); Downy Woodpecker, 1.0 (3FL); Northern Flicker, 1.0 (2FL); Yellow-throated Vireo, 1.0; Tufted Titmouse, 1.0 (6FL); American Redstart, 1.0 (4FL); Brown-headed Cowbird, 1.0 (1FL); Canada Goose, 0.5; Mute Swan, 0.5; Wood Duck, 0.5 (7FL); Great Blue Heron, 0.5; Spotted Sandpiper, 0.5; Mourning Dove, 0.5; Hairy Woodpecker, 0.5; Eastern Wood-Pewee, 0.5; Red-eyed Vireo, 0.5; American Crow, 0.5 (3FL); White-breasted Nuthatch, 0.5 (2FL); Marsh Wren, 0.5; Northern Waterthrush, 0.5; Ruby-throated Hummingbird, +; Eastern Bluebird, +; Wood Thrush, +; Rose-breasted Grosbeak, +. **Total:** 48 species; 201.0 territories (993/40 ha). **Visitors:** American Woodcock, Yellow-billed Cuckoo, Yellow-bellied Sapsucker, Blue Jay, Canada Warbler. **Remarks:** Though ground nesters suffered some ill effects from spring flooding, shrub and tree nesters did just fine. The total of 48 species found breeding this year was a new record high. This has to be due to the increase in habitat diversity brought about by succession, and is a continuation of an upward trend that began in 1997. The number of species has increased every year since then. Despite the increase in species diversity, the total number of territories decreased to 201. This is still the second-highest number ever counted in this plot. The 1993–2002 average was 175 territories, with 220 tallied last year and 191 in 2001. Species suffering the biggest declines were mostly ground nesters, which were the victims of frequent floods in May and June. Red-winged Blackbird remained the most abundant species, but declined by 5.0 territories from last year. Yellow Warbler declined by only 1.0 territory, but became the second most common species here because Swamp Sparrow declined by 6.0 territories. Common Yellowthroat increased by 1.0 territory. Gray Catbird increased by 4.0 territories. **Other Observers:** Eric Adam, John Eykelhoff, Rich Kania, Carolyn Kurtich, Ed Yescott, Janet Amalavage, and Lorraine Amalavage. **Acknowledgments:** Marie Kennedy helped compile these data.

18. COASTAL SCRUB
MATORRAL COSTANERO

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°45'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1971; 29 yr. **Size:** 8.1 ha. **Description of Plot:** See *Am. Birds* 25:1003–1004 (1971). The cover of Douglas-fir (Pseudotsuga menziesii) and shrubs continues to increase. **Weather:** Mean start temp., 9.5°C (range 4–19°C). **Coverage:** 268.7 h; 84 visits (43 sunrise, 0 sunset), 2003. **Census:** Wrentit, 11.5 (57; 11N,21FL); Spotted Towhee, 7.0 (35; 4N); Bewick's Wren, 5.0 (25); Orange-crowned Warbler, 4.5 (22); Wilson's Warbler, 4.5; Allen's Hummingbird, 3.0 (15); Hutton's Vireo, 3.0; Anna's Hummingbird, 2.5 (3N,2FL); Chestnut-backed Chickadee, 2.5; White-crowned Sparrow, 2.5; Purple Finch, 2.5; California Quail, 2.0; Northern Flicker, 2.0; Bushtit, 2.0; Song Sparrow, 2.0 (3N,3FL); Band-tailed Pigeon, 1.0 (1N); Mourning Dove, 1.0; Olive-sided Flycatcher, 1.0; Pacific-slope Flycatcher, 0.5; Western Scrub-Jay, 0.5; Golden-crowned Kinglet, 0.5; Red-tailed Hawk, +; Steller's Jay, +; Swainson's Thrush, +; American Robin, +; California Towhee, +; Dark-eyed Junco, +. **Total:** 27 species; 61.0 territories (301/40 ha). **Visitors:** None reported. **Remarks:** Overall territory density increased 27% from 2002. This is the first year that Olive-sided Flycatcher, Band-tailed Pigeon, and Pacific-slope Flycatcher were recorded. Species with notable increases include Wrentit (from 8.0 to 11.5 territories) and Hutton's Vireo (from + to 3.0). The increase in cover is likely responsible for some changes in bird numbers and community composition. **Other Observers:** Dennis Jongsomjit, Tom Gardali, Grant Ballard, and Alex Rosenthal. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1599.

19. DISTURBED COASTAL SCRUB A
MATORRAL PERTURBADO A

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°45'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1972; 29 yr. **Size:** 4.7 ha. **Description of Plot:** See *Am. Birds* 26:987–988 (1972). **Weather:** Mean start temp., 9.5°C (range 4–19°C). **Coverage:** 164.6 h; 65 visits (19 sunrise, 0 sunset), 2003. **Census:** Wrentit, 7.5 (64; 5N,5FL); American Goldfinch, 4.0 (34; 2N); California Quail, 3.0 (26); Orange-crowned Warbler, 3.0; Spotted Towhee, 3.0 (3N); Song Sparrow, 3.0 (4N,10FL); Purple Finch, 3.0; Wilson's Warbler, 2.0; Allen's Hummingbird, 1.5; Bushtit, 1.5 (1N); Bewick's Wren, 1.5; Mourning Dove, 1.0; Anna's Hummingbird, 1.0; Western Scrub-Jay, 1.0; American Robin, 1.0; Brown-headed Cowbird, 1.0; Northern Flicker, 0.5 (1N,2FL); Olive-sided Flycatcher, 0.5; Hutton's Vireo, 0.5; Chestnut-backed Chickadee, 0.5; Swainson's Thrush, 0.5; California Towhee, 0.5; White-crowned Sparrow, 0.5; Dark-eyed Junco, 0.5; Red-tailed Hawk, +; Band-tailed Pigeon, +; Pacific-slope Flycatcher, +; Steller's Jay, +; Black-headed Grosbeak, +. **Total:** 29 species; 42.0 territories (357/40 ha). **Visitors:** None reported. **Remarks:** Cover of trees (firs) and shrubs continues to increase. Overall territory density increased from 2002. This is the first year that Olive-sided Flycatcher and Dark-eyed Junco bred on the plot. Species with notable increases in density from last year include American Goldfinch (from 1.0 to 4.0 territories) and Wrentit (4.5 to 7.5). **Other Observers:** Tom Gardali, Dennis Jongsomjit, Geoff Geupel, and Geetha Jayabose. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1600.

20. DISTURBED COASTAL SCRUB B
MATORRAL PERTURBADO B

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°46'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1971; 29 yr. **Size:** 8.1 ha. **Description of Plot:** See *Am. Birds* 25:1002 (1971) and *J. Field Ornithol.* 66(Suppl.):104 (1995). **Weather:** Mean start temp., 9.5°C (range 4–19°C). **Coverage:** 401.5 h; 119 visits (41 sunrise, 2 sunset), 2003. **Census:** Song Sparrow, 12.5 (62; 14N,13FL); Wrentit, 10.0 (49; 9N,23FL); American Goldfinch, 7.0 (35; 3N); Swainson's Thrush, 5.0 (25); Wilson's Warbler, 5.0; Spotted Towhee, 5.0; Orange-crowned Warbler, 3.5 (17); Purple Finch, 3.5; Anna's Hummingbird, 3.0 (15); Bewick's Wren, 2.5 (1N); Golden-crowned Kinglet, 2.5; Chestnut-backed Chickadee, 2.0; Western Scrub-Jay, 1.5; American Robin, 1.5; Brown-headed Cowbird, 1.5; Mourning Dove, 1.0 (1N); Allen's Hummingbird, 1.0 (1N); Northern Flicker, 1.0; Hutton's Vireo, 1.0; California Towhee, 0.5; White-crowned Sparrow, 0.5; Red-tailed Hawk, +; Bushtit, +; Winter Wren, +; House Finch, +. **Total:** 25 species; 71.0 territories (351/40 ha). **Visitors:** None reported. **Remarks:** Cover of trees (firs) and shrubs continues to increase. Overall territory density increased slightly (15%) from 2002. Species with notable increases in density from

last year include Wilson's Warbler (from 2.0 to 5.0 territories) and Spotted Towhee (2.5 to 5.0). This is the first year that Golden-crowned Kinglet was recorded breeding on the plot. **Other Observers:** Dennis Jongsomjit, Tom Gardali, Geoff Geupel, and Amanda Shults. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1601.

21. BLUEGRASS–MILKWEED GRASSLAND

YERBASAL DE "YERBA-AZUL"

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°32'48"N, 80°9'45"W; Little Creek Ridges Quadrangle, DEMR. **Continuity:** Established 1973; 5 yr. **Size:** 10.5 ha. **Description of Plot:** See *Am. Birds* 27:1013 (1973), *J. Field Ornithol.* 63(Suppl.):107–108 (1992) and 67(Suppl.):87–88 (1996). **Weather:** Mean start temp., 15°C (range 10–19°C). **Coverage:** 28.0 h; 8 visits (6 sunrise, 2 sunset); 2, 11, 14, 16, 18, 21, 23, 26 June, 2003. **Census:** Field Sparrow, 6.0 (23; 2FL); Common Yellowthroat, 4.0 (15); Red-winged Blackbird, 4.0 (1N); Killdeer, 3.0 (11; 1N); Eastern Kingbird, 3.0 (1N); Northern Rough-winged Swallow, 3.0 (3N); Chipping Sparrow, 3.0; Song Sparrow, 3.0; Mourning Dove, 2.0 (1N); Tree Swallow, 2.0; Bank Swallow, 2.0 (1N); Northern Mockingbird, 2.0; Yellow Warbler, 2.0; Baltimore Oriole, 1.5; Northern Flicker, 1.0; European Starling, 1.0 (1N,4FL). **Total:** 16 species, 42.5 territories (162/40 ha). **Visitors:** Yellow-billed Cuckoo, Belted Kingfisher, American Robin, Brown Thrasher, Common Grackle, Brown-headed Cowbird, American Goldfinch. **Remarks:** This plot was formerly called Bluegrass Grassland. This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** Thanks to Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

Bird Populations 8:136-148

BREEDING BIRD CENSUS: 2004

1. MIXED HARDWOOD POLETIMBER
BOSQUE MIXTO MADERERO

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Site Number: CT1265009. **Location:** Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–Wheeler Hill; 41°42'N, 73°13'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 38 yr. **Size:** 8.5 ha. **Description of Plot:** See *Aud. Field Notes* 19:609–610 (1965), *J. Field Ornithol.* 64(Suppl.):36 (1993), and 2003 report (this volume). Succession is continuing, including the area that was logged last year. Non-native, invasive species of vines, shrubs, and herbaceous plants are continuing to take over despite limited control efforts. White-tailed deer grazing is doing significant damage to the ground cover and some damage to native shrub cover. **Weather:** Mean start temp., 19.3°C (range 11–25°C). This year's weather was ideal for breeding activity. The only exceptions were a few cold nights in May. Overall, temperatures were below average from May through August. May's mean temperature was 15.9°C, June's was 17.7°C, and July's was 20.8°C. No days exceeded 32.2°C. Rain fell on 19 days in May with precipitation totaling 11.2 cm (about normal). During June, there were 12 days with rainfall totaling 5.7 cm (5 cm below average). Most of June's rainfalls were light, not exceeding 1.3 cm each. During July, there were 14 wet days with total precipitation amounting to 11.9 cm (1 cm below average). The only significant rainstorm in July (on the 28th) produced 3 cm of rain. **Coverage:** 19.5 h; 10 visits (1 sunrise, 6 sunset); 4, 11, 20, 27 May; 4, 12, 21, 29 June; 10, 19 July; 2004. Maximum number of observers/visit, 3. **Census:** Red-eyed Vireo, 16.5 (78; 1N,22FL); Veery, 13.5 (64; 23FL); Ovenbird, 13.0 (61; 1N,22FL); Gray Catbird, 12.0 (56; 5N,30FL); American Redstart, 9.0 (42; 5N,24FL); Eastern Towhee, 7.5 (35; 18FL); Wood Thrush, 6.5 (31; 2N,13FL); American Robin, 5.0 (24; 2N,14FL); Common Yellowthroat, 5.0 (10FL); Black-capped Chickadee, 4.0 (19; 1N,19FL); Chestnut-sided Warbler, 4.0 (1N,6FL); Scarlet Tanager, 4.0 (1N,7FL); Tufted Titmouse, 3.0 (14; 1N,14FL); Yellow Warbler, 3.0 (2N,8FL); Black-and-white Warbler, 3.0 (9FL); Northern Cardinal, 3.0 (3N,9FL); American Crow, 2.0 (2N,8FL); Baltimore Oriole, 2.0 (1N,4FL); Wild Turkey, 1.5 (6FL); Mourning Dove, 1.5 (1N,3FL); Downy Woodpecker, 1.5 (4FL); Blue Jay, 1.5 (1N,6FL); Song Sparrow, 1.5 (3FL); Red-bellied Woodpecker, 1.0 (2FL); Great Crested Flycatcher, 1.0; Warbling Vireo, 1.0 (2FL); White-breasted Nuthatch, 1.0 (3FL); Cedar Waxwing, 1.0; Blue-winged Warbler, 1.0 (3FL); Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0; House Finch, 1.0 (1N,4FL); American Goldfinch, 1.0; Red-tailed Hawk, 0.5; Barred Owl, 0.5 (1N,2FL); Northern Flicker, 0.5; Eastern Wood-Pewee, 0.5; House Wren, 0.5 (5FL); Golden-crowned Kinglet, 0.5; Blue-gray Gnatcatcher, 0.5; Magnolia Warbler, 0.5; Black-throated Green Warbler, 0.5; Eastern Phoebe, +; Eastern Kingbird, +; Yellow-throated Vireo, +; Carolina Wren, +; Purple Finch, +. **Total:** 47 species; 138.0 territories (649/40 ha). **Visitors:** Hairy Woodpecker, Pileated Woodpecker, Fish Crow, Black-throated Blue Warbler. **Remarks:** The number of species breeding in the plot decreased to 47 (from 50 in 2003 and 2002 and 49 in 2001 and 2000). This is equal to the 1994–2003 average. The species composition was similar to previous years except for the loss of Cooper's Hawk, Broad-winged Hawk, Chipping Sparrow, and Common Grackle; all were found last year. New species found were Carolina Wren and Golden-crowned Kinglet. The kinglet had never before shown breeding evidence. The number of territories in the plot increased to 138.0, the second highest total ever recorded; the record was 139.5 in 2002. The number of territories increased by 16 from 2003, with the total being 34 more than the 10-yr average of 104. Species that increased by one or more territories over last year included Red-eyed Vireo (+ 4.0), Veery (+ 3.0), Ovenbird (+ 1.0), Gray Catbird (+ 1.0), American Redstart (+ 4.0), American Robin (+ 1.0), Chestnut-sided Warbler (+ 1.0), Yellow Warbler (+ 1.0), and Baltimore Oriole (+ 1.5). The only species that declined dramatically this year was Eastern Towhee (– 1.5). Red-eyed Vireo remained the most abundant species, but Veery moved into the number two spot this year. **Other Observers:** Eric Adam, John Eykelhoff, John Grabowski, Richard Kania, Marie Kennedy, and Pamela Velez. **Acknowledgments:** Marie Kennedy was instrumental in helping to compile our Breeding Bird Census data this year.

2. SECOND-GROWTH HARDWOOD FOREST
BOSQUE SECUNDARIO DE MADERAS DURAS

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Site Number: CT2765006. **Location:** Connecticut; Litchfield Co.; Morris; White Memorial Foundation–Van Winkle Road; 41°42'N, 73°12'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 38 yr. **Size:** 10.1 ha. **Description of Plot:** See *Aud. Field Notes* 19:590–591 (1965), *J. Field Ornithol.* 64(Suppl.):37–38 (1993), and 2003 report (this volume). **Weather:** Mean start temp., 19.3°C (range 14–26°C). This year's weather was ideal for breeding activity. The only exceptions were a few cold nights in May. Overall, temperatures were below average from May through August. May's mean temperature was 15.9°C, June's was 17.7°C, and July's was 20.8°C. Rain fell on 19 days in May with precipitation totaling 11.2 cm (about average). During June, there were 10 days with rainfall totaling only 5.7 cm (5 cm below average). During July, there were 14 days with precipitation that amounted to a total of 11.9 cm (1 cm below average). **Coverage:** 17.5 h; 10 visits (1 sunrise, 5 sunset); 6, 15, 22, 29 May; 10, 21 June; 2, 9, 19, 30 July; 2004. Maximum number of observers/visit, 3. **Census:** Red-eyed Vireo, 13.5 (53; 6FL); Veery, 12.0 (48; 12FL); Ovenbird, 11.5 (46; 13FL); Yellow-bellied Sapsucker, 3.5 (14; 1N,10FL); Black-capped Chickadee, 3.0 (12; 16FL); Tufted Titmouse, 3.0 (1N,11FL); Wood Thrush, 3.0; American Robin, 3.0 (1N,6FL); Scarlet Tanager, 3.0 (4FL); Red-bellied Woodpecker, 2.0 (2N,7FL); American Redstart, 2.0 (3FL); Downy Woodpecker, 1.5 (5FL); Eastern Wood-Pewee, 1.5 (2FL); American Crow, 1.5 (1N,7FL); Gray Catbird, 1.5 (2FL); Wild Turkey, 1.0 (6FL); Red-tailed Hawk, 1.0 (1N,2FL); Great Crested Flycatcher, 1.0; Blue Jay, 1.0 (1N,4FL); White-breasted Nuthatch, 1.0 (4FL); Black-and-white Warbler, 1.0 (3FL); Common Yellowthroat, 1.0; Chipping Sparrow, 1.0 (3FL); Northern Cardinal, 1.0 (2FL); Mourning Dove, 0.5; Eastern Phoebe, 0.5; Blue-gray Gnatcatcher, 0.5; Cedar Waxwing, 0.5; Pine Warbler, 0.5; Eastern Towhee, 0.5; Broad-winged Hawk, +; Barred Owl, +; Hairy Woodpecker, +; Northern Flicker, +; Eastern Kingbird, +; Yellow-throated Vireo, +; Chestnut-sided Warbler, +; Louisiana Waterthrush, +; Rose-breasted Grosbeak, +; Brown-headed Cowbird, +; Baltimore Oriole, +; American Goldfinch, +. **Total:** 42 species; 77.5 territories (307/40 ha). **Visitors:** None. **Remarks:** The number of breeding species (42) was similar to last year (41) and is only one less than the 10-yr average. Species found this year but not last year included Red-tailed Hawk, Northern Flicker, and Pine Warbler. The latter two species were visitors last year. Species found last year but not this year included Ruby-throated Hummingbird and Brown Creeper. The total number of territorial males crashed for no obvious reason. Only 77.5 were counted, compared to 99.5 last year, 99.0 in 2002, and 100.0 in 2001. The previous 10-yr average was 99.0 territories. Red-eyed Vireo remained the most abundant species and only declined by 1.5 territories from last year. Veery was the second most numerous species, declining by only 0.5 territories from last year. Ovenbird dropped to third place with a decrease of 2.0 territories from last year. Wood Thrush, American Robin, and American Redstart also declined. **Other Observers:** Eric Adam, John Eykelhoff, Marie Kennedy, Pamela Velez, Edward Yescott, James Zingo, and Amy Zingo. **Acknowledgments:** Marie Kennedy was instrumental in helping to compile our Breeding Bird Census data this year.

3. MIXED UPLAND BROADLEAF FOREST
BOSQUE MIXTO DE HOJA ANCHA DE ALTURAS

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Washington DC 20016

Site Number: DC1060009. **Location:** District of Columbia; Washington; Glover-Archbold Park; 38°55'N, 77°5'W; Washington West Quadrangle, USGS. **Continuity:** Established 1959; 46 yr. **Size:** 14.2 ha. **Description of Plot:** See *Aud. Field Notes* 14:502–503 (1960). **Weather:** Mean start temp., 13.8°C (range 7–21°C). Six days were clear, one was partly cloudy, and nine were cloudy. **Coverage:** 32.0 h; 16 visits (16 sunrise); 28 March; 3, 7, 9, 17, 24 April; 1, 8, 14, 18, 22, 31 May; 4, 13, 19, 27 June; 2004. **Census:** Carolina Wren, 17.0 (48; 11FL); Northern Cardinal, 11.0 (31; 4FL); Red-bellied Woodpecker, 9.0 (25); Gray Catbird, 8.0 (23; 2FL); Red-eyed Vireo, 6.0 (17); White-breasted Nuthatch, 6.0; Veery, 6.0; Downy Woodpecker, 5.0 (14; 9FL); Northern Flicker, 3.0 (8); Acadian Flycatcher, 3.0; American Crow, 3.0; Eastern Towhee, 3.0; Hairy Woodpecker, 2.0; Blue-gray Gnatcatcher, 2.0 (1FL); House Sparrow, 2.0; Chimney Swift, 1.0; Pileated Woodpecker, 1.0; Eastern Wood-Pewee, 1.0; Great Crested Flycatcher, 1.0; House Wren, 1.0; Wood Thrush, 1.0; Song Sparrow, 1.0; Common Grackle, 1.0; Mourning Dove, +; American Robin, +; European Starling, +. **Total:** 26 species; 94.0 territories (265/40 ha). **Visitors:** Mallard, Red-shouldered Hawk, Yellow-billed Cuckoo, Eastern Phoebe, White-eyed Vireo, Blue Jay, Carolina Chickadee, Tufted Titmouse, Northern Mockingbird, Brown-headed Cowbird, House Finch. **Remarks:** The periodical cicadas provided an unusual food source for birds and small mammals this year. Still, even fewer birds were seen on average than last year or previous years. There were few crows, and almost no jays, titmice, or chickadees. The Red-shouldered Hawks nested further north, near the community gardens. There were fewer territories for most species.

4. MATURE BROADLEAF FOREST
BOSQUE DE HOJA ANCHA MADURA

CHARLES W. SAUNDERS* & STEVE PELIKAN
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Fairfield OH 45014

Site Number: OH1591043. **Location:** Ohio; Hamilton Co.; Hooven; Miami Whitewater Forest; 39°14'42"N, 84°45'38"W; Hooven Quadrangle, USGS. **Continuity:** Established 1991; 10 yr. **Size:** 16.0 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl.):52 (1992) and 65(Suppl.):59 (1994). **Weather:** Mean start temp., 17.9°C (range 14–22°C). **Coverage:** 25.2 h; 10 visits (10 sunrise); 29, 30 May; 5, 6, 12, 13, 19, 20, 27 June; 10 July; 2004. **Census:** Wood Thrush, 16.0 (40; 3FL); Red-eyed Vireo, 12.5 (31); Acadian Flycatcher, 6.5 (16; 1N); Northern Cardinal, 5.5 (14; 2FL); Red-bellied Woodpecker, 5.0 (13); Brown-headed Cowbird, 5.0 (5FL); Tufted Titmouse, 4.5 (11); White-breasted Nuthatch, 4.5; Blue Jay, 4.0 (10); Scarlet Tanager, 4.0; American Robin, 3.5 (9; 6FL); Downy Woodpecker, 3.0 (8); Eastern Wood-Pewee, 3.0; Carolina Chickadee, 2.5; Yellow-throated Vireo, 2.0; Great Crested Flycatcher, 1.5; Carolina Wren, 1.5; Broad-winged Hawk, 1.0; Yellow-billed Cuckoo, 1.0; Hairy Woodpecker, 1.0; Northern Flicker, 1.0; Pileated Woodpecker, 1.0; Ovenbird, 1.0; Louisiana Waterthrush, 1.0; Kentucky Warbler, 1.0; Cooper's Hawk, 0.5; Red-tailed Hawk, 0.5; Ruby-throated Hummingbird, 0.5; Eastern Phoebe, 0.5. **Total:** 29 species; 94.5 territories (236/40 ha). **Visitors:** Wild Turkey, Barred Owl, Blue-gray Gnatcatcher, Hooded Warbler, Summer Tanager, Common Grackle, American Goldfinch. **Remarks:** The total number of territorial males was up from 88.0 in 2003, and within one standard deviation of the mean number from the eight censuses from 1991–98 (97 ± 2.6). This year, two species (Red-eyed Vireo and Brown-headed Cowbird) were present in numbers greater than one standard deviation above their mean from 1991–98. In contrast, six species (Hairy Woodpecker, Eastern Wood-Pewee, Tufted Titmouse, Hooded Warbler, Scarlet Tanager, and Rose-breasted Grosbeak) declined more than one standard deviation from their 1991–98 mean. Of particular concern are Hooded Warbler and Rose-breasted Grosbeak, both absent as breeding species in 2004, compared to 3.3 ± 1.2 and 2.4 ± 1.1 territorial males, respectively, from 1991–98. **Acknowledgments:** We thank John Klein and the Hamilton County Park District for the use of the land.

5. RED OAK–SUGAR MAPLE FOREST
BOSQUE DE ROBLE ROJO–ARCE DULCE

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 15.3 km W of Long Point Lighthouse; 42°33'45"N, 80°14'30"W; Little Creek Ridges Quadrangle; DEMR. **Continuity:** Established 1973; 7 yr. **Size:** 11.0 ha. **Description of Plot:** See *Am. Birds* 27:967 (1973), *J. Field Ornithol.* 63(Suppl.):57–58 (1992) and 66(Suppl.):50–51 (1995). **Weather:** Mean start temp., 16.7ºC (range 10–27ºC). **Coverage:** 38.2 h; 10 visits (9 sunrise, 1 sunset); 3, 7, 13, 16, 20, 23, 26, 28, 30 June; 1 July; 2004. **Census:** House Wren, 24.5 (89; 1N,4FL); Tree Swallow, 17.0 (62; 11N,12FL); Common Yellowthroat, 14.5 (53); Eastern Wood-Pewee, 12.0 (44); Baltimore Oriole, 12.0 (5N,4FL); Song Sparrow, 9.0 (33; 3FL); Gray Catbird, 8.0 (29; 5FL); Indigo Bunting, 8.0; Red-winged Blackbird, 6.5 (24; 3FL); Eastern Kingbird, 6.0 (22); European Starling, 5.5 (20; 1N,3FL); Yellow Warbler, 5.5; Red-eyed Vireo, 4.5 (16); Mourning Dove, 4.0 (14); Northern Flicker, 4.0 (1N); Brown-headed Cowbird, 4.0; Great Crested Flycatcher, 3.5 (13); Red-bellied Woodpecker, 3.0 (11; 1N,1FL); Downy Woodpecker, 3.0 (1N,2FL); Warbling Vireo, 3.0; Eastern Towhee, 3.0; Common Grackle, 3.0 (1N,3FL); Whip-poor-will, 2.5; American Robin, 2.5 (2FL); Yellow-billed Cuckoo, 2.0; Blue Jay, 2.0 (1FL); Black-capped Chickadee, 2.0 (1FL); White-breasted Nuthatch, 2.0; American Redstart, 2.0; Northern Cardinal, 2.0; Rose-breasted Grosbeak, 2.0; Field Sparrow, 1.5; American Woodcock, 1.0 (1FL); Black-billed Cuckoo, 1.0; Hairy Woodpecker, 1.0; Blue-gray Gnatcatcher, 1.0; Scarlet Tanager, 1.0; Red-tailed Hawk, 0.5; Swamp Sparrow, +. **Total:** 39 species; 189.5 territories (689/40 ha). **Visitors:** Wood Duck, Bald Eagle, Great Horned Owl, Ruby-throated Hummingbird, Belted Kingfisher, Wood Thrush, Brown Thrasher, Cedar Waxwing, Worm-eating Warbler, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, Stu Mackenzie for field assistance, and the Canadian Wildlife Service for financial support.

6. RED OAK–SUGAR MAPLE SAVANNAH
SAVANA DE ROBLE ROJO–ARCE DULCE

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Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 16.7 km from Long Point Lighthouse; 42°33'40"N, 80°15'W; Big Rice Bay Quadrangle, DEMR. **Continuity:** Established 1979; 5 yr. **Size:** 10.5

ha. **Description of Plot:** See *Am. Birds* 34:51 (1980), *J. Field Ornithol.* 63(Suppl.):58–59 (1992) and 66(Suppl.):51–52 (1995). **Weather:** Mean start temp., 15.2°C (range 10–20°C). **Coverage:** 44.8 h; 10 visits (9 sunrise, 1 sunset); 1, 5, 12, 17, 21, 24, 27, 29 June; 1 July; 2004. **Census:** House Wren, 18.5 (70; 1N,5FL); Common Yellowthroat, 14.0 (53; 1N); Tree Swallow, 12.0 (46; 3N,10FL); Yellow Warbler, 12.0 (1N); Song Sparrow, 11.5 (44; 5FL); Eastern Wood-Pewee, 10.5 (40; 1N); Red-winged Blackbird, 10.0 (38; 2FL); Baltimore Oriole, 9.0 (34; 5N,5FL); Gray Catbird, 8.0 (30; 1N,3FL); Eastern Kingbird, 7.0 (27); Warbling Vireo, 7.0 (1FL); Indigo Bunting, 6.0 (23); European Starling, 5.0 (19; 2N,2FL); American Robin, 4.0 (15; 1FL); Field Sparrow, 4.0 (1FL); Blue Jay, 3.5 (13); Black-capped Chickadee, 3.5 (3FL); Northern Flicker, 3.0 (11; 1FL); Great Crested Flycatcher, 3.0; Red-eyed Vireo, 3.0 (1FL); White-breasted Nuthatch, 3.0; Common Grackle, 3.0 (1FL); Red-bellied Woodpecker, 2.0; Eastern Towhee, 2.0; Northern Cardinal, 2.0 (1N); Brown-headed Cowbird, 2.0; Downy Woodpecker, 1.5 (1N,1FL); Yellow-billed Cuckoo, 1.0; Ruby-throated Hummingbird, 1.0; Hairy Woodpecker, 1.0 (1FL); Blue-gray Gnatcatcher, 1.0; Chestnut-sided Warbler, 1.0. **Total:** 32 species, 175.0 territories (667/40 ha). **Visitors:** Wood Duck, Great Blue Heron, Bald Eagle, Red-tailed Hawk, American Woodcock, Mourning Dove, White-eyed Vireo, Eastern Bluebird, Brown Thrasher, Cedar Waxwing, Scarlet Tanager, Chipping Sparrow, Swamp Sparrow, Rose-breasted Grosbeak, American Goldfinch. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observer:** Stu Mackenzie. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, Stu Mackenzie for field assistance, and the Canadian Wildlife Service for financial support.

7. OAK–MAPLE–POPLAR HOLLOW

BOSQUE DE ROBLE–ARCE–ALAMO HUECO

LINDA INGRAM
Nolde Forest Environmental Education Center
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Reading PA 19607

Site Number: PA1093123. **Location:** Pennsylvania; Berks Co.; Reading; Nolde Forest, Buck Hollow; 40°17'N, 75°57'W; Reading Quadrangle, USGS. **Continuity:** Established 1993; 12 yr. **Size:** 11.3 ha. **Description of Plot:** See *J. Field Ornithol.* 65(Suppl.):61 (1994). **Weather:** Mean start temp., 15.6°C (range 8–25°C). Grounds were damp with winds calm to light. May 2004 received near normal precipitation, however observers avoided days with heavy rain. Normal May temperatures: mean 16.7°C, minimum 11.1°C, maximum 22.2°C. **Source:** National Climatic Data Center, Asheville, NC (2000). **Coverage:** 16.5 h; 9 visits (9 sunrise, 0 sunset); 1, 5, 9, 10, 11, 12, 16, 20, 25 May; 2004. **Census:** Wood Thrush, 5.0 (18); Ovenbird, 5.0; Red-eyed Vireo, 3.0 (11); Veery, 2.5; Northern Cardinal, 2.5; Red-bellied Woodpecker, 1.0; Pileated Woodpecker, 1.0; Blue Jay, 1.0; American Crow, 1.0; Tufted Titmouse, 1.0; Scarlet Tanager, 1.0. **Total:** 11 species; 24.0 territories (85/40 ha). **Visitors:** Mourning Dove, Downy Woodpecker, Northern Flicker, Eastern Wood-Pewee, Great Crested Flycatcher, White-breasted Nuthatch, American Robin, Gray Catbird, Chipping Sparrow, Rose-breasted Grosbeak, American Goldfinch. **Other Observers:** Lynn Scheirer, Patricia Mangas, Phyllis Reynolds, and David Reynolds.

8. HARDWOOD SWAMP FOREST

BOSQUE DE MADERAS DURAS PANTANOSO

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Francis Beidler Forest
336 Sanctuary Road
Harleyville SC 29448

Location: South Carolina; Dorchester Co.; Harleyville; Francis Beidler Forest Sanctuary, Four Holes Swamp; 33°11'N, 80°19'W; Pringletown Quadrangle, USGS. **Continuity:** Established 1979; 13 yr. **Size:** 8.1 ha. **Description of Plot:** See *Am. Birds* 34:50 (1980) and *J. Field Ornithol.* 64 (Suppl.):56 (1993). The plot is still recovering from the effects of hurricane Hugo in 1989. Post-hurricane profusion of bushes is thinning as the understory trees grow up and shade the forest floor. Coarse woody debris is rotting away, further opening up the forest floor. The plot vegetation was resurveyed in 1996 (unpublished). **Weather:** Mean start temp., 15.6°C (range 7–20°C). Temperatures were normal. Water levels were very low due to a springtime dry spell. **Coverage:** 14.7 h; 11 visits (11 sunrise); 30 April; 1, 5, 6, 7, 11, 15, 19, 23, 27(2) May; 2004. **Census:** Blue-gray Gnatcatcher, 29.0 (143); Northern Parula, 10.5 (52); Red-eyed Vireo, 8.0 (40); Tufted Titmouse, 7.0 (35); Prothonotary Warbler, 6.0 (30); Acadian Flycatcher, 5.0 (25); Great Crested Flycatcher, 5.0; Northern Cardinal, 3.0 (15); Yellow-billed Cuckoo, 2.5; White-eyed Vireo, 2.5; Red-bellied Woodpecker, 2.0; Carolina Wren, 2.0; Pileated Woodpecker, 1.5; Swainson's Warbler, 1.5; Hooded Warbler, 1.5; Yellow-throated Vireo, 1.0; American Crow, 1.0. **Total:** 17 species; 89.0 territories (440/40 ha). **Visitors:** Great Blue Heron, Yellow-crowned Night-Heron, White Ibis, Downy Woodpecker, Yellow-throated Warbler. **Other Observer:** Norman Brunswig.

9. MATURE MAPLE–BEECH–BIRCH FOREST

BOSQUE MADURO DE ARCE–HAYA–ABEDUL

DAVID F. VOGT & LAURA M. LEWIS*
**Cherokee National Forest*
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Cleveland TN 37312

Site Number: TN2392102. **Location:** Tennessee; Monroe Co.; Whigg Ridge, Cherokee National Forest; 35°19'N, 84°2'W; Big Junction Quadrangle, USGS. **Continuity:** Established 1992; 12 yr. **Size:** 10.2 ha. **Description of Plot:** See *J. Field Ornithol.* 64(Suppl.):57–58 (1993) and 66(Suppl.):63 (1995). **Weather:** Mean start temp., 18.0°C (range 14–21°C). The 2 July visit followed heavy rain; stream noise was considerable. **Coverage:** 19.8 h; 8 visits (6 sunrise, 2 sunset); 29 May; 11, 18, 19, 24 June; 2, 3, 9 July; 2004. **Census:** Veery, 13.5 (53); Blue-headed Vireo, 11.5 (45); Dark-eyed Junco, 10.0 (39; 3FL); Ovenbird, 9.5 (37); Black-throated Blue Warbler, 5.5 (22; 1FL); Blackburnian Warbler, 4.5 (18); Chestnut-sided Warbler, 1.5; Rose-breasted Grosbeak, 1.0; Ruffed Grouse, 0.5 (4FL). **Total:** 9 species; 57.5 territories (225/40 ha). **Visitors:** Barred Owl, Hairy Woodpecker, Red-eyed Vireo, Common Raven, Carolina Chickadee, Black-capped Chickadee, Tufted Titmouse, Red-breasted Nuthatch, Winter Wren, Cedar Waxwing. **Remarks:** Flyovers included Northern Bobwhite, Chimney Swift, American Crow, and American Goldfinch. Mammals sighted included red squirrel, wild boar, and black bear (in plot). **Acknowledgments:** Logistical and financial support provided by USDA Forest Service, Cherokee National Forest.

10. CLIMAX HEMLOCK–WHITE PINE FOREST WITH TRANSITION HARDWOODS

BOSQUE CLIMAX DE PICEA–PINO BLANCO EN TRANSICION A MADERAS DURAS

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P.O. Box 368
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Site Number: CT2765008. **Location:** Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–Catlin Woods; 41°43'N, 73°12'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 38 yr. **Size:** 10.5 ha. **Description of Plot:** See *Aud. Field Notes* 19:594–595 (1965), *J. Field Ornithol.* 67(Suppl.):60 (1996), and 2003 report (this volume). Succession is continuing in the areas where blow-downs have occurred in the past few years. These areas are thick with seedling and sapling eastern hemlocks, black birches, various other trees, and hobblebush. **Weather:** Mean start temp., 19.8°C (range 13–25°C). This year's weather was ideal for breeding activity, except for a few cold nights in May. Overall, temperatures were below average from May through August; May's mean temperature was 15.9°C, June's was 17.7°C, and July's was 20.8°C. No days exceeded 32.2°C. Rain fell on 19 days in May with precipitation totaling 11.2 cm (average); there were 10 days of rain totaling 5.7 cm during June (5 cm below normal); and 14 days of rain totaling 11.9 cm during July (1 cm below normal). The only significant rainstorm in July (on the 28th) produced 3 cm of rain. **Coverage:** 24.5 h; 12 visits (1 sunrise, 5 sunset); 1, 7, 14, 21, 29 May; 8, 15, 26 June; 6, 16, 24, 31 July; 2004. Maximum number of observers/visit, 3. **Census:** Black-throated Green Warbler, 16.0 (61; 3N,46FL); Ovenbird, 15.0 (57; 2N,19FL); Veery, 14.0 (53; 20FL); Blackburnian Warbler, 12.0 (46; 6FL); Red-eyed Vireo, 11.5 (44; 16FL); Hermit Thrush, 6.0 (23; 14FL); Scarlet Tanager, 5.0 (19; 8FL); Wood Thrush, 4.5 (17; 1N,13FL); Black-capped Chickadee, 3.5 (13; 1N,17FL); Pine Warbler, 3.0 (11; 3FL); Great Crested Flycatcher, 2.5 (5FL); Black-and-white Warbler, 2.5 (6FL); Eastern Wood-Pewee, 2.0 (4FL); Blue-headed Vireo, 2.0; American Crow, 2.0 (2N,8FL); American Robin, 2.0 (10FL); Purple Finch, 2.0 (5FL); Wild Turkey, 1.5 (10FL); Blue Jay, 1.5 (4FL); Red-breasted Nuthatch, 1.5 (3FL); Brown Creeper, 1.5; Yellow-rumped Warbler, 1.5 (5FL); Northern Cardinal, 1.5 (3FL); Pileated Woodpecker, 1.0 (2FL); Tufted Titmouse, 1.0 (5FL); White-breasted Nuthatch, 1.0 (1N,5FL); Brown-headed Cowbird, 1.0 (1FL); Broad-winged Hawk, 0.5; Mourning Dove, 0.5; Barred Owl, 0.5; Yellow-bellied Sapsucker, 0.5; Downy Woodpecker, 0.5; Hairy Woodpecker, 0.5 (2FL); Gray Catbird, 0.5 (3FL); Cedar Waxwing, 0.5; American Redstart, 0.5; Rose-breasted Grosbeak, 0.5; Great Horned Owl, +; Eastern Kingbird, +; Common Yellowthroat, +; Eastern Towhee, +; Chipping Sparrow, +; American Goldfinch, +. **Total:** 43 species; 123.5 territories (470/40 ha). **Visitors:** Blue-gray Gnatcatcher, Canada Warbler. **Remarks:** The total number of species found (43) was three more than last year, six fewer than 2002, and similar to the long-term average. No new species were found. Several species were found again after having been missed last year: Eastern Kingbird, Cedar Waxwing, and Eastern Towhee. Species found last year but missed this year included Ruby-throated Hummingbird and Louisiana Waterthrush. Despite an increase in the number of breeding species, the total number of territories decreased to 123.5. This is only one below the previous 10-yr average, but it is 13.0 fewer than last year. This was the third year of a decline following a record high number of territories, of 141.0, found in 2001. The six most abundant species this year were the same and in the same order of abundance as last year. This was despite the fact that all except Hermit Thrush declined by as much as 2.5 territories. **Other Observers:** John Eykelhoff, Lukas Hyder, Richard

Kania, Marie Kennedy, Russ Naylor, Hugh Schoelzel, Perry Stafford, Pamela Velez, Edward Yescott, James Zingo, and Amy Zingo. **Acknowledgments:** Marie Kennedy was instrumental in helping to compile our Breeding Bird Census data this year.

11. YOUNG MIXED HARDWOOD–CONIFER STAND

BOSQUE JOVEN–MIXTO DE MADERAS DURAS/RODAL DE CONIFEROS

DAVID ROSGEN
White Memorial Conservation Center
P.O. Box 368
Litchfield CT 06759

Site Number: CT2778262. **Location:** Connecticut; Litchfield Co.; Morris; White Memorial Foundation–Pitch Road; 41°42'N, 73°10'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1978; 27 yr. **Size:** 8.5 ha. **Description of Plot:** See *Am. Birds* 33:72 (1979). **Weather:** Mean start temp., 19.4°C (range 12–23°C). This year's weather was ideal for breeding activity, except for a few cold nights in May. Overall, temperatures were below average from May through August. May's mean temperature was 15.9°C, June's was 17.7°C, and July's was 20.8°C. No days exceeded 32.2°C. Rain fell on 19 days in May with precipitation totaling 11.2 cm (average); there were 10 days of rain totaling 5.7 cm in June (5 cm below normal); and 14 days of rain totaling 11.9 cm in July (1 cm below normal). The only significant rainstorm in July (on the 28th) produced 3 cm of rain. **Coverage:** 13.5 h; 8 visits (1 sunrise, 6 sunset); 13, 20, 28 May; 11, 22 June; 2, 15, 26 July; 2004. **Census:** Ovenbird, 11.0 (52; 14FL); Veery, 10.5 (49; 12FL); Red-eyed Vireo, 10.0 (47; 4FL); Wood Thrush, 5.0 (24; 2N,7FL); Scarlet Tanager, 3.5 (16; 5FL); Hermit Thrush, 3.0 (14; 2FL); Yellow-bellied Sapsucker, 2.5 (3FL); American Robin, 2.5 (5FL); Black-capped Chickadee, 2.0 (12FL); American Redstart, 2.0; Downy Woodpecker, 1.5 (5FL); Eastern Wood-Pewee, 1.5 (2FL); Tufted Titmouse, 1.5 (5FL); Gray Catbird, 1.5; Northern Cardinal, 1.5 (4FL); Blue Jay, 1.0 (4FL); Black-throated Blue Warbler, 1.0; Black-throated Green Warbler, 1.0; Black-and-white Warbler, 1.0; Louisiana Waterthrush, 1.0; Common Yellowthroat, 1.0; Rose-breasted Grosbeak, 1.0; Ruby-throated Hummingbird, 0.5; Northern Flicker, 0.5; Great Crested Flycatcher, 0.5; American Crow, 0.5; White-breasted Nuthatch, 0.5 (4FL); Blackburnian Warbler, 0.5; Eastern Towhee, 0.5; Brown-headed Cowbird, 0.5 (1FL); American Goldfinch, 0.5; Wild Turkey, +; Barred Owl, +; Red-bellied Woodpecker, +; Eastern Phoebe, +; Blue-gray Gnatcatcher, +; Cedar Waxwing, +; Canada Warbler, +; Chipping Sparrow, +; Baltimore Oriole, +. **Total:** 40 species; 71.0 territories (334/40 ha). **Visitors:** Mourning Dove, Pileated Woodpecker, Blue-headed Vireo, Pine Warbler. **Remarks:** The number of breeding species decreased to 40 (from 43 last year and 50 in 2002). The 1994–2003 average is 44.5 species. The continued harassment of wildlife by dirt bikers, ATV users, and partiers partly may be to blame. The only species found on territory this year but not last year were Canada Warbler and Chipping Sparrow. Species that were missed entirely included Broad-winged Hawk, Mourning Dove, and Chestnut-sided Warbler. The number of territorial males declined by 23 to 71, compared to last year, and is 21 birds fewer than the previous 10-yr average. This shows that something was really wrong. Species declining by more than 1.0 territory from last year included Red-eyed Vireo (– 2.0) and Hermit Thrush (– 1.5). A total of 29 species decreased in number of territories. The only species showing increases were Northern Flicker, Black-throated Green Warbler, and Rose-breasted Grosbeak. Ovenbird was the most common species, followed by Veery and Red-eyed Vireo. **Other Observers:** Lukas Hyder, Russ Naylor, and Ed Yescott. **Acknowledgments:** Marie Kennedy was instrumental in helping to compile our Breeding Bird Census data this year.

12. RIPARIAN WOODLAND

ARBOLADO RIVEREÑO

SCOTT R. ROBINSON
Bureau of Land Management
3815 N. Schreiber Way
Coeur d'Alene ID 83815

Location: Idaho; Kootenai Co.; Coeur d'Alene; Blackwell Island; 47°41'N, 116°48'W; Coeur d'Alene Quadrangle, USGS. **Continuity:** Established 1997; 8 yr. **Size:** 8.9 ha. **Description of Plot:** See 1997 BBC report (unpublished) and *Bird Populations* 7:106 (2006) and 7:123 (2006). This is the second year post construction of the day-use recreation site. **Weather:** Mean start temp., 9.7°C (range 6–14°C). The seven sunrise visits explain the lower starting temperatures than during the first five years of the census. No flooding this year. This year's mosquito hatch between 15 and 22 June was less than last year's hatch for the same time period. **Coverage:** 11.5 h; 7 visits (7 sunrise); 3, 11, 17 May; 1, 8, 15, 22 June; 2004. **Census:** American Robin, 6.5 (29); Mallard, 4.0 (18; 11FL); Tree Swallow, 4.0 (2N); Yellow Warbler, 4.0; Song Sparrow, 3.0 (13); Brown-headed Cowbird, 3.0; Spotted Sandpiper, 2.5 (3FL); European Starling, 2.0; Red-winged Blackbird, 2.0; Bullock's Oriole, 2.0; Canada Goose, 1.0; Calliope Hummingbird, 1.0; Hairy Woodpecker, 1.0; Northern Flicker, 1.0; Violet-green Swallow, 1.0 (1N); Black-capped Chickadee, 1.0; Gray Catbird, 1.0; Cedar Waxwing, 1.0; Common Yellowthroat, 1.0. **Total:** 19 species; 42.0 territories (189/40 ha). **Visitors:** California Quail, Great Blue Heron, Osprey, Killdeer, Ring-billed Gull, Mourning

Dove, Red-naped Sapsucker, Downy Woodpecker, Western Wood-Pewee, Warbling Vireo, Black-billed Magpie, American Crow, Common Raven, Barn Swallow, Pygmy Nuthatch, Yellow-rumped Warbler, American Redstart, Chipping Sparrow, Black-headed Grosbeak. **Remarks:** The second artificial nest box fell from a tree within the census plot. Swallows have continually occupied these nest boxes in place of Wood Ducks.

13. DRY COTTONWOOD–JUNIPER SAVANNAH
SAVANA DE ALAMO SECO–JUNIPERO

JANUS ETHELBERG
Bird Studies Canada
P.O. Box 160
Port Rowan ON N0E 1M0

Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°32'35"N, 80°6'30"W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1991; 4 yr. **Size:** 10.5 ha. **Description of Plot:** See *J. Field Ornithol.* 63(Suppl.):81 (1992) and 67(Suppl.):64–65 (1996). **Weather:** Mean start temp., 15°C (range 12–20°C). **Coverage:** 34.0 h; 8 visits (7 sunrise, 1 sunset); 3, 6, 7, 20, 22, 23, 28, 30 June; 2004. **Census:** Song Sparrow, 8.5 (32); Chipping Sparrow, 6.0 (23; 2N); Field Sparrow, 4.0 (15); Mourning Dove, 2.0 (2N); Eastern Kingbird, 2.0; Tree Swallow, 2.0 (2N); Red-winged Blackbird, 2.0; Yellow Warbler, 1.5; Eastern Towhee, 1.5; House Wren, 1.0; American Robin, 1.0; Northern Mockingbird, 1.0; Brown Thrasher, 1.0; Common Grackle, 1.0; House Finch, 1.0; **Total:** 15 species, 35.5 territories (135/40 ha). **Visitors:** Killdeer, Whip-poor-will, Black-capped Chickadee, Blue-gray Gnatcatcher, Eastern Bluebird, Gray Catbird, European Starling, Cedar Waxwing, Common Yellowthroat, Brown-headed Cowbird. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

14. INTERGRADING DUNE–SWALE SAVANNAH
SAVANA CON GRADIENTE DE DUNA A CIENAGA

JANUS ETHELBERG
Bird Studies Canada
P.O. Box 160
Port Rowan ON N0E 1M0

Location: Ontario; Municipality of Haldimand-Norfolk; Port Rowan; Long Point National Wildlife Area; 42°32'45"N, 80°4'0"W; Gravelly Bay Quadrangle, DEMR. **Continuity:** Established 1965; 8 yr. **Size:** 11.0 ha. **Description of Plot:** See *Aud. Field Notes* 19:630 (1965), *J. Field Ornithol.* 63(Suppl.):82–83 (1992), 65(Suppl.):85–86 (1994), and 67(Suppl.):65–66 (1996). **Weather:** Mean start temp., 16.8ºC (range 12–25ºC). **Coverage:** 34.8 h; 8 visits (7 sunrise, 1 sunset); 5, 9, 15, 16, 18, 24, 26, 27 June; 2004. **Census:** Tree Swallow, 10.5 (38; 10N); Chipping Sparrow, 7.0 (25; 1N); Eastern Kingbird, 2.5 (2N); Killdeer, 2.0; Mourning Dove, 2.0 (2N); House Wren, 2.0; Northern Mockingbird, 2.0 (1N); Brown Thrasher, 2.0; Field Sparrow, 2.0; Common Grackle, 2.0; Whip-poor-will, 1.0, European Starling, 1.0 (1N). **Total:** 12 species, 36.0 territories (131/40 ha). **Visitors:** American Woodcock, Black-billed Cuckoo, Northern Flicker, American Robin, Common Yellowthroat, Song Sparrow, Indigo Bunting, Red-winged Blackbird. **Remarks:** This study is part of a long-term project designed to monitor the response of plant and breeding bird communities to a reduction in deer browsing at Long Point, Lake Erie. **Other Observer:** Christian Friis. **Acknowledgments:** I thank Jon McCracken for project supervision, Jane Bowles and Michael Bradstreet for measuring vegetation parameters, and the Canadian Wildlife Service for financial support.

15. RIPARIAN SCRUB BASIN
CUENCA CON MATORRAL RIBEREÑO

MELODY AIMAR
Santa Ana Watershed Association
25864-K Business Center Drive
Redlands CA 92374

Location: California; Riverside Co.; Riverside; Mockingbird Canyon; 33°53'33"N, 117°24'47"W; Riverside West Quadrangle, USGS. **Continuity:** New. **Size:** 12.7 ha. **Description of Plot:** The irregularly shaped plot is within the Santa Ana River watershed, and is located in the basin between Mockingbird Canyon Reservoir and the adjoining narrow riparian canyon. In general the stream is mostly perennial, but it is only ephemeral on the plot. Site disturbance includes historical grazing and other human-related activities (e.g., paintball games and ATVs). The plot contains both riparian woodland and disturbed scrub; the dominant plants are black willow and mulefat. The study area originally contained a multitude of exotic plant species, most notably *Arundo donax*, castor bean (*Ricinus communis*), and mustard (*Brassica nigra*). Persons from the Santa Ana Watershed Association removed *Arundo* and castor bean throughout the plot in 2003. **Edge:** Between 26 and 50% of the plot's perimeter is bordered by the same habitat, and the plot lies within a tract of similar habitat 51–100 ha in size. Surrounding land use includes moderately dense riparian habitat north to the open-water reservoir, rural

and agricultural land use, and gentle slopes of historically grazed hillsides bisected by major roads and development. The southernmost edge of the plot is the upper canyon connection, which passes through a large underpass to a narrow, winding canyon surrounded by development. **Topography and Elevation:** The plot is nearly level with a slope of <5%. Elevation is 300 m. A sandy wash traverses the plot. **Weather:** Mean start temp., 21.4°C (range 11–33°C). Temperatures were mildly warm, as typical for southern California's Mediterranean climate. There was no precipitation during, or within 24 hours of, survey visits. **Coverage:** 23.2 h; 10 visits (3 sunrise, 0 sunset); 19, 25, 27 May; 7, 13, 24 June; 8, 14, 22, 23 July; 2004. **Census:** Spotted Towhee, 14.5 (46); California Towhee, 12.5 (39); Bewick's Wren, 9.0 (28); Black-headed Grosbeak, 6.0 (19); Lesser Goldfinch, 5.5 (17); Anna's Hummingbird, 5.0 (16); Phainopepla, 5.0; Song Sparrow, 4.0 (13); House Finch, 4.0; Mourning Dove, 3.0 (9); California Thasher, 3.0; Western Scrub-Jay, 2.5; California Quail, 2.0; Nuttall's Woodpecker, 2.0; American Goldfinch, 2.0; Black-chinned Hummingbird, 1.5; Black Phoebe, 1.5; Red-tailed Hawk, 1.0; Northern Flicker, 1.0; Ash-throated Flycatcher, 1.0; Bushtit, 1.0; House Wren, 1.0; California Gnatcatcher, 1.0; Hooded Oriole, 1.0; Downy Woodpecker, 0.5; Yellow-breasted Chat, 0.5; Lawrence's Goldfinch, 0.5. **Total:** 27 species; 91.5 territories (288/40 ha). **Visitors:** Cooper's Hawk, Say's Phoebe, Western Kingbird, Loggerhead Shrike, Least Bell's Vireo, American Crow, Northern Mockingbird, Orange-crowned Warbler, Common Yellowthroat, Brown-headed Cowbird, Bullock's Oriole. **Remarks:** Spotted and California towhees were the most abundant potential breeders. All species observed were common with the exception of California Gnatcatcher, Yellow-breasted Chat, and Least Bell's Vireo. The latter two species nested offsite and only partially used the plot. The Red-tailed Hawk nest was on the plot, but the territory was larger than the plot. The small number of Brown-headed Cowbirds on the plot is attributed to the Santa Ana Watershed Association's cowbird trapping program nearby. In addition to winter and breeding bird surveys, this site is currently being monitored for invasive plant re-growth and Least Bell's Vireo nesting. **Acknowledgements:** Special thanks to Gage Canal for site access.

16. STREAMSIDE RIPARIAN WOODLAND I

BOSQUE RIBEREÑO I

TERRY REESER
Santa Ana Watershed Association
25864-K Business Center Drive
Redlands CA 92374

Location: California; Orange Co.; Yorba Linda; Featherly Regional Park; 33°52'24"N, 117°42'23"W; Black Star Canyon and Prado Dam Quadrangles, USGS. **Continuity:** New. **Size:** 16.4 ha. **Description of Plot:** The plot is a narrow corridor of riparian forest approximately 2.3 km in length and 40–165 m in width edged by disturbed upland coastal sage scrub and chaparral elements set in a highly urban environment. It is part of a narrow wildlife corridor in the Santa Ana Canyon connecting two large wildlife reserve fragments, the Cleveland National Forest/Limestone Canyon Reserve and Chino Hills State Park. The keystone species, the mountain lion, is frequent in the plot area. Cottonwoods and black willow line the river, but sycamore, scrub oak, California walnut, eucalyptus, and Peruvian pepper occur in the upland edge of the plot. Patchy cobblestone and gravel floodplain occurs within the riparian understory, which is dominated by mulefat and elderberry and also includes toyon, cattail, wild grape, poison oak, and cocklebur. The upland plant community consists of California sage, California buckwheat, laurel sumac, conyza, brittle bush, and tarragon. Non-native invasive plants such as mustard, castor bean, tree tobacco, and giant reed occur in the plot. Invasive weed management is done sporadically. The river has a maximum depth of approximately 3 m. The maximum width is 15.2 m. Manholes for a hazardous waste line that runs under the river occur along the length of the plot. The plot is roughly bisected longitudinally by a dirt service road (6–13 m in width), which is maintained by the local sanitation district for access to the manholes. **Edge:** Between 51 and 75% of the plot's perimeter is bordered by the same habitat, and the plot lies within a tract of similar habitat 101–500 ha in size. The Santa Ana River forms the southern edge and is included in the plot. The plot will vary slightly from year to year due to river flow that is east to west. Similar habitat occurs on the south side of the river and upstream and downstream from the plot. Just outside the northern edge are citrus groves, a bike trail, and railroad tracks beyond which is a residential community. **Topography and Elevation:** The plot is nearly level with a slope of <5%. Minimum elevation 111 m, maximum 121 m. **Weather:** Mean start temp., 18.0°C (range 17–21°C). Temperatures were mild, as typical for southern California's Mediterranean climate. There was no precipitation during, before, or after (within 24 hours of) survey visits. **Coverage:** 36.8 h; 8 visits (7 sunrise, 0 sunset); 30 April; 12, 17 May; 3, 15, 23 June; 2, 9 July; 2004. **Census:** Common Yellowthroat, 34.5 (84; 2FL); Spotted Towhee, 21.5 (52); Song Sparrow, 21.5 (1FL); Yellow Warbler, 19.5 (48); Bewick's Wren, 17.5 (43); House Wren, 15.5 (38; 1FL); Black-headed Grosbeak, 11.5 (28; 2N,3FL); Least Bell's Vireo, 11.0 (27; 4N,3FL); Black Phoebe, 10.0 (24); Wrentit, 10.0; Anna's Hummingbird, 9.0 (22); California Towhee, 8.0 (20); Lesser Goldfinch, 8.0 (2FL); Nuttall's Woodpecker, 6.0

(15); Ash-throated Flycatcher, 4.0 (10); American Crow, 3.0 (7); Yellow-breasted Chat, 3.0; American Goldfinch, 3.0 (1N); Western Scrub-Jay, 2.5; California Thrasher, 2.0; Mallard, 1.0; California Quail, 1.0; Cooper's Hawk, 1.0; Downy Woodpecker, 1.0; Northern Rough-winged Swallow, 1.0 (2FL); Bushtit, 1.0; Savannah Sparrow, 1.0; Blue Grosbeak, 0.5. **Total:** 28 species; 228.5 territories (557/40 ha). **Visitors:** Red-shouldered Hawk, Red-tailed Hawk, Mourning Dove, Black-chinned Hummingbird, Western Wood-Pewee, European Starling, Orange-crowned Warbler, Wilson's Warbler, Western Tanager, Hooded Oriole, Bullock's Oriole, House Finch. **Remarks:** The breeding bird community includes riparian, coastal sage, and chaparral species. The endangered Least Bell's Vireo and California Species of Concern Yellow Warbler and Yellow-breasted Chat bred on the plot along with other species of local concern such as Downy Woodpecker. We possibly over-counted some species due to surveying only one side of the river, but we took this into account for some species. Nest monitoring for the Least Bell's Vireo and winter bird surveys take place on the plot. **Other Observer:** Susan Hoffman. **Acknowledgements:** I thank Harbors, Beaches, and Parks Resources and Development Department, County of Orange, for site access and its continuing logistical support.

17. STREAMSIDE RIPARIAN WOODLAND II

BOSQUE RIBEREÑO II

BONNIE NASH
Orange County Water District
14980 River Road
Corona CA 92880

Location: California; Riverside Co.; Corona; Prado Basin; 33°55'N, 117°36'W; Corona North Quadrangle, USGS. **Continuity:** New. **Size:** 10.3 ha. **Description of Plot:** The plot is part of a 770 ha riparian preserve behind Prado Dam. It is approximately rectangular with shortest side 141 m and longest side 767 m. The site is recovering from a September 2002 fire that killed much of the vegetation above ground. The plot contains approximately 50% natives consisting of a mixed willow (black willow and arroyo willow)-cottonwood-mulefat plant community without an associated upland component. The dominant non-native plant is giant cane (*Arundo donax*), which is under spray management since the fire. The dominant ground cover plants are blackberry and mustard. As of September 2003, there has been significant re-growth of black willow, cottonwood, mulefat, and blackberry. Patches of *Arundo* still occur. Mature willows, cottonwoods, and eucalyptus are dense along the bluff side of the plot and spread sparsely throughout the rest of the plot. The plot contains a 1400 m2 pond with a depth of 1–1.5 m. Vegetation covers approximately one-third of the pond. Site disturbances include a newly constructed access road and human encroachment such as ATV, paintball, and equestrian activities. **Edge:** Between 26 and 50% of the plot's perimeter is bordered by the same habitat, and the plot lies within a tract of similar habitat >500 ha in size. The plot is bordered by the Santa Ana River to the north and a bluff with residential development to the south. Similar habitat occurs to the east and west, but there is also a busy two-lane road that borders the plot on the east. **Topography and Elevation:** The plot is nearly level with a slope of <5%. Minimum elevation 520 m, maximum 540 m. **Weather:** Mean start temp., 20.6°C (range 16–28°C). Temperatures were mildly warm, as typical for southern California's Mediterranean climate. **Coverage:** 13.4 h; 8 visits (1 sunrise, 0 sunset); 13, 20, 28 May; 4, 11, 18 June; 13, 23 July; 2004. **Census:** Song Sparrow, 17.0 (66); Common Yellowthroat, 16.5 (64); Spotted Towhee, 8.5 (33); Anna's Hummingbird, 7.5 (29); Yellow-breasted Chat, 7.5; Black-headed Grosbeak, 6.5 (25; 1FL); Yellow Warbler, 6.0 (23); Bewick's Wren, 5.0 (19); Ash-throated Flycatcher, 3.5 (14); California Thrasher, 2.5; California Towhee, 2.5; Common Ground-Dove, 2.0; Brown-headed Cowbird, 2.0; *Selasphorus* sp., 1.5; Nuttall's Woodpecker, 1.5; Downy Woodpecker, 1.5; Western Scrub-Jay, 1.5; House Finch, 1.5; Lesser Goldfinch, 1.5; Northern Flicker, 1.0; Black Phoebe, 1.0; Cassin's Kingbird, 1.0; Least Bell's Vireo, 1.0 (1N,2FL); American Crow, 1.0; Bushtit, 1.0; House Wren, 1.0; Bullock's Oriole, 1.0; Red-tailed Hawk, 0.5; American Kestrel, +; Wrentit, +. **Total:** 30 species; 104.5 territories (406/40 ha). **Visitors:** Cooper's Hawk, Hooded Oriole, American Goldfinch. **Remarks:** Snowy Egrets, Great Blue Herons, and Black-crowned Night-Herons foraged on the plot. Least Bell's Vireo nesting was monitored. This plot was damaged during 2004–2005 winter flooding and has not been accessible since then. Invasive giant cane grew in the plot and is currently being cut and sprayed. Whether surveys continue here, has not yet been determined.

18. STREAMSIDE RIPARIAN WOODLAND III

BOSQUE RIBEREÑO III

TALULA BARBEE
Santa Ana Watershed Association
14980 River Road
Corona CA 92880

ALLYSON BECKMAN
Santa Ana Watershed Association
25864-K Business Center Drive
Redlands CA 92374

Location: California; Riverside Co.; Redlands; San Timoteo Canyon; 33°59'5"N, 117°7'45"W; Sunnymead Quadrangle, USGS. **Continuity:** New. **Size:** 13.0 ha. **Description of Plot:** The linear plot is located along

San Timoteo Creek, in a fairly narrow canyon that drains approximately 198,000 ha of the San Bernardino Mountains and foothills in western Riverside and San Bernardino counties. It is approximately 1 km in length and varies from 46–200 m in width. Two wide, low-lying terraces within the canyon constitute the widest portions of the plot. The habitat is characterized by typical southern California riparian vegetation including a canopy of cottonwood and black willow. The understory is dominated by black willow, stands of mulefat, and arroyo willow, but also includes elderberry, mugwort, golden currant, and toyon. Associated upland plants include *Artemisia californica* and California buckwheat. A large portion of the ground cover is composed of leaf litter and bare soil. The study area originally was dominated by invasive plants, most notably giant cane (*Arundo donax*) and tamarisk. Removal of invasives in 1997–2001, however, has allowed restoration of the native plant community. The water is shallow (<1 m in depth) and meanders through the plot. The maximum width of the creek is 15 m. Water flow is usually perennial and predominantly from discharged treated water and agricultural and urban runoff. **Edge:** Less than 25% of the plot's perimeter is bordered by the same habitat, and the plot lies within a tract of similar habitat >500 ha in size. The plot is enclosed by 9–12 m steep cliff walls, and the surrounding upland area consists mostly of non-native grasslands used for grazing and agriculture. The riparian habitat along the stream, however, is continuous for approximately 20 km above and below the plot. **Topography and Elevation:** The plot is nearly level with a slope of <5%. Minimum elevation 515 m, maximum 533 m. **Weather:** Mean start temp., 20.8˚C (range 12–29˚C). Temperatures were mildly warm, as typical for southern California's Mediterranean climate. There was no precipitation during, or within 24 hours of, survey visits. **Source:** Western Regional Climate Center for Beaumont, CA. **Coverage:** 21.5 h; 8 visits (1 sunrise, 0 sunset); 14, 21, 28 May; 4, 8, 25 June; 2, 9 July; 2004. **Census:** Bewick's Wren, 12.0 (37); Spotted Towhee, 12.0; Song Sparrow, 12.0; Mourning Dove, 10.0 (31); House Wren, 9.0 (28); Least Bell's Vireo, 8.0 (25); California Towhee, 8.0; American Goldfinch, 7.0 (22); Ash-throated Flycatcher, 5.0 (15); Lesser Goldfinch, 4.5 (14); Barn Owl, 4.0 (12); Nuttall's Woodpecker, 4.0; Bushtit, 4.0; Brown-headed Cowbird, 4.0; Oak Titmouse, 3.0 (9); Yellow Warbler, 3.0; Yellow-breasted Chat, 3.0; Black-chinned Hummingbird, 2.0; Anna's Hummingbird, 2.0; Northern Flicker, 2.0; Common Yellowthroat, 2.0; Lark Sparrow, 2.0; California Quail, 1.0; Red-shouldered Hawk, 1.0 (1N); Red-tailed Hawk, 1.0; Downy Woodpecker, 1.0; Pacific-slope Flycatcher, 1.0; Black Phoebe, 1.0; American Crow, 1.0; European Starling, 1.0; Phainopepla, 1.0; Black-headed Grosbeak, 1.0; Blue Grosbeak, 1.0; House Finch, 1.0; Bullock's Oriole, 0.5; **Total:** 35 species; 135.0 territories (415/40 ha). **Visitors:** White-tailed Kite, Cooper's Hawk, Southwestern Willow Flycatcher, Common Raven, Northern Rough-winged Swallow, Northern Mockingbird, California Thrasher. **Remarks:** The plot that has been undergoing passive restoration for three years after removal of over 80 ha of invasive giant cane that choked the entire canyon. Thirty-five avian species bred within it, including one endangered species, Least Bell's Vireo. Endangered Southwestern Willow Flycatchers have been reported as breeders here on occasion. Other breeding species that have suffered declines and are of state or local concern include Yellow-breasted Chat, Yellow Warbler, and Downy Woodpecker. Raptors are present, as are a number of cavity nesters, which previously had been sparse. Nest monitoring for the Least Bell's Vireo and winter bird surveys are also done on this plot. **Acknowledgements:** Special thanks to the U.S. Army Corps of Engineers for providing funding for the surveys.

19. SHRUBBY SWAMP AND SEDGE HUMMOCKS

PANTANO ARBUSTIVO–MOGOTE

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Location: Connecticut; Litchfield Co.; Litchfield; White Memorial Foundation–North Shore Marsh; 41°43'N, 73°13'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 38 yr. **Size:** 8.1 ha. **Description of Plot:** See *Aud. Field Notes* 19:625–627 (1965) and *Bird Populations* 7:125–126 (2006). Succession is continuing with more shrubs and trees and less herbaceous vegetation present every year. Flooding last year caused several more trees in the 8–15 cm DBH size range to die. There are now quite a few snags in the plot. **Weather:** Mean start temp., 19.6°C (range 15–25°C). This year's weather was ideal for breeding activity. The only exceptions were a few cold nights in May. Overall, temperatures were below average from May through August. May's mean temperature was 15.9°C, June's was 17.7°C, and July's was 20.8°C. No days exceeded 32.2°C. Rain fell on 19 days in May with precipitation totaling 11.2 cm (average). There were 10 days of rain totaling only 5.7 cm in June (5 cm below normal), and 14 days of rain totaling 11.9 cm in July (1 cm below normal). The only significant rainstorm in July (on the 28th) produced 3 cm of rain. **Coverage:** 24.5 h; 12 visits (1 sunrise, 4 sunset); 1, 8, 17, 25 May; 3, 11, 18, 29 June; 9, 16, 24, 31 July; 2004. Maximum number of observers/visit, 3. **Census:** Swamp Sparrow, 35.0 (173; 6N,90FL); Red-winged Blackbird, 34.0 (168; 8N,74FL); Yellow Warbler, 30.0

(148; 16N,87FL); Common Yellowthroat, 23.0 (114; 58FL); Gray Catbird, 18.5 (91; 7N,61FL); Common Grackle, 9.0 (44; 7N,37FL); Song Sparrow, 6.0 (30; 21FL); Cedar Waxwing, 5.0 (25; 1N,11FL); American Goldfinch, 5.0 (1N,8FL); Eastern Kingbird, 4.0 (20; 3N,12FL); Willow Flycatcher, 3.5 (17; 1N,10FL); Tree Swallow, 3.5 (2N,18FL); Warbling Vireo, 3.0 (15; 1N,9FL); Baltimore Oriole, 3.0 (3N,14FL); Least Flycatcher, 2.5 (7FL); Black-capped Chickadee, 2.5 (2N,10FL); Blue-gray Gnatcatcher, 2.5 (2N,8FL); Veery, 2.5 (6FL); Alder Flycatcher, 2.0 (5FL); American Robin, 2.0 (2N,8FL); Mallard, 1.5 (11FL); Downy Woodpecker, 1.5 (1N,7FL); Northern Flicker, 1.5 (6FL); Great Crested Flycatcher, 1.5 (3FL); Yellow-throated Vireo, 1.5 (3FL); Black-and-white Warbler, 1.5 (4FL); American Redstart, 1.5 (4FL); Brown-headed Cowbird, 1.5 (2FL); Mourning Dove, 1.0 (2FL); Tufted Titmouse, 1.0 (6FL); White-breasted Nuthatch, 1.0 (1N,5FL); Northern Cardinal, 1.0 (1N,5FL); Mute Swan, 0.5 (1N); Wood Duck, 0.5 (6FL); Great Blue Heron, 0.5; Hairy Woodpecker, 0.5 (2FL); Eastern Wood-Pewee, 0.5 (3FL); Northern Waterthrush, 0.5; Spotted Sandpiper, +; Yellow-billed Cuckoo, +; Ruby-throated Hummingbird, +; Red-eyed Vireo, +; Purple Finch, +. **Total:** 43 species; 215.5 territories (1064/40 ha). **Visitors:** Canada Goose, Red-bellied Woodpecker, Yellow-bellied Sapsucker. **Remarks:** The number of breeding species decreased dramatically this year. The total of 43 species was 5 fewer than last year, but still higher than the previous 10-yr average of 36.8 species. The only species found this year but not last year were Yellow-billed Cuckoo and Purple Finch. Species found last year but not this year included Canada Goose, American Crow, Marsh Wren, Eastern Bluebird, Wood Thrush, Chestnut-sided Warbler, and Rose-breasted Grosbeak. The total absence of Chestnut-sided Warbler is perplexing. Despite the decrease in the number of species, the total number of territorial males rose to the second-highest total ever. The 215.5 territories counted this year is well above the previous 10-yr average of 175. Swamp Sparrow was the most abundant species with an increase of 6.0 territories over last year. **Other Observers:** Eric Adam, John Eykelhoff, Marie Kennedy, Bruce Sebastian, Pamela Velez, and Edward Yescott. **Acknowledgments:** Marie Kennedy was instrumental in helping to compile our Breeding Bird Census data this year.

20. COASTAL SCRUB

MATORRAL COSTANERO

GERHARD EPKE & ELIZABETH PORZIG
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Petaluma CA 94954

Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°45'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1971; 30 yr. **Size:** 8.1 ha. **Description of Plot:** See *Am. Birds* 25:1003–1004 (1971). The cover of Douglas-fir (*Pseudotsuga menziesii*) and shrubs continues to increase. **Weather:** Mean start temp., 10°C (range 5–14°C). **Coverage:** 170.5 h; 49 visits (24 sunrise, 0 sunset). 2004. **Census:** Wrentit, 11.0 (54; 8N,23FL); Bewick's Wren, 8.0 (40); Spotted Towhee, 7.5 (37; 2N); Wilson's Warbler, 5.5 (27; 1N); Orange-crowned Warbler, 4.5 (22; 2N); Allen's Hummingbird, 2.5; Hutton's Vireo, 2.0 (3N); Bushtit, 2.0; Swainson's Thrush, 2.0; Chestnut-backed Chickadee, 1.5; Red-breasted Nuthatch, 1.5; California Quail, 1.0; Purple Finch, 1.0; Pacific-slope Flycatcher, 0.5; Western Scrub-Jay, 0.5; Golden-crowned Kinglet, 0.5 (1N); Red-tailed Hawk, +; Mourning Dove, +; Northern Flicker, +; Olive-sided Flycatcher, +; Steller's Jay, +; American Robin, +; Song Sparrow, +; White-crowned Sparrow, +; Dark-eyed Junco, +. **Total:** 25 species; 51.5 territories (254/40 ha). **Visitors:** Sharp-shinned Hawk, Band-tailed Pigeon, Anna's Hummingbird, Hairy Woodpecker, Northern Mockingbird, American Goldfinch. **Remarks:** The increase in cover is likely responsible for some changes in bird numbers and species composition. **Other Observer:** Dennis Jongsomjit. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1605.

21. DISTURBED COASTAL SCRUB A

MATORRAL PERTURBADO A

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°45'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1972; 30 yr. **Size:** 4.7 ha. **Description of Plot:** See *Am. Birds* 26:987–988 (1972). **Weather:** Mean start temp., 10°C (range 5–14°C). **Coverage:** 136.1 h; 65 visits (22 sunrise, 0 sunset). 2004. **Census:** Wrentit, 4.5 (38; 5N,13FL); Allen's Hummingbird, 3.5 (30); Spotted Towhee, 3.0 (26; 2N); Bushtit, 2.5; Song Sparrow, 2.5 (10N,20FL); Purple Finch, 2.5; American Goldfinch, 2.5 (3N); California Quail, 2.0; Anna's Hummingbird, 2.0; Wilson's Warbler, 2.0; Bewick's Wren, 1.0; Orange-crowned Warbler, 1.0; Mourning Dove, 0.5; Hutton's Vireo, 0.5; Chestnut-backed Chickadee, 0.5; Red-breasted Nuthatch, 0.5; Swainson's Thrush, 0.5; White-crowned Sparrow, 0.5; Dark-eyed Junco, 0.5; Downy Woodpecker, +; Northern Flicker, +; Olive-sided Flycatcher, +; Pacific-slope Flycatcher, +; Steller's Jay, +; Western Scrub-Jay, +; Golden-crowned Kinglet, +; American Robin, +; California Towhee, +; Black-headed Grosbeak, +; Brown-headed Cowbird, +; House Finch, +. **Total:** 31 species; 32.5 territories

(277/40 ha). **Visitors:** Osprey. **Remarks:** Cover of trees (firs) and shrubs continues to increase. Overall territory density decreased by 23% from 2003. Species with notable decreases in density from last year include Wrentit (from 7.5 to 4.5 territories). This is the first year that Red-breasted Nuthatch was recorded breeding on the plot. **Other Observers:** None reported. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1606.

22. DISTURBED COASTAL SCRUB B

MATORRAL PERTURBADO B

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°46'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1971; 30 yr. **Size:** 8.1 ha. **Description of Plot:** See *Am. Birds* 25:1002 (1971) and *J. Field Ornithol.* 66(Suppl.):104 (1995). **Weather:** Mean start temp., 10°C (range 5–14°C). **Coverage:** 204.2 h; 68 visits (25 sunrise, 0 sunset). 2004. **Census:** Song Sparrow, 10.0 (49; 5N,10FL); American Goldfinch, 9.0 (44; 6N); Wrentit, 7.0 (35; 6N,10FL); Swainson's Thrush, 4.0 (20); Bewick's Wren, 3.5 (17); Wilson's Warbler, 3.5 (1N); Spotted Towhee, 3.5 (3N); Anna's Hummingbird, 3.0 (15); Orange-crowned Warbler, 3.0; Allen's Hummingbird, 2.5; Purple Finch, 1.5; Mourning Dove, 1.0; Western Scrub-Jay, 1.0; Downy Woodpecker, 0.5; Bushtit, 0.5; Brown-headed Cowbird, 0.5; Northern Flicker, +; Steller's Jay, +; Chestnut-backed Chickadee, +; Golden-crowned Kinglet, +; American Robin, +; California Towhee, +; White-crowned Sparrow, +. **Total:** 23 species; 54.0 territories (267/40 ha). **Visitors:** California Quail, Band-tailed Pigeon. **Remarks:** Cover of trees (firs) and shrubs continues to increase. Overall territory density decreased by 24% from 2003. No single species decreased dramatically, but rather a majority of species exhibited slight declines. This is the first year that Downy Woodpecker was recorded with a territory in the plot. **Other Observers:** None reported. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1607.

23. RED OSIER DOGWOOD SHRUBLAND

MATORRAL DE CORNEJO DE HOJAS ROJAS

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Vancouver BC V6S 1N3

Location: Ontario; Waterloo; Laurel Creek Conservation Area; 43°29'N, 80°35'W. **Continuity:** New. **Size:** 10.0 ha. **Description of Plot:** A roughly square plot located within the Laurel Creek Conservation Area. The park itself contains a variety of habitats: deciduous forest, coniferous woodland, wetland marsh, meadowland, and shrubland. The primary habitat of the plot is shrubland dominated by red osier dogwood, which is scattered in varying densities throughout. The dogwoods range from 1–3 m in height, and are tallest and most dense in the southeast end of the plot. Both the height and density of the dogwoods gradually decrease toward the northwest end such that the sparse shrubs are separated by a ground cover of tall grass. A few small deciduous trees are dispersed within the shrubland. Within the plot, there is a teardrop-shaped pond with a diameter of approximately 50 m. Also within the plot, there are grass- or gravel-covered trails and nine birdhouses. **Edge:** The plot is surrounded by a variety of habitats. There is a deciduous forest and a private residence to the north. To the east is marshland, Laurel Creek Reservoir, and Laurel Creek itself. The southern border is delineated by an east-west running powerline. To the southwest is a deciduous swamp forest, and to the west there is a long, thin, tall swath of trees (primarily cedar) and then more shrubland. **Topography and Elevation:** The plot is roughly level with a gentle slope down towards the reservoir at the eastern end. This area can be exceptionally wet. **Weather:** Mean start temp., 14.2˚C (range 7–18˚C). The 10 June visit was ended early due to heavy rain. The 27 May visit began with heavy fog, which soon lifted to clear skies. **Coverage:** 12.2 h; 6 visits (6 sunrise, 0 sunset); 13, 18, 27 May; 3, 10, 14 June; 2004. **Census:** Yellow Warbler, 19.0 (76; 1N); American Goldfinch, 18.0 (72); Song Sparrow, 14.0 (56); Tree Swallow, 10.0 (40); Red-winged Blackbird, 10.0; Willow Flycatcher, 8.0 (32; Gray Catbird, 6.0 (24); Brown-headed Cowbird, 5.0 (20); Black-capped Chickadee, 4.0 (16); American Robin, 4.0; Northern Flicker, 2.0; Blue Jay, 2.0; Common Yellowthroat, 2.0; Northern Cardinal, 2.0; Canada Goose, 1.0 (FL); Great Blue Heron, 1.0; Eastern Kingbird, 1.0; American Crow, 1.0; Brown Thrasher, 1.0; Indigo Bunting, 1.0; Baltimore Oriole, 1.0. **Total:** 21 species; 113.0 territories (452/40 ha). **Visitors:** Mallard, Ruby-throated Hummingbird, Downy Woodpecker, Red-eyed Vireo, Cedar Waxwing, Chestnut-sided Warbler, Clay-colored Sparrow, Rose-breasted Grosbeak. **Remarks:** Mosquitoes and dragonflies were numerous during the second half of the census. In general, the most intense amount of bird activity was in the southeastern corner of the plot where the dogwoods were the tallest and densest. The bordering powerlines and the birdhouses showed a considerable amount of bird activity. The powerlines were used by a variety of species including Brown-headed

Cowbird, Willow Flycatcher, Gray Catbird, Red-winged Blackbird, and Tree Swallow. The birdhouses were used by Tree Swallows.

24. ABANDONED UPLAND PASTURE II
PASTIZAL DE ALTURAS ABANDONADO II

LYNN BOWDERY, LIN FAGAN, ALLAN BOWDERY, TOM SARRO, JANE VECCHIONE, RUTH ELWELL, ELIZABETH MOFFET & BEA CONOVER
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Site Number: NY1394089. **Location:** New York; Ulster Co.; Marbletown; Spring Farm; 41°47'30"N, 74°7'30"W; Mohonk Lake & Rosendale Quadrangles, USGS. **Continuity:** Established 1994; 3 yr. **Size:** 30.0 ha. **Description of Plot:** See *J. Field Ornithol.* 66(Suppl.):114–115 (1995). Brush conditions in the fields were similar to 1999. Ash trees at the edges continue to die, and the dead elms are losing branches and rotting away. Woolly adelgid has killed some of the hemlocks in the surrounding woods. **Weather:** Mean start temp., 17.3°C (range 12–23°C). We enjoyed good observing weather for this census. In particular, there were no days in which wind noise prevented us from hearing the birds. **Coverage:** 33.0 h; 13 visits (12 sunrise, 1 sunset); 14, 17, 19, 24 May; 2, 4, 7, 9, 14, 16, 21, 23 June; 4 August; 2004. Maximum number of observers/visit, 9. **Census:** Indigo Bunting, 36.0 (48; 2N); Red-eyed Vireo, 17.0 (23; 1N); Field Sparrow, 12.0 (16); Tufted Titmouse, 9.5 (13; 3FL); Common Yellowthroat, 8.0 (11); Prairie Warbler, 7.0 (9); American Goldfinch, 7.0; Red-bellied Woodpecker, 6.0 (8); Northern Cardinal, 6.0; Chipping Sparrow, 5.0 (7; 2FL); Downy Woodpecker, 4.0 (5; 2FL); Black-capped Chickadee, 4.0 (3FL); Wood Thrush, 4.0; Gray Catbird, 4.0; Scarlet Tanager, 4.0; Brown-headed Cowbird, 4.0; Baltimore Oriole, 4.0; Eastern Wood-Pewee, 3.5 (5); Ruby-throated Hummingbird, 3.0 (4); Eastern Phoebe, 3.0 (1FL); Blue Jay, 3.0; Tree Swallow, 3.0 (3FL); White-breasted Nuthatch, 3.0; American Robin, 3.0 (2FL); Blue-winged Warbler, 3.0; Eastern Towhee, 3.0 (1FL); Rose-breasted Grosbeak, 3.0; Red-winged Blackbird, 3.0; Mourning Dove, 2.0; Great Crested Flycatcher, 2.0; Eastern Bluebird, 2.0 (5FL); American Redstart, 2.0; Wild Turkey, 1.0 (4FL); Yellow-billed Cuckoo, 1.0; Hairy Woodpecker, 1.0; Northern Flicker, 1.0; Pileated Woodpecker, 1.0; Eastern Kingbird, 1.0; Barn Swallow, 1.0 (1N); House Wren, 1.0 (1N); Blue-gray Gnatcatcher, 1.0; Cedar Waxwing, 1.0; Black-and-white Warbler, 1.0; Ovenbird, 1.0; Song Sparrow, 1.0; Sharp-shinned Hawk, 0.5; Yellow-throated Vireo, 0.5; American Crow, 0.5; European Starling, +; Yellow Warbler, +; Worm-eating Warbler, +; Common Grackle, +. **Total:** 52 species; 197.5 territories (263/40 ha). **Visitors:** Red-tailed Hawk, Black-billed Cuckoo, Acadian Flycatcher, Least Flycatcher, Carolina Wren, Golden-crowned Kinglet, Black-throated Blue Warbler, Yellow-rumped Warbler, Black-throated Green Warbler, Cerulean Warbler, House Finch. **Remarks:** New species this year were Sharp-shinned Hawk, Red-tailed Hawk, Black-billed Cuckoo, Acadian Flycatcher, Golden-crowned Kinglet, and Carolina Wren. Chestnut-sided Warbler had been seen on territory previously but was not seen this year. There were substantial declines in the numbers of territories of Field Sparrow, Common Yellowthroat, Prairie Warbler, Chipping Sparrow, American Redstart, American Robin, and Song Sparrow. Species that increased their numbers included Indigo Bunting, Red-eyed Vireo, Tufted Titmouse, Downy Woodpecker, Red-bellied Woodpecker, Eastern Wood-Pewee, Baltimore Oriole, and Ruby-throated Hummingbird. **Other Observers:** Barbara Rubin, David Arner, Betty Boomer, Tom Crepet, John Thompson, Ethan Pierce, Lauren McPhillips, and Clea Bowdery. **Acknowledgments:** Thanks to the Mohonk Preserve for its cooperation, and especially to the Daniel Smiley Research Center, for which these censuses are done.

Bird Populations 8:149-155
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WHAT HAS BEEN HAPPENING TO COMMON BIRD POPULATIONS?

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Mike Raven, David Noble and *Stephen Baillie* report on the results of the Breeding Bird Survey: 1994–2003.

¿QUÉ HA ESTADO OCURRIENDO CON LAS POBLACIONES DE AVES COMUNES?
Mike Raven, David Noble y *Stephen Baillie* informan sobre los resultados del Conteo de Aves Reproductoras: 1994-2003.

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) is now the main survey aimed at keeping track of changes in the breeding populations of widespread terrestrial bird species across the UK. Knowledge of the status of bird populations is fundamental to their conservation and BBS results are already being used by Government and nongovernmental organisations to set conservation priorities.

Randomly selected 1-km squares are allocated to participants within each BBS Region by volunteer Regional Organisers (ROs). The BBS is a line-transect survey, with each observer visiting their square on two occasions from April to June to count all the birds they see and hear along a 2-km route. Although many parts of the country have reached a near optimum level of coverage, other areas are still in need of participants. We are particularly keen to increase the number of squares surveyed in Northern Ireland, Scotland, North East England and the Midlands. Increasing the coverage in these areas would allow us to monitor the population changes of more bird species.

SURVEY COVERAGE

This carefully designed, yet simple survey attracted many participants and in the spring of 2003 there were more than 1,800 BBS observers collecting information on bird numbers from 2,254 1-km squares throughout the UK. Of this total, the majority was located in England (1,671 squares), with smaller numbers in Scotland (255), Wales (212), Northern Ireland (105), Channel Islands (7) and the Isle of Man (4). This considerable effort on the part of organisers and observers means that we are able to report on changes in bird populations for England, Northern Ireland, Scotland and Wales and in nine English Government Office Regions as well as for the UK overall.

SPECIES AND HABITAT COVERAGE

A total of 212 species was recorded in 2003 and of these, 100 species were noted in at least 40 squares, enabling UK population trends to be measured. Work has recently been undertaken to assess the precision and reliability of BBS trends for all species, with the aim of developing a protocol for ensuring that the reporting of trends is based on reliable data and sufficient sample sizes. This has resulted in the population trends of five species of gull (Black-headed, Common, Herring, Lesser Black-backed and

Great Blackbacked) being excluded from the report as a large proportion of the counts are considered to be of non-breeding, wintering or migratory birds. Trends for Cormorant, Grey Heron and Common Tern are reported with the caveat that counts may contain a high proportion of birds away from breeding sites, and the trend for Tawny Owl with the caveat that the BBS method monitors nocturnal species poorly.

No official UK rarities were reported, although lucky observers managed to record a number of rare breeding species on their squares, such as Black-necked Grebe, Garganey, Honey Buzzard, Whitetailed Eagle, Montagu's Harrier, Corncrake, Mediterranean Gull, Firecrest, Hawfinch and Golden Oriole. Late winter visitors and migrants included Great Northern Diver, Scaup, Wood Sandpiper and Iceland Gull. Redwing and Fieldfare were recorded on an unusually high number of squares in 2003, suggesting that they were late to leave the UK for their breeding grounds in northern Europe.

In total, the habitat details from more than 21,000 200 m transect sections were recorded in 2003. Work is planned this year to use this extensive dataset of habitat information, to generate habitat-specific trends for individual species. This will further help us to identify possible reasons for population changes.

POPULATION TRENDS

Table 1 shows the population changes between the last two seasons for which complete data are available (2002 and 2003) and for the survey period to date (1994 to 2003). Trends are estimated using a log-linear regression model that corrects for differences in coverage among regions. Across the UK, 44 species increased and 26 species declined significantly between 1994 and 2003. The following are some of the more interesting ups and downs.

GOLDFINCH & LINNET

The Common Birds Census (CBC) data indicate that Goldfinch underwent a marked decline between the mid 1970s and mid 1980s, but has recovered since 1986. Numbers have increased by 33% on BBS squares since 1994 (see Figure 1). It is thought that this decline was driven by reduced survival rates, caused by a reduction in the availability of weed seeds. The subsequent recovery may be partly due to the Goldfinch's new fondness for visiting garden bird tables, and this is borne out by the increasing number of Garden BirdWatch and Garden Bird Feeding Survey (see p37–40) sites reporting this species since 1985. An interesting comparison can be made with the red-listed Linnet, which underwent a similar decline, after which numbers stabilised (there has been little change on BBS sites since 1994). However declines are still being reported from Constant Effort Sites (CES), probably driven by low productivity. Modern day hedgerow management, which can leave broods vulnerable to predation, could be a contributing factor to this decline. Linnets, unfortunately, have not taken to garden feeders.

TURTLE DOVE

Numbers of the red-listed Turtle Dove declined by 44% on BBS squares between 1994 and 2003. Declines were first identified from Common Birds Census (CBC) data in the late 1970s, and have continued at an alarming rate. Since the first Breeding Bird Atlas was published in 1976, numbers have fallen by threequarters, with the estimated UK population dropping from more than 125,000 pairs to less than 45,000 pairs at present. The range has also contracted, with populations disappearing from peripheral areas in the North and South West of England. The East of England (birds recorded on 31% of BBS squares), South East (15%) and East Midland regions (10%) hold the core of the UK population, with the West Midlands (4%), Yorkshire (2%) and South West (1%) now at the

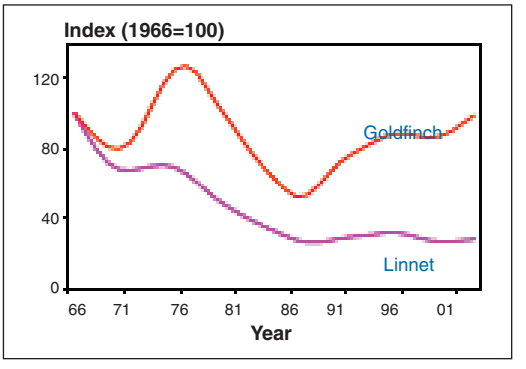

FIGURE 1. Goldfinch and Linnet CBC/BBS for England.

edge of its range. Only in the fenland areas of East Anglia, can the Turtle Dove be described as reasonably common. A number of factors are probably driving this severe and continuing decline, including hunting pressure along its migration route in southern Europe, and agricultural intensification in the UK. Work done by the Game Conservancy Trust indicates that the latter factor appears to be limiting the number of breeding attempts.

STARLING

The downward trend of the Starling continues, with numbers falling by 28% on BBS squares between 1994 and 2003. The UK conservation listing for Starling has recently been changed from Amber to Red because the long-term decline now exceeds 50%. Numbers fell significantly in eight of the nine English regions, and in Wales a decline of 62% was recorded. However, the picture was not all bad, with little change reported in Scotland, and a significant increase of 76% in Northern Ireland. A serious decline was first noted in the UK in the early 1980s, and this has been especially severe in woodland. Analysis of ringing data undertaken by BTO staff indicates that decreasing survival rates, particularly among first year birds, may be responsible for the decline, which in turn may be linked to a loss of the species' preferred feeding habitat — permanent pasture — and the intensification of livestock rearing.

RAVEN

The increase of Raven populations, however, is another success story recorded by the BBS. After many years of decline and contraction in range, the BBS is reporting significant increases in England, Scotland and Wales. In the early 19th century this species bred across the UK, including most lowland counties of England. Following widespread persecution, its range contracted into core areas in Wales, Scotland and South West England. In the past 10 years, however, widespread reports show this species to be recolonising areas in which it had only recently been classified as a rare visitor. Although Ravens are not recorded in enough squares for BBS trends to be calculated in separate English regions, occurrence on BBS squares has more than doubled in the North West, West Midlands and South West since the start of the survey. Likewise in Northern Ireland, Ravens were recorded more widely in 2003, than in 1994.

MIXED FORTUNES FOR MIGRANT WARBLERS

Most of Britain's warblers are long distance migrants, over-wintering in areas from the Mediterranean to Africa south of the Sahara, and hence year-to-year changes are strongly influenced by conditions outside the breeding season. The UK BBS trends for 10 species are shown in Figure 2. BBS results showed that Sedge Warbler numbers fell sharply in 2003 to levels below those in 1994 (although not significantly). Reed Warbler and Grasshopper Warbler numbers also dropped in 2003, but showed no overall change over the survey period. The fortunes of the four *Sylvia* warblers monitored by the BBS were more varied, with significant declines in Lesser Whitethroat (down 39%) and Garden Warbler (down 17%), contrasting with increases in Whitethroat (up 17%) and Blackcap (up 36%) over the survey period.

Of the three *Phylloscopus* warblers monitored by the BBS, the Wood Warbler has the dubious honour of having undergone the greatest decline in the UK since 1994, with numbers falling by 68%. Chiffchaff continued to increase, with numbers up by 22% between 2002 and 2003, and up by 46% over the survey period. Regionally, increases in excess of 100% since 1994 were reported for this species in North West England, Yorkshire and the East Midlands. The decline in Willow Warbler however, continued, with numbers down by 11% in the UK. This moderate fall masked much larger declines in seven of the eight English regions for which trends could be calculated, although numbers increased in Scotland (up 25%) and Northern Ireland (up 47%).

Populations of Sedge Warbler and Whitethroat, and probably Garden Warbler have been adversely affected by drought conditions in their African wintering grounds in the past, although they have made varying degrees of recovery since the declines of the late 1960s and early 1970s. Chiffchaff also underwent a decline

TABLE 1. Population changes of common and widespread species 2002–2003 and 1994–2003.

Species	Sample	Change 02-03	Change 94-03	lcl	ucl
Little Grebe	47	18.6	47.4 *	5	106
Little Grebe	49	1	49 *	7	107
Great Crested Grebe	56	–39	–28 *	–47	–1
Cormorant	153	–28	14	–4	37
Grey Heron	494	6	40 *	26	56
Mute Swan	174	–6	14	–2	33
Greylag Goose	92	14	183 *	120	264
Canada Goose	311	44 *	136 *	108	169
Shelduck	114	–9	–39 *	–49	–26
Mallard	943	–12	24 *	16	33
Tufted Duck	121	9	50*	22	85
Sparrowhawk	271	2	–5	–18	10
Buzzard	504	2	53 *	38	69
Kestrel	514	36 *	–5	–15	5
Red Grouse	100	17	22	–1	50
Red-legged Partridge	379	7	28 *	14	43
Grey Partridge	210	–25	–39 *	–49	–27
Pheasant	1262	14 *	33 *	26	39
Moorhen	508	8	32 *	19	45
Coot	194	30	102 *	74	134
Oystercatcher	237	1	–14 *	–23	–5
Golden Plover	53	21	–9	–31	21
Lapwing	542	2	–13 *	–20	–6
Snipe	121	–1	46 *	21	76
Curlew	429	–10	–27 *	–33	–21
Redshank	67	–4	–22	–39	0
Common Sandpiper	60	13	–12	–31	12
Common Tern	46	7	1	–28	42
Feral Pigeon	539	36 *	14 *	3	25
Stock Dove	597	1	13 *	2	24
Wood Pigeon	1851	7	12 *	8	17
Collared Dove	1003	5	31 *	23	38
Turtle Dove	184	–5	–44 *	–53	–33
Cuckoo	707	–12	–36 *	–41	–30
Little Owl	90	–22	1	–22	32
Tawny Owl	76	6	–32 *	–49	–10
Swift	852	4	–28 *	–34	–22
Kingfisher	42	–26	23	–16	82
Green Woodpecker	561	7	28 *	16	40
Gr. Sp. Woodpecker	619	7	85 *	68	104
Skylark	1378	0	–14 *	–17	–10
Sand Martin	96	–51 *	–46 *	–59	–29
Swallow	1437	–1	8 *	2	14
House Martin	736	1	15 *	6	26
Tree Pipit	119	–2	–1	–19	21
Meadow Pipit	628	7	3	–2	8
Yellow Wagtail	151	14	–17 *	–29	–2
Grey Wagtail	162	3	53 *	26	85
Pied Wagtail	982	9	34 *	24	43
Dipper	44	68	34	–8	95
Wren	1816	3	17 *	13	20
Dunnock	1513	9	21 *	15	26
Robin	1749	0	17 *	13	21
Redstart	131	–18	11	–8	33

TABLE 1. (Continued)

Species	Sample	Change 02-03	Change 94-03	lcl	ucl
Whinchat	76	10	–10	–29	14
Stonechat	88	3	168 *	100	258
Wheatear	239	–6	2	–10	17
Blackbird	1832	2	18 *	15	21
Song Thrush	1428	4	18 *	12	24
Mistle Thrush	964	4	2	–6	10
Grasshopper Warbler	58	–22	–3	–32	38
Sedge Warbler	241	–34 *	–9	–21	4
Reed Warbler	87	–15	10	–10	35
Lesser Whitethroat	202	–15	–39 *	–48	–27
Whitethroat	987	–10	17 *	9	24
Garden Warbler	366	–2	–17 *	–27	–6
Blackcap	1067	–6	36 *	28	44
Wood Warbler	54	–24	–68 *	–78	–55
Chiffchaff	978	22 *	46 *	38	55
Willow Warbler	1191	–3	–11 *	–15	–7
Goldcrest	553	–1	57 *	44	71
Spotted Flycatcher	190	4	–42 *	–51	–31
Pied Flycatcher	41	–38	–43 *	–59	–20
Long-tailed Tit	646	13	11	–1	23
Marsh Tit	122	–9	16	–7	46
Willow Tit	54	55	–55 *	–68	–37
Coal Tit	559	3	29 *	19	40
Blue Tit	1710	9 *	18 *	13	22
Great Tit	1568	7	26 *	20	31
Nuthatch	303	–1	42 *	24	61
Treecreeper	268	–8	9	–7	27
Jay	524	–21 *	–11 *	–20	–1
Magpie	1422	0	1	-3	6
Jackdaw	1203	6	20 *	13	27
Rook	1012	9	8	0	17
Carrion Crow	1734	–7	8 *	3	14
Hooded Crow	111	32	–4	–23	21
Raven	173	31	99 *	65	141
Starling	1469	–17 *	–28 *	–33	–23
House Sparrow	1239	7	–2	–6	2
Tree Sparrow	133	0	52 *	24	85
Chaffinch	1833	2	7 *	4	11
Greenfinch	1329	–1	30 *	23	37
Goldfinch	1053	12	33 *	24	43
Siskin	112	–21	–33 *	–46	–16
Linnet	1024	3	–1	–8	6
Lesser Redpoll	120	–8	11	–10	37
Bullfinch	448	3	–19 *	–28	–9
Yellowhammer	992	–3	–17 *	–21	–13
Reed Bunting	338	11	13 *	2	26
Corn Bunting	139	10	–35 *	–45	–22

KEY TO TABLE 1

Population changes of widespread species 2002–2003 and 1994–2003. The sample size indicated is the mean number of squares occupied each year over the 10 years (excluding squares where the species was recorded in only one year). The figures presented are the percentage changes in population levels for the respective time periods, those marked with an asterisk were significantly different at a 5% level. For the 1994–2003 period, the lower and upper 95% confidence intervals (lcl, ucl) are given. Species in bold are redlisted, and species in italics amber-listed in *The Population Status of Birds in the UK, Birds of conservation concern: 2002–2007.*

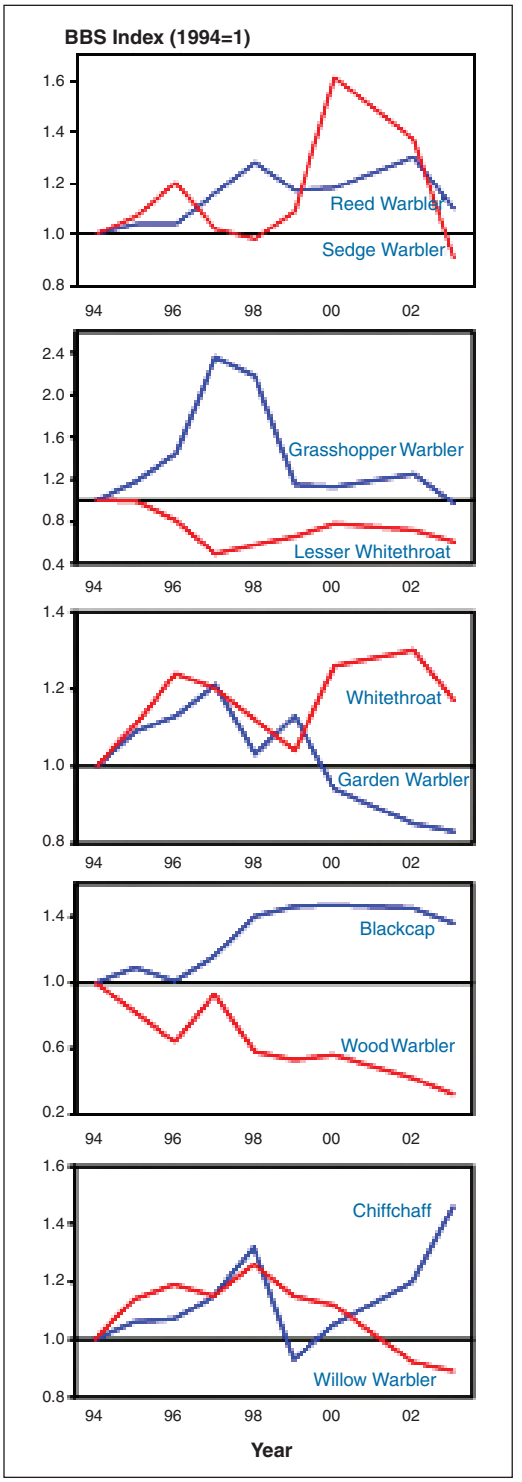

FIGURE 2. Warbler population changes on UK BBS sites.

during the early 1970s, after which numbers have increased. Lesser Whitethroat numbers have undergone a moderate decline since the late 1980s possibly due to lower productivity, as revealed by Constant Effort Site (CES) results, but have shown a slight recovery since 1997. Blackcap numbers have increased consistently since the late 1970s and increases have occurred across most of the countries and English regions for which trends can be calculated. The reason for this success remains unknown, with no identifiable trends in productivity, but we do know that increasing numbers of continental birds are over-wintering in the UK.

USE OF BBS DATA FOR FARMLAND BIRD CONSERVATION

The BBS has taken over the role of supplying information on changes in UK terrestrial breeding bird populations from the CBC, and these data are more important for conservation than ever. BBS data are now fully integrated with CBC data for the calculation of long-term trends and in the headline wild bird indicators. The Farmland Bird Indicator has been adopted by the Government as a Public Service Agreement target, with a promise to reverse declines by 2020. A number of species have Biodiversity Action Plans because of their poor conservation status, and progress towards BAP targets is assessed using the most recent CBC/BBS trends, or special surveys (e.g. Stone Curlew).

Data from the Nest Record Scheme, CES and Ringing Scheme have been analysed to determine whether changes in survival or breeding performance appear to be driving the declines in farmland species. Armed with this information and intensive studies of their ecological requirements, conservationists have a much better idea about changes in agricultural practices and the aspects of habitat management needed to reverse these trends. The next step is to test management options in the field and a number of broad-scale experiments are underway. These include studies of the impact of winter food availability on seed-eating farmland birds, the effectiveness of Skylark scrapes (unsown patches) for nesting in arable crops, and on the provision of field margins in pastoral systems. Early results from these

projects, and other research within Europe, were highlighted at a recent BOU Farmland Bird Conference attended by academics, farmers, representatives from conservation organisations and those responsible for government agricultural policy. One of the most important outcomes of farmland bird monitoring and research over the past few decades is that in January 2005, the government will be rolling out its new Entry Level Environmental Stewardship Scheme. This will include familiar options such as set-aside and organic farming, but also a variety of new options aimed at improving biodiversity (not just birds) in agricultural landscapes. Importantly, the success of the broad-scale implementation of these options across the UK will be measured by changes in breeding bird populations on BBS squares.

BBS data are also being used in a special project (the Farmland Bird Database) to map the distributions of less widespread species in order to direct agri-environment scheme applications at sites where they are likely to have the most impact.

THE FUTURE

BBS-online went live in October 2003 allowing observers to submit their BBS counts electronically via the web. To date, counts from more than 450 BBS squares have been submitted online for the 2004 field season. All of the historical data (1994–2002), together with the latest counts for 2003 have been loaded onto the system and this provides the user with a fascinating insight into the birds, mammals and habitat recorded on BBS squares over the past nine years. The website pages provide a wealth of information on BBS trends, county and regional species lists, species distribution maps, scheme coverage, methodology and how to take part. Once the BBS observer has registered as an online user, they can enter their BBS counts and view past data for their squares (www.bto.org/bbs).

One of the aims of the system is to encourage new volunteers to take part in the BBS, and so it has been very encouraging to see so many enquiries to participate in the scheme since the system went live. Many thanks must be given to the RSPB for generously funding the development of BBS-online, and to members of the BTO's Information Systems Unit (Iain Downie, Karen Wright, James Hall and James Mackinnon) who have developed the system and provided technical support over the past few months.

ACKNOWLEDGEMENTS

We are again extremely grateful to all the ROs, observers and BTO members who took part in the BBS last year. We would also like to thank the farmers and landowners for their support and cooperation in allowing BBS volunteers onto their land. The BBS continues to be an enormous success and is now the primary source of information on national and regional trends in common breeding birds. If you would like to take part in the scheme, please contact your local RO or Mike Raven at BTO HQ (e-mail: bbs@bto.org).

The BBS is a partnership between the British Trust for Ornithology, the Joint Nature Conservation Committee (on behalf of English Nature, Scottish Natural Heritage and the Countryside Council for Wales, and also on behalf of the Environment and Heritage Service in Northern Ireland) and the Royal Society for the Protection of Birds.

FURTHER READING

Crick, *et al.* (2004) *Breeding Birds in the Wider Countryside: their conservation status 2003.* BTO Research Report No. 353. BTO, Thetford. (www.bto.org/birdtrends)

Raven, M J, Noble, D G & Baillie, S R (2004). *The Breeding Bird Survey 2003.* BTO Research Report 363. BTO, Thetford.

Bird Populations 8:156-159
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BTO News 253:14-15

MONITORING WATERWAYS BIRDS (AND MAMMALS)

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The BTO's programme of annual surveys includes two that offer birdwatching walks in what is often prime habitat for breeding birds. *John Marchant* gives the latest news from these surveys: Waterways Bird Survey and Waterways Breeding Bird Survey.

MONITOREO DE AVES (Y MAMÍFEROS) A LO LARGO DE CURSOS ACUÁTICOS
El programa de conteos anuales del BTO incluye dos que ofrecen paseos de observación de aves en lo que suele ser hábitat de alta calidad para aves reproductoras. *John Marchant* aporta las últimas noticias de estos conteos: Conteos de aves en cursos acuáticos, y Conteo de aves reproductoras en cursos acuáticos.

The Waterways Bird Survey (WBS) has just entered its fourth decade of territory mapping along rivers and canals. It was begun in recognition of the special importance of waterways as a habitat for birds, with some of its species being found only rarely elsewhere, and also of their vulnerability to pollution and mismanagement. The Breeding Bird Survey now measures the population trends of most UK breeding birds, but there are several species that WBS covers better. Further, WBS can produce trends in bird numbers that are specific to the waterside habitat: these help to indicate the health of that ecosystem.

Table 1, drawn directly from the website, shows that six declining species have crossed thresholds (at –25% or –50%) for BTO to raise an alert to conservation bodies that action may be needed to reverse the current trend. Three of the species that raise alerts are the wagtails, with Yellow Wagtail clearly in serious trouble. Detailed studies have already begun to examine why this should be so.

Across these 24 species, the median change is an increase of about one-third. Undoubtedly the well-documented general improvement in water quality has contributed to this change. Some of the species, initially too scarce in the sample to monitor, have logged substantial increases over periods shorter than 25 years. It is surprising to see Lapwing, which is Amber-listed because of its strong decline on farmland, as the second-strongest increase — but, perhaps because of its semicolonial nesting behaviour, the confidence interval for this species is exceptionally wide, and the change is not statistically significant. For the introduced geese, and maybe also for Mallard (many of which along waterways show evidence of domestic ancestry), the increases may indicate burgeoning problems for conservation rather than success stories. WBS does not monitor the Hebridean or Icelandic populations of Greylag, for which the species is Amber-listed in the UK.

A review, just completed at the request of the Environment Agency, looks at WBS population trajectories in more detail (Newson *et al.*, BTO research report 337). The similarity between Dipper and Grey Wagtail suggests a relationship to environmental conditions along fast-flowing rivers, although Grey Wagtails occur much more widely. For Mute Swan, Moorhen, Kingfisher, and

TABLE 1. Long-term trends from the Waterways Bird Survey.

Species	% change
Yellow Wagtail	–89 *
Reed Bunting	–68 *
Little Grebe	–60 *†
Redshank	–49 *†
Pied Wagtail	–48 *
Grey Wagtail	–34 *
Common Sandpiper	–23 *
Sedge Warbler	–15
Dipper	–13
Moorhen	–13
Kingfisher	+3
Sand Martin	+32 *†
Tufted Duck	+41
Coot	+49
Curlew	+64 *
Goosander (1981–2000)	+65
Mute Swan	+73 *
Canada Goose (1981–2000)	+76
Whitethroat	+81
Reed Warbler	+81 *†
Oystercatcher	+112 *
Greylag Goose (1993–2000)	+145 *†
Lapwing	+170
Mallard	+196 *

Data cover 1975–2000 unless stated otherwise. An asterisk indicates statistical significance, and a dagger warns that the sample size is small. Species shown as *italic* are Amber-listed, and those shown as **bold** are Red-listed. For more information, see www.bto.org/birdtrends.

Grey and Pied Wagtails, annual changes in abundance were related to mean winter temperature.

WBS RESULTS FROM 2003

There were 74 plots where results for 2002 and 2003 could be paired to assess population changes between these two years. Of these, 31 (42%) were in counties north of the Mersey and Humber; again, none were in Northern Ireland. Rivers made up 65% of the sample and the others were canals or mixed sites. Paired counts from these sites are summarised in Table 2.

Of the five statistically significant changes between these two years, four were increases and only one, for Sand Martin, a decrease. On both WBS and BBS, Sand Martins have decreased since a population peak in 1996. Among the 'alert' species, decreases continued for Common Sandpiper, but both Pied and Grey Wagtails increased significantly. Little Grebe, Redshank and Yellow Wagtail have become too scarce for annual WBS monitoring. All the wildfowl species that are covered by the indices continued their population growth, including Greylag Goose, for which an increase of 16% was recorded from 13 plots.

WBS NEEDS MORE PLOTS!

It is important for waterbird conservation that the long run of WBS trend data is continued. The BTO's keen band of volunteer surveyors is doing just this –and deserve our thanks! The number of surveys completed annually has started to fall in recent years, however, from 105 in 1999 to 98 in 2000, 91 in 2002, and just 83 last year. This may be because potential observers are anticipating the survey's (as yet unplanned) demise. We are very keen to add more new WBS plots in 2005, in all parts of the UK, to reverse this decline. This survey suits people who enjoy a riverside walk and can identify the water birds they are likely to meet. Volunteers can choose their own stretch of river or canal to cover, provided it is at least 3 km long and does not overlap with existing surveys. If you may be able to help, please ask us for more details.

NEWS FROM WBBS

The Waterways Breeding Bird Survey is a BBS-style transect survey along waterways, introduced as a pilot scheme in 1998, and still in development. The current phase of WBBS development ends in 2004, and we are now seeking funding for further work. Eventually, WBBS might supersede WBS, but this depends on the results of studies still in progress, and on whether funding can be found for WBBS as an ongoing scheme. It is vital that WBS mapping continues strongly, at least until we understand how the WBBS's transects might replace it.

The plan for 2004 was to double the sample of random WBBS sites, and to bring the total sample up towards 300 sites (see *BTO News* 249: 22). Good progress towards this target was made in 2003, with an increase to 261 sites from 228 in 2002.

A full analysis of the WBBS data collected so far will be made before next spring. This will tell

TABLE 2. Estimates of population change 2002–03, from WBS data.

Species	Territory totals 2000	2002	% change	lcl	ucl	Number of plots
Mute Swan	79	81	**+3**	–10	+16	46
Canada Goose	133	146	**+10**	–19	+42	34
Mallard	1810	1910	**+6**	–2	+14	74
Tufted Duck	57	60	**+5**	–31	+59	15
Goosander	51	61	**+20** *	0	+43	25
Moorhen	537	586	**+9** *	+2	+17	65
Coot	203	205	**+1**	–12	+14	34
Oystercatcher	232	218	**–6**	–20	+59	24
Lapwing	181	195	**+8**	–22	+37	33
Curlew	54	54	**0**	–17	+17	17
Common Sandpiper	101	90	**–11**	–19	+3	18
Kingfisher	49	43	**–12**	–34	+12	38
Sand Martin	1734	1060	**–39** *	–66	–3	17
Dipper	83	88	**+6**	–9	+21	29
Reed Warbler	222	238	**+7**	–5	+19	21
Sedge Warbler	302	274	**–9**	–21	+5	35
Whitethroat	215	200	**–7**	–20	+7	45
Pied Wagtail	163	186	**+14** *	+2	+27	53
Grey Wagtail	132	159	**+20** *	+7	+37	48
Reed Bunting	210	217	**+3**	–7	+15	42

lcl and ucl = 95% lower and upper confidence limits; * = statistically significant change. Species listed in italics are Amberlisted, and those in bold Red-listed. Species with fewer than 15 plots contributing paired data are excluded.

us how many plots would be needed to make monitoring of trends for a range of target species sufficiently precise. Probably, trends of the same precision can be drawn from fewer occupied WBBS than BBS sites: this is because WBBS observers walk on average 50% further than BBS's standard 2 km, and keep to rich bird habitats, and so record more birds per site.

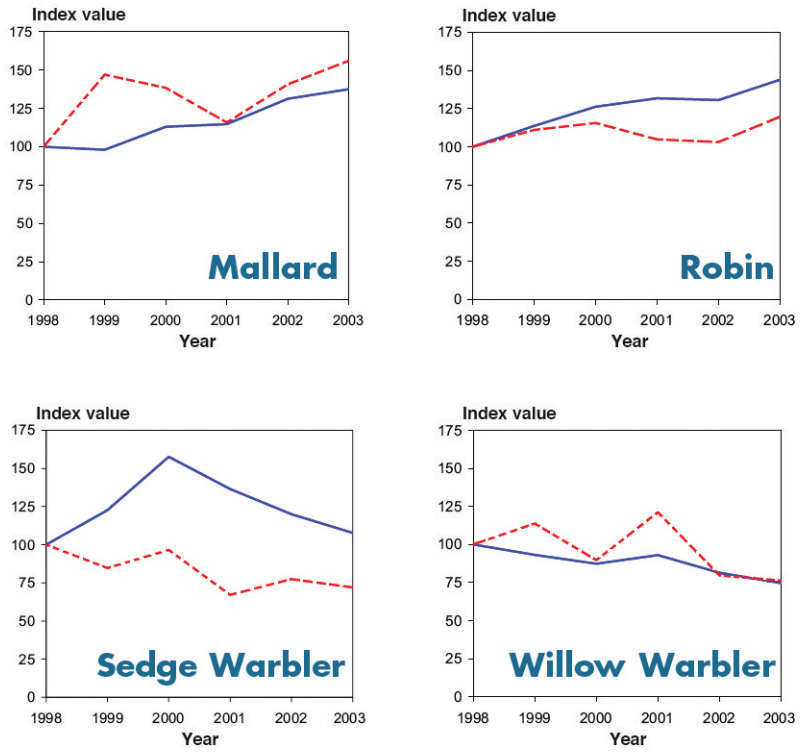
Unlike WBS, WBBS covers all bird species. This opens the possibility of producing trends that are specific to the waterside habitat for widespread species like Blackbird and Robin. These could be compared with similar habitat-specific trends for the same species derived from BBS, for example for farmland and woodland. By combining data for a range of species, WBBS could also produce an indicator of bird populations generally along waterways. The first attempts at producing trends from WBBS data, using old-style chain methods, are encouraging — despite the much-reduced sample of sites surveyed in 2001, when Foot & Mouth struck (Figure 1). These graphs compare the results from randomly selected sites with those from sites that were surveyed because they were also being covered for WBS, and show good consistency with BBS and other schemes.

MAMMALS, TOO

BTO is making increasingly valuable contributions to mammal as well as bird recording in the UK. This began in 1995 with BBS observers noting mammals on their transect walks. Using a very similar protocol, WBBS has recorded mammals since 1998, its first year. A study is now under way to investigate whether WBBS mammal data can usefully augment those collected by BBS and other schemes. We hope that WBBS will have a very special part to play in monitoring those mammals that specialise in waterside habitats — especially Otter, American Mink and Water Vole.

WBBS IN 2005

How WBBS will operate in spring 2005 will not be known in detail until the New Year. We fully expect, however, that we will be asking for repeat surveys at all sites already surveyed for the scheme. This will extend the overlap between WBS and WBBS monitoring to seven years



Trends from WBBS data, using old-style chain methods. The blue solid lines are for randomly selected sites, the red dash lines for sites also being covered for WBS.

FIGURE 1. Example trend graphs from WBBS — not just waterbirds!

(omitting 2001 when FMD restrictions made most sites inaccessible), and provide seven data points on WBBS trend graphs — enough to assess the direction of trends for mammals and nonwaterbirds along waterways for the first time.

If you are interested in helping with WBS and/or WBBS, please contact me at BTO Thetford HQ, e-mail: john.marchant@bto.org

Thank you to the Environment Agency for funding WBBS.

INFORMATION ON BIRD POPULATION TRENDS

For information on bird population trends in the UK, the 'Wider Countryside' report on the BTO web site (www.bto.org/birdtrends), which combines data from all BTO surveys that look at changes in population size and productivity, and has only recently been updated and rewritten, is by far the best single source.

Bird Populations 8:160-163
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BTO News 257:12-13

CHARTING THE SUCCESS OF UK HERONS

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The long-running BTO Heronries Census was supplemented by a highly successful special survey in 2003, the first such survey since 1985. *John Marchant* discusses some of the results that are now emerging.

ANÁLISIS DEL ÉXITO DE LAS GARZAS EN EL REINO UNIDO
El longevo censo de colonias de garzas del BTO fue suplementado por un exitoso censo especial en 2003, el primero de su clase desde 1985. *John Marchant* comenta los resultados que comienzan a emerger.

The Heronries Census has proved remarkably successful at following trends in the size of the UK Grey Heron population over more than three-quarters of a century. The latest graphs (Figure 1) show the gradual increase of the population, interrupted, although not since the 1980s, by setbacks caused by extra mortality in hard winters.

The big samples in England give an especially clear pattern: the 85% confidence intervals are wider elsewhere, although shrinking. Increasing numbers of heronries counted annually in Scotland allow the calculation of a separate trend there, but this cannot extend back to the early decades of the survey. Uniquely, rather than an index of population size as is usual for other common birds, the graphs show annual estimates of actual breeding numbers. The new model for converting annual nest counts to population estimates was recently published in *Ibis* (146:2 323– 335). It produces corrected estimates of uncounted nests that can be added to the counted nests to produce each annual total.

Current estimates of nesting pairs for 2003, and trends for recent periods, to 2002 from 1977, 1992 and 1997 are shown in Table 1. UK figures include the Isle of Man. Trends, which like the graphs are drawn from the new *Wider Countryside Report* on the BTO website, are positive for all the countries and periods for which we calculate them, showing how well this species has fared in the recent UK environment of milder winters and cleaner fresh waters.

THE 2003 SPECIAL SURVEY

The original 1928 survey, covering mostly England and Wales, was followed by further full surveys in 1954, 1964 (including the Irish Republic), and 1985, that ran alongside the normal annual coverage.

These periodic special heron surveys are designed to boost coverage of heronries across the UK beyond that normally achieved by the annual Heronries Census. In 1985, which was the most successful previous survey, 727 colonies and 7,653 nests were counted — doubling the 360 colonies counted the year before. Nowadays, the background level of

Table 1. Grey Heron nest counts, estimates and trends.

	Counted 2003	2003 estimate	25 years	10 years	5 years
England	7,389	8,410	+23%	+15%	+7%
Scotland	1,523	3,980	+7%	+16%	+19%
Wales	780	1,040	+4%	+17%	+9%
N Ireland	525	760	–	–	–
UK	10,260	14,200	+19%	+13%	+9%

Counts and estimates from the 2003 survey, and trends for the periods 1977–2002, 1992–2002 and 1997–2002.

counting is consistently much higher. It is this welcome development that has allowed us to publish trends for UK countries separately, as well as the UK one. In 2002, for example, 594 colonies held 8,447 nests, a higher total than was counted in any of the special surveys! The aims of the 2003 survey were not only to boost coverage still further, but also to collect extra information that would help us to refine the estimation of total population size.

As usual in such surveys, we asked the Census's regional organisers to find volunteers to count as many as possible of the known heronries. The way the survey totals have dwarfed earlier figures, with unprecedented totals of 772 heronries counted and 10,260 nests found, is a measure of their success (see Table 1 and Figure 2). The map shows the concentrations of large heronries in the London area and on the Cheshire Plain, and in Northern Ireland around Loughs Erne, Neagh and Strangford. A line of heronries marks the English coast from Cornwall to Norfolk. Not all regions were well covered in 2003, however: few of the islands were covered from the Clyde north to Mull; there are no data from Armagh; most importantly, barely a handful of colonies were reported from the whole of northeast Scotland, including Perthshire, Angus and Aberdeen. Surprisingly perhaps, absences from Shetland, Scilly and the Channel Islands are real.

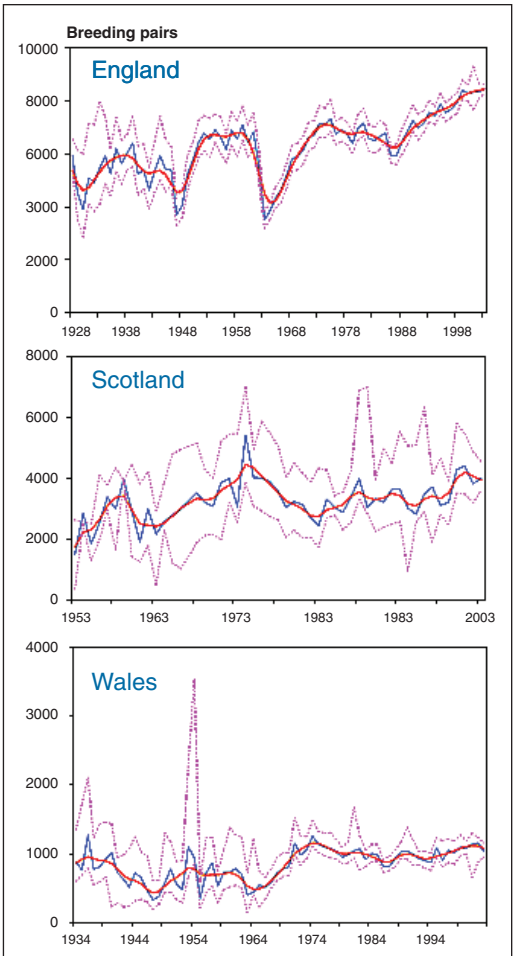
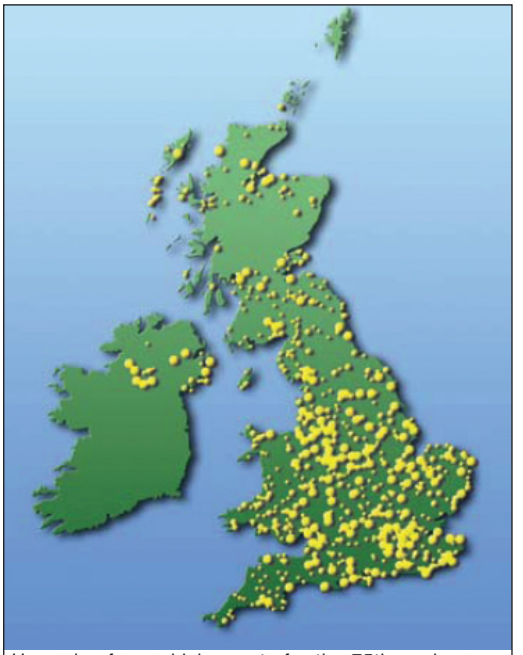


FIGURE 1. Grey Heron population trends for England, Scotland and Wales.

FROM COUNTS TO POPULATION ESTIMATES

The main problem for estimating the total population is to know how efficient we are at finding heronries. In 1928, for example, the count that was made then, approaching 4,000 nests, was believed at the time to be a realistic estimate of the population, at least for England and Wales. We now estimate that almost 40% of



Heronries from which counts for the 75th anniversary special survey in 2003 have been received. Dots are in three categories: small, 1–9 nests; medium, 10–19 nests; and large, 20–154 nests.

FIGURE 2. Heronries — special survey 2003.

the English and Welsh heronries active in 1928 were not located by that year's surveyors. Ideally, population estimates from new heron surveys should be proof against future discoveries of previously unknown heronries — otherwise, they and their calculated confidence intervals, like the 1928 figure, may also be widely inaccurate.

Population estimates from our current models are shown in Table 1, alongside the numbers of nests actually counted. We hope to assess, from the 2003 survey, whether these models can be improved further. The implication of the figures presented is that, despite tremendous efforts in 2003, 1,100 or so nests were missing from the English counts, and around 250 each for Wales and Northern Ireland. In Scotland there seem to have been around 2,500 nests missed — more than 60% of the estimated population there. Where could all these missing birds be?

Some of the nests missing from the counts can be accounted for by the colonies known or assumed to be active in 2003, but not counted in that year — for example the site by the Ythan estuary that held 27 nests in 2002. Others will be in the regions, mainly Scottish ones, where few or no records were received for the 2003 survey — here, estimates can perhaps be made by extrapolation from data collected in 1985 or other previous years. In England at least, such colonies will account for only a small fraction of the 'missing' nests. The remainder would be, by definition, at unknown sites never reported to the Heronries Census.

An innovative feature of the 2003 survey was a random tetrad survey that was carried out alongside the normal counts. We selected 1,209 tetrads not known to hold nesting herons, and asked volunteers to search them for previously unknown heronries. More than 700 reports were received, including some from the 2004 spring season. Adding in reports from observers and regional organisers that a tetrad held no suitable habitat for the species, together with similar assessments made by reference to OS maps, raises the total coverage to 72%. Five new heronries were discovered by these random searches — one each in Lancashire, Cleveland, Northumberland, Dumfriesshire and Inverness — although none held more than five nests, and the Inverness-shire site had apparently been recently abandoned. It will be possible to multiply up (maybe by factors of 100 or so) to produce estimates, regionally and nationally, of how many completely unknown heronries exist in the countryside. Because there were so few new nests found, however, these results cannot be very precise. Regions covered poorly by heronry counts in 2003 were also generally poorly covered for the tetrad survey, and this will have to be taken into account in the final analysis.

HOW WELL IS EACH HERONRY COUNTED?

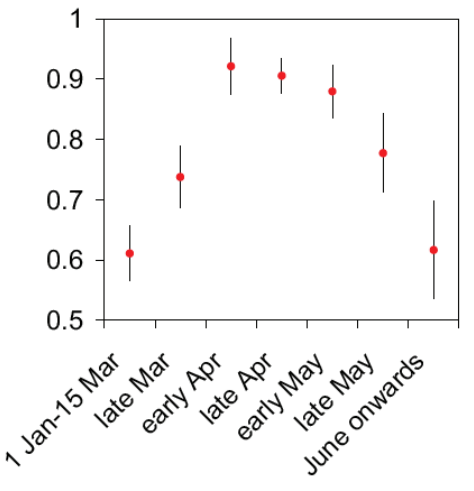
A further question about the accuracy of Grey Heron population estimates arises from work organised by Mick Marquiss in Scotland for the survey there in 1985. Intensive studies at colonies covered throughout the heron's long breeding season found more nests than were counted by the usual few visits made by BTO counters. Overall, it was estimated that BTO observers found only 68% of the actual nesting pairs (with 95% confidence limits of 56% and

83%). This result appeared to be independent of heronry size, and so should not affect population monitoring. If applicable widely, however, it suggests that we may need to add about a half again to our estimates of population size, to allow for under-counting!

New evidence from the 2003 census cards shows that early and late counts are not very efficient, compared with those in mid season (Figure 3). Thus, colonies counted only once, in late March or in late May, should be increased by about one-third to give a more realistic total. These data do not suggest that such a correction should be applied generally.

A second way to address this question is through the intensive coverage that was the third element of the special 2003 survey. We asked for volunteers who could count their heronries at short intervals throughout the nesting season, to see how count efficiency related to date. Initial results, drawn from a subset of eight heronries where the nest count was in double figures, are presented in Figure 4. The number of active nests counted, expressed as a proportion of the final count for each of the eight heronries, is averaged across the counts made in each fortnight of the breeding season. Late February counts can be good (week numbers 7 and 8 in the diary), although visits then may miss around a third of the nesting pairs for the whole season. There is a clear peak in counting efficiency in late April to early May (weeks 17–18). Visits after mid June found very few nests still active. Again, these data could be used to correct singlevisit counts that were not made at the peak of the season.

The good news is that a visit in the second half of April, supplemented if possible by an earlier and a later visit, as has long been the standard procedure for the Heronries Census, should be finding at least 90% of the active nests at each site.

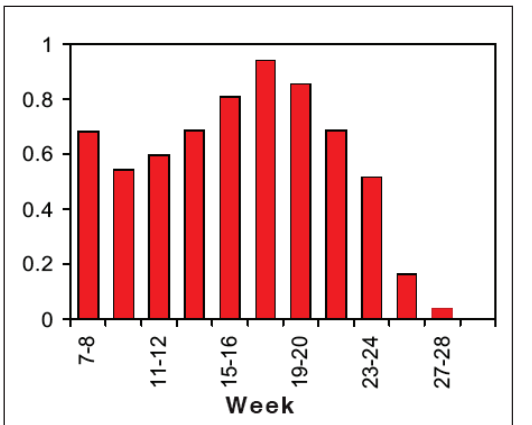


Proportions of the best overall estimate for each heronry in 2003 that were found on single visits at different times of the season. Data are from 36 heronries visited on at least four occasions.

FIGURE 3. Proportion of overall numbers for each heronry in 2003.

ACKNOWLEDGEMENTS

Thanks to Thames Water and Essex and Suffolk Water for their generous support of this project. Thanks also to everyone who made a donation to the Heron Appeal or volunteered their time to assist with the survey.



Heronry nest counts from eight intensive surveys as a proportion of the year's final nest total, plotted against count date (week numbers from 1 January).

FIGURE 4. Heronry nest counts as a proportion of the year's final total.

Bird Populations 8:164-167
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BTO News 251:6-7

A POOR BREEDING SEASON — CONSTANT EFFORT SITES, 2003

DAWN BALMER AND STEVE FREEMAN
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Dawn Balmer and *Steve Freeman* of the BTO's Demography Unit report on population and productivity changes between 2002 and 2003 on Constant Effort ringing Sites (CES).

UNA MALA TEMPORADA REPRODUCTIVA – SITIOS DE ESFUERZO CONSTANTE, 2003

Dawn Balmer y *Steve Freeman*, de la Unidad de Demografía del BTO, informan sobre cambios poblacionales y de productividad entre 2002 y 2003 en los lugares de anillamiento de esfuerzo constante (CES).

Following a successful breeding season for most species in 2002 and generally mild over-winter weather, the adult populations of some resident species in 2003 were high, compared with the previous year. Southeasterly winds in April led to the early arrival of some migrants and early nesting attempts but, later in the month, poor weather in North Africa and Iberia held up many migrants heading for Britain and Ireland. Table 1 shows the changes on CE sites between 2002 and 2003. There were statistically significant increases in the numbers of adults for Wren, Song Thrush, Chiffchaff, Blue Tit, Great Tit and Linnet. For Wren, Chiffchaff and the tits this reflects a very productive breeding season in 2002.

SONG THRUSH ON THE UP?

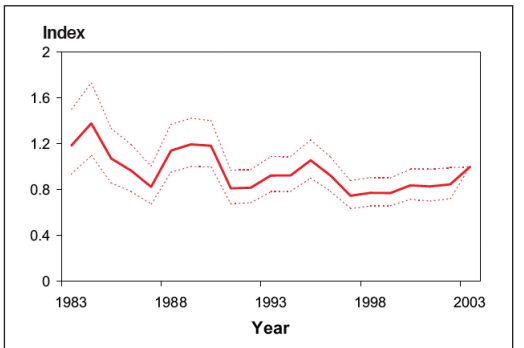
Song Thrush is currently red-listed on the *Population Status of Birds in the UK* list on the basis of a rapid (>50%) decline in the UK breeding population in the last 25 years. The long-term trend in adult abundance on CE sites (Figure 1) is also downwards but from 1997 has shown a shallow but consistent upward trend. Results from the Breeding Bird Survey also suggest an increase in Song Thrush abundance between 1994 and 2002, so perhaps there is some hope of a recovery for this species. Previous work by BTO staff has suggested that survival of birds during their first year of life was, at least in part, responsible for the decline. Song Thrush productivity shows no clear pattern over time (Figure 2), though evidence from the Nest Record Scheme indicates that overall breeding performance has improved. One explanation could be that birds may be having fewer nesting attempts as there has been no overall change in post-fledging survival. It is possible that the recent increase in adult numbers on CE sites may be due to their increasing survival rates.

Four species showed a statistically significant decline in the numbers of adults caught between 2002 and 2003: Sedge Warbler, Reed Warbler, Whitethroat and Willow Warbler. Sedge Warbler and Reed Warbler have shown large variations between years but the long-term pattern for Sedge Warbler is stable, whilst Reed Warbler showed a decline (see *BTO News* 245). In the longer-term, the number of adult Whitethroats caught on CE sites shows a

TABLE 1. Changes in captures on CE sites from 2002 to 2003.

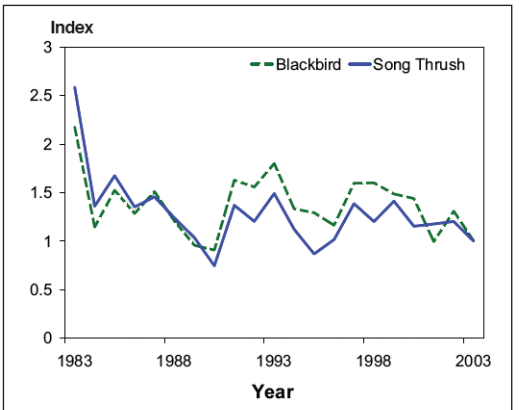
Species	Adults n 2003	Juveniles n 2003	Adult % change vs 2002	Trend	Productivity % change vs 2002	vs 83-02	Trend
Wren	102	105	+13 *	↔	–30 *	–17	↔
Dunnock	100	101	+5	↔	–26 *	–22	↔
Robin	101	104	+7	↑	–20 *	–19	↓
Blackbird	102	96	+2	↓	–24 *	–25	↔
Song Thrush	93	79	+18 *	↓	–16	–17	↔
Sedge Warbler	66	67	–11 *	↔	–11	–12	↓
Reed Warbler	55	53	–14 *	↓	–12 *	–2	↔
Lesser Whitethroat	31	42	–26	↓	–32	–29	↔
Whitethroat	62	71	–26 *	↔	–10	–7	↓
Garden Warbler	54	59	0	↔	–15	–17	↓
Blackcap	96	97	+3	↑	–33 *	–17	↔
Chiffchaff	86	93	+35 *	↑	–36 *	–28	↓
Willow Warbler	75	91	–13 *	↓	–3	+15	↓
Long-tailed Tit	84	82	+6	↔	–45 *	–32	↔
Willow Tit	8	15	+1	↓	–39	–8	↔
Blue Tit	99	103	+14 *	↔	–53 *	–33	↓
Great Tit	96	102	+33 *	↔	–44 *	–25	↓
Treecreeper	43	77	+16	↔	–12	+25	↔
Chaffinch	88	68	+4	↔	–2	+37	↓
Greenfinch	54	36	–1	↑	+21	+24	↓
Goldfinch	36	25	+13	↔	+1	+22	↓
Linnet	15	11	+74 *	↓	+90	–6	↓
Bullfinch	83	64	+1	↓	–20 *	+5	↔
Reed Bunting	53	45	–10	↓	–36 *	–24	↓

n 2003 = number of sites operated in 2003 at which the species was captured
vs 2002 = percentage change between 2002 and 2003
vs 83–02 = % change with respect to 1983-2002 average
* = significance (at the 5% level) of increase/decrease with respect to previous year only
Long-term trend = long-term trend during the period of CES ringing. See Wider Countryside Report on the BTO website for further details (www.bto.org/birdtrends)
↑ = long-term trend shows an increase
↓ = long-term trend shows a decline
↔ = long-term trend shows stability



Long-term trend in adult abundance on CE sites. (Dotted line represents 95% confidence limits.)

FIGURE 1. Adult Song Thrush abundance



Long-term trends in productivity for Blackbird and Song Thrush on CE sites.

FIGURE 2. Blackbird and Song Thrush productivity.

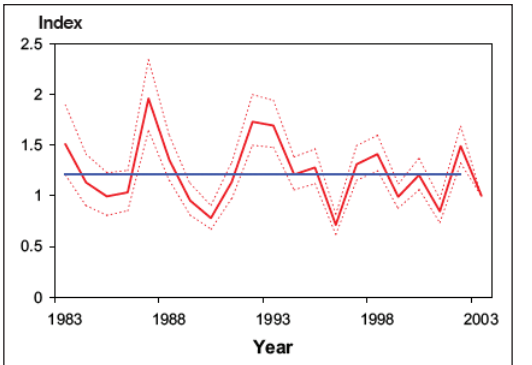
cyclical pattern (see *BTO News* 239) whilst Willow Warblers are in longterm decline, so a further drop in numbers in 2003 is worrying. Such declines could result from unfavourable conditions during migration.

BELOW AVERAGE BREEDING SEASON FOR MOST

The breeding season got off to a good start with a sunnier and drier February than normal and by March early broods of Robins and thrushes were reported. Many of these broods were later lost in sharp night frosts during April. Temperatures fluctuated throughout May and sharp frosts affected tits, finches and warblers. Ringers and nest recorders reported small clutches for Blue Tits and Great Tits across much of the UK. The cold and wet weather reduced the availability of caterpillar prey, which meant that broods were also small with partial and complete losses in some areas. Heavy rains mid-month caused more losses for early breeding species (*BTO News* 245). Warm weather throughout much of June benefited second broods, whilst July and August will be remembered for blistering heat which may have caused some problems for late nesting birds.

Given this mix of weather, it might not be too surprising that the overall breeding season was below average (Table 1). There were 12 statistically significant decreases in productivity between 2002 and 2003 and no significant increases. Residents (Wren, Robin, Dunnock, Blackbird, Longtailed Tit, Blue Tit, Great Tit, Bullfinch and Reed Bunting) and migrants (Reed Warbler, Blackcap and Chiffchaff) were affected. This year we have introduced a new measure of productivity in Table 1, which is the percentage change between 2003 and the average breeding success for each species during previous years, 1983–2002. This gives us a much better indication of how good a season it has been, relative to the longer-term average.

Figure 3 gives the long-term pattern of productivity for Blackcap and shows that productivity varies widely between years, as we might expect, largely because breeding success is heavily dependent on the weather. The average breeding success for Blackcap between the start of the CES index (1983) and the penultimate year (2002) is shown as a straight



Annual pattern of breeding success for Blackcap from CE sites. The straight line shows the average breeding success 1983–2002.

FIGURE 3. Breeding success of Blackcap.

line through the graph. You can then see how productivity in 2003 compares with the average for Blackcap and this shows clearly that productivity in 2003 was below the long-term average (–17%).

The mix of harsh frosts and rain during the early part of the season, and later hot temperatures and drought conditions in some areas, is likely to have caused problems for some species. Blackbird and Song Thrush both had a poor breeding season in 2003. The cold and wet weather during the first part of the season may have caused early broods to suffer and later, the hot weather is likely to have made it difficult for the adult birds to get the preferred earthworms from the baked ground. The long-term productivity indices for these two species are remarkably similar suggesting that similar environmental conditions affect them (Figure 2). Productivity was low for both species in 1984, 1986, 1988–1990, for Song Thrush only in 1995, for Blackbird only in 2001 and for both in 2003. The summer weather in these years was characterised by high temperatures and drought conditions. Breeding success tended to be better in the wetter summers of 1985, 1991, 1993 and 1997.

Overall, 2003 was a poor breeding season for many species. We hope for settled weather and improved breeding success this year and an enjoyable season's mistnetting for CES ringers.

ACKNOWLEDGEMENTS

Many thanks to Rob Robinson for overseeing the running of the CES scheme and for

contributing to this report. Jane Waters kindly typed in CES data received in a non-computerised format.

The Constant Effort Sites scheme was undertaken within the Partnership between the BTO and JNCC, as part of its programme of research into nature conservation.

THE SURVEY SUMMARY

The Constant Effort Sites Scheme is a key component of the BTO's Integrated Population Monitoring programme. It is a well-established method for monitoring population size (using changes in the total number of adults caught), breeding success (using the ratio of young birds to adults) and survival (estimated from retraps of birds ringed in previous years) for common songbirds in scrub, woodland and reedbed habitats. Dedicated ringers carry out ringing on CE sites, making 12 visits to each site between late April and the end of August, monitoring early and late breeding attempts for most species.

Results from CES, together with information from other long-running BTO schemes, can be found in the *Wider Countryside Report* on the BTO web site www.bto.org/birdtrends.

COVERAGE IN 2003

We were delighted that 11 new CES ringing sites were started in 2003, including seven in England, three in Wales and one in Scotland. The results we present above come from the 110 sites that have submitted data for 2003 so far: 85 from England, 15 from Scotland, six from Wales and four from Ireland. The habitats covered are comparable to previous years, with sites located in dry scrub (35%), wet scrub (27%), reedbed (24%) and deciduous woodland (14%). Nearly all CES ringers now computerise their own data and submit them electronically.

MORE CE SITES NEEDED

New Constant Effort Sites are welcomed from throughout Britain and Ireland, but particularly from southwest England, Wales, Scotland and Ireland, where there are currently few sites. The locations of the CES sites used in this report are shown on the map. Please contact Dawn Balmer at The Nunnery for further information.

THANK YOU

As with all ongoing BTO projects, the success of the CES scheme depends entirely on the dedication, enthusiasm and skill of its volunteers. We are grateful to all the ringers and helpers who participated in the scheme in 2003, some of whom are listed here.

Borders RG, Chew Valley RS, J L Coates, R Cole, G Dagnall, Doncaster RG, Fylde RG, Gibraltar Point BO, J A Glazebrook, Goldcliff RG, Gordano Valley RG, R J Graham, J Heaton, M Hughes, H Insley, A J Johnston, K H Jones, R J Lanaway, Lothian RG, Lower Test RG, Market Weston RG, Pembrokeshire RG, S T Robinson, M H Rogers, Rye Bay RG, Severn Vale RG, South West Notts RG, South West Lancs RG, A Stratford, D J Turner, M J Thompson, T H Walker, N C Williams.

(BO= Bird Observatory, RG= Ringing Group, RS= Ringing Station)

Bird Populations 8:168-170
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LATE FINISHERS AND EARLY STARTERS

DAVID GLUE
British Trust for Ornithology
The National Centre for Ornithology
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Norfolk, IP24 2PU, United Kingdom

BTO Research Biologist, *David Glue*, describes how a mild autumn and winter, led to late and early nesting activity among UK birds.

TARDONES Y TEMPRANEROS

El biólogo investigador del BTO *David Glue* describe cómo un otoño e invierno suaves han dado lugar a actividad de nidificación tardía y temprana en aves del Reino Unido.

BTO volunteers charted a more productive breeding season for most resident and migrant species in 2002 compared with 2001. The early signs for 2003 are very hopeful.

INDIAN SUMMER HELPS LATE NESTERS

A pleasantly changeable midsummer mix of weather in 2002 prolonged the breeding season for many. Observations from nestbox monitoring revealed the latest ever free-flying broods of Little Owl, Great Tit and Pied Flycatcher, a result of repeat layings. The warm, dry Indian summer heat in September saw successful late breeding by a number of species. Arguably, 'Nestbox of the Year' was at Treswell Wood (Notts), which successfully disgorged its final brood, Tawny Owl spring twins, which were followed by one, two and two young Stock Dove respectively (pers. comm. Chris du Feu).

BLACKBIRD AND ROBIN EXPLOIT NEW YEAR WARM SPELLS

Nesting activity continued low key during a mild, if very wet December. Most reports involved Woodpigeon and Feral Pigeon, though there were some surprises. The BTO Barn Owl Monitoring Programme showed that, after a flying start in spring 2002, pairs were egg-laying a fortnight earlier than normal. About 10% of the monitored birds produced late clutches, with successes in November (Lincs, Sussex and Notts) and even December 2002, defying unfavourable hunting conditions. One unrivalled pair raised broods of four and nine young near Peterborough (Cambs).

Breeding activity was checked in mid December, as arctic air brought sharp frosts on 18–19th. Then over the Christmas week, unseasonably warm air lifted temperatures to a balmy 15°C in sheltered South Devon and North Wales, prompting a scatter of nesting attempts into the New Year. Early breeding activity involved Golden Eagle, Raven, Ring-necked Parakeet, Nuthatch and tits. Nesting was invariably in the shelter of suburbia and rural hamlets, with egg-laying and active young of Mallard (Herts, Central London), Robin (York, Leicester) and Blackbird (Southampton, Surrey, Pembroke) being reported from parks, shopping malls, allotments and hospital grounds.

A raw northerly chill from 3–11 January 2003, when frosts dipped to –18°C at Aviemore

(Highland), destroyed most early nesting attempts. However, record high monthly temperatures in the third week, with temperatures topping 18°C at Aboyne (Grampian), prompted the first Tawny Owl clutches and broods, from Cheshire, Gwent, Nottingham and Aberdeen (see Box). This activity was fuelled by plentiful Field Voles and Wood Mice, which were in part a product of a bumper beech mast crop.

VALENTINE'S DAY CHILL FRUSTRATES RESIDENTS AND WINTER VISITORS

Frustratingly, temperatures see-sawed violently during February, although overall it was drier and sunnier than normal. Early blizzards and widespread snowfall extended southwards into London suburbs, followed by a destructive raw easterly chill around St Valentine's Day.

The recovery of 14 dead Wrens, crammed into a single roosting 'pouch' near Church Stretton (Shrops) was a chilling find. Similarly, emaciated and oiled corpses, and ailing birds, including Little Auk, Puffin, Snipe, Water Rail, Goldcrest and Waxwing, were reported from the BTO/WWT/RSPB/JNCC Wetland Bird Survey, or were passed to the BTO's Ringing Unit or Natural History Museum (Tring). Fortunately, the wintry episodes were short-lived and the absence of lengthy lying snow and penetrating frosts helped the survival prospects of unusual over-wintering Ring Ouzel (Derbys), Whinchat (Bucks), Dusky Warbler (Suffolk), Yellow-browed Warbler, Little Stint, Whimbrel and Spoonbill (various sites). High numbers of voles will have supported larger than usual numbers of Short-eared Owls, Long-eared Owls and Great Grey Shrikes.

By the end of the month, 13 nesting species had been reported (five fewer than this stage in 2002). This included egglaying by Egyptian Goose (Southeast), Moorhen (Gloucs), Starling (Co Cork) and Mistle Thrush (Hereford). The largest UK winter influx and dispersal of Bitterns in modern times apparently led to only a few extra booming males.

MARCH HEAT HELPS RESIDENTS AND SPRING MIGRANTS

March roared in on a mild southwesterly airflow, prompting a spate of egg-laying as some resident species, including Grey Heron, Robin, thrushes and Rook played 'catch-up' in the first week. Some noteworthy cases were Cormorant (Isles of Scilly), Dipper (Gwent) and Lapwing (Bucks). Migrants, including Stone Curlew (Breckland, 3rd), Sandwich Tern (Anglesey, 16th) and Ring Ouzel (Durham 17th), were quickly noted back at traditional breeding sites by contributors to BTO/BirdWatch Ireland *Migration Watch*.

Record wintering numbers of Avocet and Mediterranean Gulls in certain counties have led to welcome extra breeding pairs. Peregrines, happily nesting atop Battersea Power Station since 2001, were joined by further pairs prospecting in London. The UK Peregrine Survey 2002 had showed an increasing use of man-made structures, notably ecclesiastical buildings, bridges, chimneys, warehouses, pylons and, most intriguingly, trees. In a similar fashion, Raven, having claimed Chester Cathedral, showed interest in further 'artificial' structures as nest sites, along with trees and quarries, enhancing prospects of their range extension yet farther eastwards in 2003.

With high pressure anchored over the UK midmonth, temperatures climbed to 19°C at Aberystwyth (Dyfed) by St Patrick's Day. Warm, glorious sunshine, leaf bud burst, and increased aerial insect food supplies led to a surge in egg-laying of many species, including grebes, dabbling duck, rails, some plovers and corvids, alongside Woodcock (Wilts), Long-eared Owl (Derbys) and Woodlark (Surrey) in the third week.

As in 2002, we look set for a possibly productive breeding season.

EARLY EGG-LAYING TAWNY OWLS

When long-time BTO Nest Recorders, Bryan Perkins and Colin Lythgoe, undertook the annual spring-clean of their nestboxes in Quakers Coppice, Crewe (Cheshire) on 27 February, they were surprised to be confronted by a large fledgling Tawny Owl and remains of two other chicks (fratricide is regular in this species). By 3 March the fledged owlet was found happily roosting alongside two older siblings and an adult in woodland nearby.

Back-calculation, based upon observations made, suggested that a clutch of five eggs, laid during the unseasonably mild spell between Christmas 2002 and the New Year, produced five hatchlings, three surviving to leave the nestbox.

Meanwhile, Julie Stevens of Retford (Notts) had chanced across a large, dazed juvenile Tawny Owl road casualty. A nearby nestbox was found to be holding another three young. Local owl expert, Derick Scott, considered that the road casualty was fit for release and was the result of an egg laid around 6–9 January.

Several further clutches were started before the close of January (see above). Tawny Owls adjust their breeding season around an often fickle food supply but such exceptionally early clutches are rare. The bulk of clutches are normally laid in late March, so that foraging parents can satisfy developing young in early May on an ephemeral crop of larger mammalian prey. Just occasionally, as in Winter 2002/03, a super-abundant food supply and mild weather over-rides this time-table. In Autumn 2002, a huge crop of beech mast and other woodland fruits, fuelled locally high populations of rodent prey, enabling Tawny Owls to take the advantage via early egglaying. *David Glue*

BTO NEST RECORD SCHEME

Completed Nest Record Cards for nests encountered are valued by the BTO. For a free starter pack please contact: Peter Beaven, at BTO Thetford HQ.

Bird Populations 8:171-172
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FULL OF EARLY PROMISE!

DAVID GLUE
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The National Centre for Ornithology
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Norfolk, IP24 2PU, United Kingdom

The early breeding season promised much but BTO Research Biologist, *David Glue*, describes how weather extremes provided challenging conditions for many UK nesting birds.

¡TÁNTAS PROMESAS TEMPRANAS!
El temprano inicio de la temporada reproductora prometía mucho pero el biólogo investigador del BTO *David Glue* describe cómo los altibajos meteorológicos pusieron las cosas difíciles a muchas aves reproductoras en el Reino Unido.

Year 2003 demonstrated the inherent dangers of attempting to foretell nature's fickle timetable. By the close of a dry, sunny February, BTO surveyors reported egg-laying by thrushes, corvids, Starlings and Egyptian Geese, among others. This was an optimistic start.

STONECHATS PROFIT AS BARN OWLS HIT BY SPRING DROUGHT

Spring blossomed in March, with a remarkable 40-day long, essentially rainfree, warm spell for many parts. Early clutches were started by Woodlark on 9th (Thetford Forest, Norfolk) and Stonechat on 16th (East Dorset). There was a surge in egg-laying among grebes, Grey Herons, dabbling duck and thrushes in the third week, with reports of clutches laid by Woodcock (Wilts), Dipper (Gwynedd) and Long-eared Owl (Derbys) by the month's end.

April maintained the warm theme with daytime temperatures 2°C above the norm (warmest April since 1987). However, brood losses of Robins, Song Thrushes and Pied Wagtails were attributed to sharp night frosts under clear skies. It was another dry month, posing nesting problems for some species. Corvids struggled, notably Rook and Chough, with deferred egglaying and small broods, as baked turf yielded few soil invertebrates. Fortunately, the flagship pair of Chough frequenting The Lizard (Cornwall), hatched three young for a second successive year, although one chick was taken by a gull.

Large areas of tinder dry heath, moor and forest were destroyed in spring fires, the worst since 1997. Known occupied nests of Curlew (Peak District), Twite (North Staffs), Shorteared Owl and Hen Harrier (Cumbria, Lancashire) were lost in blazes. Breeding owls stuttered, as retarded vegetation, notably grasslands, led to a crash in some key small rodent prey populations, notably Field Vole and Wood Mouse. The BTO Barn Owl Monitoring Programme reported lightweight hen birds in poor condition, as well as many cases of non-breeding, and small broods.

Southeasterly continental winds in April assisted the prompt return of some Swallows, Sand Martins and Pied Flycatchers, with cases of each completing clutches by the end of the month. Ironically, the bulk of these species, and

some other migrants, were subsequently delayed by adverse cyclonic weather in North Africa and Iberia.

TITS AND PIED FLYS FALTER IN CHILLY MAY DOWNPOURS

Temperatures see-sawed in May, to the detriment of many breeding birds. Damaging prolonged tropical deluges arrived by mid-month. Flash floods and swollen water courses caused locally heavy losses among upland plovers, Merlins and Ring Ouzels, inland colonies of Blackheaded Gulls and Common Terns, streamnesting wagtails, Kingfishers and Reed Buntings (especially along the Severn-Trent complex).

Sharp frosts across much of the UK affected nesting tits, flycatchers, finches, and warblers. Those monitoring nestbox schemes reported a poor year for tits generally. Both Blue Tits and Great Tits survived the winter in strength, boosted by bumper beech mast. Their high densities probably contributed, in part, to small clutches. Damp and chill, which restricted caterpillar prey, led to many partial or complete brood losses. Andy Gosler (Edward Grey Institute, Oxford), described the worst ever season for Great Tits at Wytham Woods (barring times of excessive Weasel predation) in some 50 years of study, with small broods of young comprising skinny bundles of feathers weighing just 14–15 g (20–21 g being the norm).

Seabirds, as ever, enjoyed mixed success. Many, notably Kittiwakes and certain auks, were slow to return in strength to breeding ledges, but persisted successfully. Little Terns reached all-time high numbers in Wales, while Arctic Terns and others endured another disastrous year on Shetland, attributed to a lack of sandeels and over-fishing.

PROLIFIC PEREGRINES FLY EAST AS AVOCETS GO WEST

A warm subtropical airflow crossing the UK during much of June, created generally improved nesting conditions. Melodious Warbler (Co Durham), Serin (Beds) and Common Rosefinch (North Yorks) sang strongly but failed to attract mates. Elsewhere, Bittern, Golden Oriole, Firecrest and Marsh Warbler were more successful at fresh haunts. Avocet bred for the firsttime in Wales (Gwent levels). More surprising was the successful pair, inland at Upton Warren (Worcester), well away from the usual coastal brackish water.

The UK's newest gannetry, comprising five nests, was established on The Noup, Westray (Orkney). Peregrine bred as far east as Lincolnshire, while suburban pairs nested atop Battersea Power Station (Central London), Chichester Cathedral (Sussex), Gloucester city hospital and Nottingham Trent University, to the delight of the public. Meanwhile, motorists on the M25, as well as M40, were entertained by increasing numbers of hunting Common Buzzards and Red Kites, nesting nearby.

NIGHTJAR AND QUAIL ENJOY MIDSUMMER SCORCHER

Regular warmth in July, with above average day and night temperatures, initially helped late breeding birds. Follow-up checks of nestboxes revealed welcome replacement broods of Nuthatches and Pied Flycatchers, while Swifts eventually fledged families of two and three young, following early losses.

Searing 'High Summer' heat midmonth, with temperatures exceeding 30°C, brought mixed fortunes. Quail summered widely, with family groups noted in grasslands on airfields, golf courses and an allotment, as well as in cereal fields. Corncrake profited, notably on sympathetically managed wetlands in the Western Isles of Scotland.

Torrid, steamy heat in early August, boosted aerial and aquatic invertebrate prey, fuelling late second broods of Nightjars, Reed Warblers and Spotted Flycatchers, while some seed-eaters raised third families. Heatwave and severe drought, as stifling tropical temperatures clipped the magical 100°F mark for the first time in UK, finally took its toll on normally heat tolerant, breeding birds. Just as roads melted, rails buckled and humans wilted, so baked mud nests of House Martins crumbled, broods of Swallows in farm outbuildings perished, clutches of Great Crested Grebes and diving ducks, exposed by falling water levels, fell prey to dehydrated Fox and Badger.

From mid-August, nesting activity among hitherto persistent resident and migrant insectivores and seedeaters slowed. The full results from BTO nest recorders, ringers and surveyors for 2003 are eagerly awaited.

Bird Populations 8:173-176
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NEST RECORD SCHEME: LATEST RESULTS

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Analysing over 350,000 Nest Records Cards for 94 species brought the total on the NRS Concern List to 15 species. The latest trends and results are reported by *Humphrey Crick, Dave Leech* and *Peter Beaven*.

PROGRAMA DE REGISTROS DE NIDIFICACIÓN: ÚLTIMOS RESULTADOS
El análisis de 350,000 registros de nidificación de 94 especies aumentó el número total de especies amenazadas del NRS a 15. *Humphrey Crick, Dave Leech* y *Peter Beaven* informan sobre las últimas tendencias y resultados.

The female House Sparrow dives quickly into her nest hole — a small hole at the apex of a roof on an old timber-framed house. She has a beak full of food for her young and they call noisily at her, trying to attract her attention so that they get fed first. This House Sparrow family is lucky — they live in a small village where food is abundant – lots of insects in the rather neglected gardens surrounding the house and a small yard nearby where chickens and other livestock are kept by a hobby farmer. Elsewhere in the country, House Sparrow broods are not doing so well.

In fact, the latest results from the BTO's Nest Record Scheme (NRS) suggest that average brood sizes of House Sparrows have now fallen sufficiently for there to be a statistically significant downward trend since 1980. In 1980, House Sparrows were producing, on average 3.5 young per brood, but by 2003 this has fallen to 2.8, with annual averages consistently dropping below three young since 1999. This is just one of a number of disturbing trends that are revealed by the latest analysis of NRS data.

Every year the BTO issues an NRS Concern List to highlight potentially important declining trends in breeding performance. We do this specifically for the Joint Nature Conservation Committee (JNCC), which is the UK Government's conservation advisor and jointly fund the scheme as part of the BTO/JNCC partnership to monitor bird populations. This year the number of species on the list has increased by 4, bringing the total to 15 species (see Box 1). The new species are Barn Owl, House Sparrow, Wheatear and Pied Wagtail. These join those that have been on the list for a number of years: Bullfinch, Dunnock, Grey Wagtail, Lapwing, Linnet, Moorhen, Reed Bunting, Ringed Plover, Willow Warbler, Yellowhammer and Yellow Wagtail. The reasons for their inclusion on the list are given in Box 1 and we examine the new species in more detail below, the other species having been considered previously (*BTO News* 249: 4–5). Methods of analysis are briefly described in Box 2. One species, the Red-throated Diver, has had to be removed from the list because the BTO has received too few records since 1999 to be able to monitor it effectively.

NEWLY DETECTED DECLINES

Barn Owl: Barn Owls are now the subject of a special scheme, the BTO's Barn Owl Monitoring

BOX 1
THE NRS CONCERN LIST

Species	Years on List	Significant decline in	Population trend
Moorhen	11	Clutch size & Nest survival (E)	Fluctuating
Ringed Plover	7	Nest survival (E)	Uncertain
Lapwing	8	Nest survival (E)	Amber List
Barn Owl	New	Brood size	Amber List
Yellow Wagtail	4	Brood size	Amber List
Grey Wagtail	1	Clutch & Brood size	Amber List
Pied Wagtail	New	Clutch & Fluctuating Brood size	
Dunnock	5	Nest survival (E)	Amber List
Wheatear	New	Brood size	Possible decline
Willow Warbler	5	Nest survival (E)	Amber List
House Sparrow	New	Brood size	Red List
Linnet	12	Brood size & Nest survival (C)	Red List
Bullfinch	8	Nest survival (E)	Red List
Yellowhammer	1	Nest survival (E)	Red List
Reed Bunting	12	Nest survival (E)	Red List

(Trends come from www.bto.org/birdtrends: Red and Amber Lists are of species with high or medium conservation concern, respectively, as explained in *BTO News* 242: 11–14).
E indicates nest survival at the egg stage; C at the chick stage.

BOX 2
NRS DATA ANALYSIS

NRS data for 94 species were analysed using methods that are outlined in a recent review paper in *Bird Study* 50:254–270. Trends in laying date, clutch and brood sizes and in daily nest failure rates over egg and chick stages are described by linear or quadratic regression, as appropriate. Trends were not calculated where the mean annual sample size was less than 20 for nest failure rates or less than 10 for the other measures. Breeding performance in 2003 was assessed by comparing the observed annual mean in 2003 with that predicted from the trend calculated from 1966–2002.

Species are placed on the **NRS Concern List** if (a) they show statistically significant declines in some aspect of breeding performance over at least the last 15 years and (b) they are on the red or amber list of conservation concern or there is some uncertainty over their population status.

Programme (BOMP), but the nest record information from BOMP feeds through into the NRS as well. Worryingly, for the first time we have detected a downward trend in average brood size for the species, down from 3.43 chicks in 1987 to 3.16 in 2003 (see Figure 1a). The trend is a result of a series of poor years in the 1990s and 2000s, particularly in 1998 and 2001. BOMP suggested that the latter was a result of severe autumn flooding in 2000 that appeared to affect the numbers of small mammals that Barn Owls feed on (*BTO News* 242: 24). Although this was a oneoff (we hope!), the overall trend appears to be for smaller broods. It is possible that the trend indicates that breeding season food supplies for Barn Owls are becoming less abundant.

House Sparrow: This species was recently the subject of a government-funded study (Defra) (*BTO News* 242: 4–5). One of its conclusions was that rural House Sparrow declines were due to declines in survival rates and that the population decline was eventually halted mainly by improvements in breeding performance. The accelerated decline in brood size since 2000 is thus a cause for concern (see

FIGURE 1. Changes in brood sizes.

Figure 1b). Work by Kate Vincent at the University of Leicester has suggested that insect food for chicks may be limited in certain situations and the new trend may be a manifestation of this at a wider scale.

Pied Wagtail: Pied Wagtail populations have fluctuated a great deal since the 1960s, but populations monitored by the Waterways Bird Survey (WBS) declined by nearly 50% since 1975. It is thus of some concern that both average clutch and brood sizes show significant declines: clutch size from 5.14 in 1966 to 4.94 in 2003, and brood size from 4.52 in 1980 to 4.16 in 2003, although these may be counter-balanced somewhat by improvements in nest survival at the egg stage (see Figure 1c). The species is little studied (surprisingly) and thus the possible reasons for the new trend can only be speculated upon at the moment.

Wheatear: This charismatic species was not well monitored by BTO schemes until the inception of the BTO/JNCC/RSPB Breeding Bird Survey in 1994. The only information available came from the *New Breeding Bird Atlas* (1988–1991), which suggested that losses had occurred on the margins of its main range. The decline in its average brood size from 5.1 in 1963 to 4.5 in 2003 is relatively large and warrants further consideration, given the lack of information about its long-term status.

OTHER TRENDS

The general pattern of long-term trends are as follows:

Laying dates: Trends were estimated for 64 species, and nearly half (31) showed statistically significant trends towards earlier laying over at least the past 15 years. This increases the number of species apparently affected by climate change from the 42% of 60 species reported last year. Only one, Yellowhammer, showed a significant trend toward later laying.

Clutch sizes: While the majority of the 72 species analysed showed no trend in clutch size over time, of those that did, twice as many showed declines than increases (18 vs. 9). The majority of those with declining clutch sizes also have increasing trends of population abundance and thus may be experiencing competition for breeding space, and a greater proportion may be in less suitable habitats than when they were less numerous.

Brood sizes: A similar pattern is evident for average brood sizes. 28 species show declining average brood sizes, 16 show increases and 29 show no trend. Many of the declines are again associated with population increases.

Failure rates of nests: At the egg stage, trends were estimable for 74 species: 37 showed significant declines, but only 12 showed increases. At the chick stage, 69 species were analysed and 19 showed declines in failure rates and only 6 showed increases. Generally then, nest success has improved, affecting two main groups of birds: (a) those suffering from declining abundance, such as Marsh Tit and Starling and therefore likely to be affected by reduced competition and reduced use of suboptimal habitats, and (b) those that are no longer affected by the side-effects of pesticides used in the 1960s and 1970s and those that may have benefited

from the reduction in gamekeeper pressure in the UK, such as raptors and corvids.

THE 2003 SEASON

The 2003 nesting season appeared to be a relatively 'ordinary' one for birds breeding in the UK. Overall 10 species bred significantly early compared with the expected dates predicted from long term trends, *versus* four species breeding later than expected. Clutch and brood sizes and nest failure rates were generally unexceptional when compared to recent trends.

THE BENEFITS OF IPMR

Probably the most stunning difference between this and previous annual reports has been the huge additional input made by records submitted on Integrated Population Monitoring Reporter (IPMR) software. The number of records analysed this year has tripled as large numbers have been submitted using the home inputting program developed by volunteer Mark Cubitt. Not only has this increased the numbers of records of nestbox species that we could analyse, but there has been a noticeable effect on the numbers of records of open-nesting species received.

This is hugely beneficial for the scheme's aim of monitoring the breeding performance of the UK's birds and we would like to thank all volunteers who made the effort to use the new program. We hope that more members will be encouraged to visit and record the nests of birds, particularly those of open-nesting species such as thrushes, warblers and finches to help ensure that the BTO can continue to track the fortunes of our nesting birds for their future.

If you would like a free 'Starter Pack' or information about IPMR, please contact Peter Beaven at nest.records@bto.org

The NRS is funded by a partnership of the BTO and JNCC and we are very grateful to all the volunteers who send in their valuable records, without whose efforts none of this monitoring would be possible. We also thank Karen Wright for help with the NRS database and to David Glue for his contributions to the scheme.

Bird Populations 8:177-180
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WETLAND BIRD SURVEY ALERTS

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BTO/WWT/RSPB/JNCC Wetland Bird Survey (WeBS) counters help to reveal the extent of waterbird declines on some of the UK's important sites.

WeBS data are often used to guide conservation policy and management. Here *Ilya Maclean* and *Graham Austin* describe some of the potential conservation concerns highlighted by the latest WeBS Alerts update.

ALERTAS DE LOS CONTEOS DE AVES EN HUMEDALES

Los observadores de los conteos de aves en humedales (WeBS) del BTO/WWT/RSPB/JNCC ayudan a revelar la magnitud de los declives de aves acuáticas en algunos de los lugares más importantes del Reino Unido.

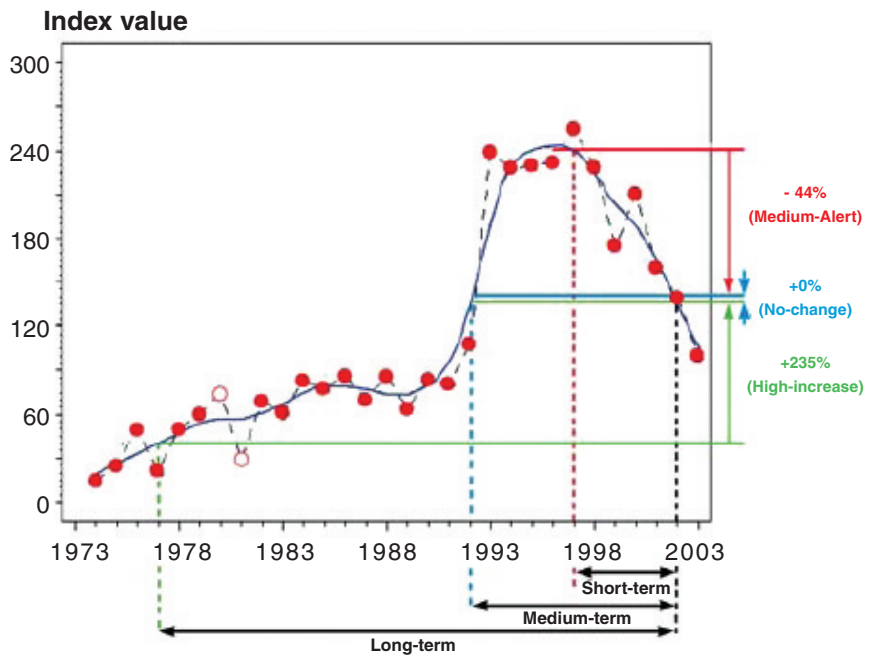
Los datos del programa WeBS son utilizados con frecuencia para guiar políticas de conservación y manejo. *Ilya Maclean* y *Graham Austin* describen algunos objetivos potenciales de conservación que emergen de la última alerta de WeBS.

Of all the bird species in the UK, it is probably waterbirds that are present in the most internationally important numbers. The government has agreed to meet international obligations to protect these birds, but unfortunately the funds available to do so are finite and it is difficult to know where conservation resources would be best used.

One way of guiding conservation policy is to identify those sites that contain the most important numbers of waterbirds and monitor changes in bird numbers on these sites. If one knows which species are declining the most, or which sites have a large number of declining species, resources can then be directed towards assessing why these changes have taken place and then, where possible, managing to reverse them.

Whilst such monitoring is helpful, it does not provide the full answer. Alerting people to declines depends upon placing recent population changes in a long-term context. Also, declines or increases at any given site may not necessarily be due to conditions at that site, but could potentially be linked to large-scale population changes, perhaps driven by conditions on breeding grounds. In order to identify whether local problems are responsible for decreasing bird numbers, it is necessary to compare changes at that site with those occurring regionally and nationally.

The WeBS Alerts System provides a standardised method of doing this (Figure 1). The direction and magnitude of changes in bird numbers are identified at site level and these trends are compared to regional and national trends, allowing distinctions to be drawn between declines due to sitespecific factors and those driven by largescale population changes. Species that have undergone major declines can then be flagged by issuing an Alert.



First, index values are calculated, based on WeBS counts made by volunteers. Then a smoothed trend is fitted through the data using a Generalised Additive Model. Percentage changes in the smoothed trend value over the short (5 year), medium (10 year) and long term (25 year) are calculated. For some Special Protection Areas (SPAs), the percentage change since the site was designated is also calculated. In this instance, the site was designated as an SPA in 2001, so insufficient time has elapsed for a meaningful change to be calculated. Closed circles represent complete counts and open circles represent "imputing" missing or incomplete data. Such values are derived by calculating the proportion of the regional population typically occurring on the site when complete counts are made and then estimating what the number might be by examining trends elsewhere in the region.

A High-Alert is triggered in instances where declines exceed 50% and a Medium-Alert is triggered when declines exceed 25%. Medium-Increases are reported when increases exceed 50% and High-Increases when increases exceed 100%.

FIGURE 1. An example illustrating the standardised way of assessing population trends using the WeBS Alerts system (Grey Plover on the Firth of Forth Special Protection Area).

THE NEW WEBS ALERTS SYSTEM

The WeBS Alerts System has been running for a number of years. However this year's update has seen some important changes in the methodology and has provided some illuminating insights into changes in waterbird numbers. On previous occasions, the WeBS Alerts System reported trends in bird numbers on all Special Protection Areas (SPAs) (aside from a few, which haven't been counted) on a three-year rolling basis and key Sites of Special Scientific Interest (SSSIs) designated for waterbirds on a six-year rolling basis. Thus in any given year we reported on fewer than one third of sites and information was sometimes several years out of date.

We now aim to review all sites on an annual basis. This has been possible because the process has become increasingly automated. Complex computer programs have been developed that retrieve all the necessary data off the database, spend hours analysing it, and produce ready-formatted graphs ready for displaying on the internet. This saves tedious hours of manual data analyses and page formatting. It also means

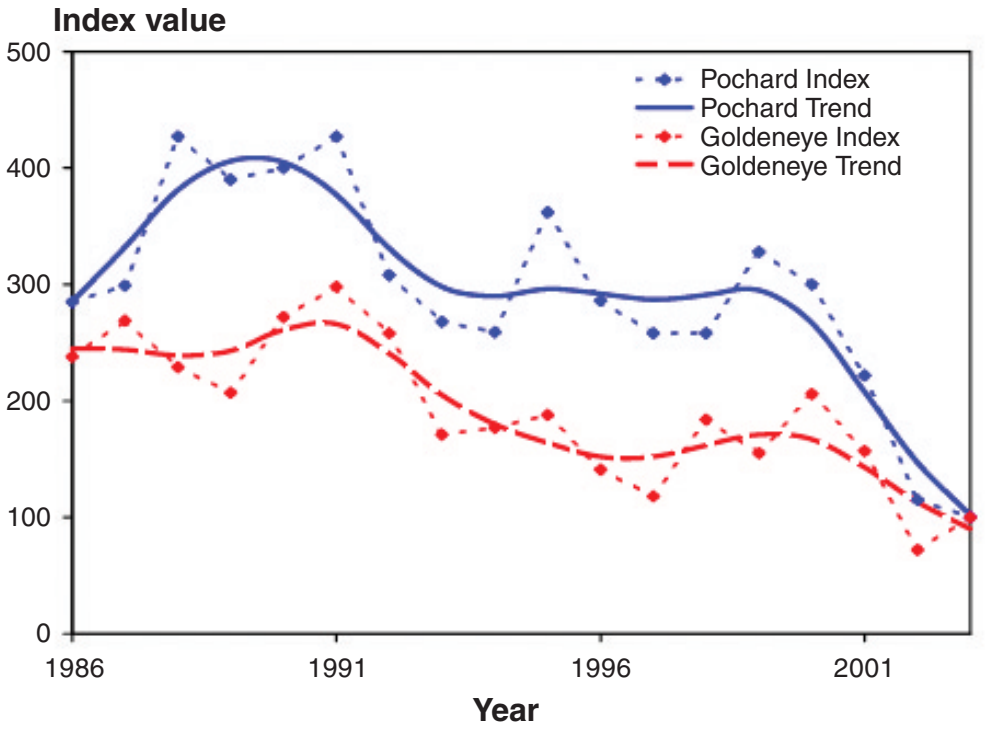
that the whole report is much more user friendly and is available online (www.bto.org/survey/webs/webs-alerts-index.htm). Although the results of the WeBS Alerts System are already used by government bodies such as JNCC and the statutory conservation agencies, it is hoped that this new format will ensure that results are even more widely accessible.

WATERBIRD TRENDS

One of the biggest conservation issues highlighted by WeBS Alerts is the demise of diving ducks on Loughs Neagh and Beg in Northern Ireland (Figure 2). Species such as Pochard and Goldeneye have undergone precipitous declines triggering High-Alerts. This drop in numbers is particularly worrying given the international importance of this site for these species. To illustrate the scale of the problem, back in the winter of 1990/91, these Loughs hosted over 40,000 Pochard, almost 11% of the northern European wintering population and more than three quarters of the UK population. In the winter of 2003/04, fewer than 8,000 were recorded by WeBS counters.

The stories for Goldeneye and Tufted Duck are much the same. Goldeneye numbers peaked in 1990/91, when almost 14,000 were recorded (over 4% of the European wintering population and almost half the UK population). In the winter of 2003/ 04, fewer than 4,500 were recorded. Somewhere along the line, over 55,000 individuals of these three species have disappeared from the site. The Environment and Heritage Service in Northern Ireland has begun to investigate why. Changes in the abundance of chironomid larvae (the main food supply of these diving duck species) in response to eutrophication has been offered as one likely explanation.

The most adversely affected site is Abberton Reservoir, however. Of the 14 species evaluated, nine have had High- Alerts triggered and a



Diving waterfowl such as Pochard and Goldeneye (shown here), but also Coot and Tufted Ducks have undergone drastic declines. The Lough Neagh and Lough Beg Special Protection Area is the most important site in the United Kingdom for waterfowl.

FIGURE 2. Pochard and Goldeneye trends on Lough Neagh and Lough Beg.

further species has a Medium-Alert raised (http://blx1.bto.org/ webs/alerts2005/Results/ UK9009141/ 9009141.htm). English Nature has already begun investigating the reasons for recent declines, including seeking the views of local WeBS counters.

It is not all bad news though. Waders have tended to fare somewhat better than diving ducks, and dabbling duck numbers on some sites have increased substantially. In the UK as a whole for example, Gadwall have increased almost sixfold in the last 25 years.

The new report is now available online at http://blx1.bto.org/webs/alerts/.

THANKS

Thanks to the team of counters who collect data for WeBS, important conservation monitoring projects like this one can be undertaken.
Acknowledgements at the end of the next article.

Bird Populations 8:181-183
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LATEST NEWS FROM THE WEBS FRONT

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Mark Collier, Steve Holloway and *Andy Musgrove*, from the BTO's WeBS team, review the findings for winter 2003/04.

ULTIMAS NOTICIAS DEL PROGRAMA WEBS
Mark Collier, Steve Holloway y *Andy Musgrove*, del equipo WeBS del BTO, revisan los resultados del invierno 2003-04.

The 2003/04 season was a very successful one for the Wetland Bird Survey (WeBS) core counts, with counts carried out at around 2,000 sites within the UK during the crucial 'winter' period of September to March. At least 1,500 sites were counted in each of these months, with almost 1,200 covered every month throughout this period. Altogether around 3,000 counters were involved at some time or other. We highlight some of the main findings.

DIVERS AND GREBES

Both Black-throated and Great Northern Divers were recorded in similar numbers to those of the previous winter, whilst the totals of Red-throated Diver were somewhat lower than recent years. Interestingly, very large numbers were recorded flying past Thorpeness, on the Suffolk coast, including an incredible peak of 4,710 on 4 January 2004. The numbers of both Little and Great Crested Grebe continued at their current high levels, having increased most years since their inclusion as WeBS species in 1982/83. In contrast, the counts of two of our rarer wintering grebes — Red-necked and Black-necked — were both at their lowest ever and the maximum count of the latter was just under half that of winter 2002/03.

CORMORANTS, HERONS AND EGRETS

Numbers of Cormorant, Grey Heron and Little Egret all continued their recent increase, albeit on a small scale for the first two species.

SWANS AND GEESE

There were mixed fortunes among the swans with no change for Mute Swan, an increase for Whooper Swan and a slight decline for Bewick's Swan. However, Bewick's recorded the highest single site total ever in the UK with 6,330 individuals on the Ouse Washes in early January; although this was not an official WeBS count. The numbers of Whooper Swan showed an increase of 35% over the previous winter, with the Ouse Washes, Martin Mere and the Ribble Estuary the most important sites. Fewer European and Greenland White-fronted Geese were recorded than during 2002/03, both totals falling by around 20%. In contrast, counts of Pink-footed Geese remained high and totals of Icelandic Greylag, Canada and Barnacle Geese did not differ greatly from the previous winter.

During recent years there has been concern expressed over the apparent decline in the numbers of Darkbellied Brent Goose around our shores, and this trend continued during the 2003/ 04 winter, and resulted in the lowest total for over 20 years. The most serious declines were evident from the North Norfolk Coast, Blackwater Estuary, Pagham Harbour, the Beaulieu Estuary and the Medway Estuary. Although the reasons for this decline are not entirely understood, fledging success over recent years has fallen below the 15% level needed to maintain the population. However, there was better news regarding the 2003 breeding season, and this was reflected in a greater number of family parties sighted during winter 2003/04.

Lindisfarne and Strangford Lough recorded an increase of around 10% in both the Svalbard and East Canadian High Arctic populations of Pale-bellied Brent Geese respectively, with a site record of over 21,000 geese at the latter wetland in October.

DUCKS

The winter populations of Shelduck, Teal, Mallard and Pintail recorded by WeBS were each similar to those of the previous winter. This is in contrast to Gadwall, which continued its long-term increase and reached record levels at over 16,800 individuals in December. The Gadwall is a widespread and increasing species throughout much of the UK, although the stronghold remains central and southern England. The wintering population includes birds from north and east Europe, whilst some of the UK breeding population, which is currently estimated at less than 1,000 breeding pairs, winter in southern Europe. Despite some fluctuation in recent years there has been an approximate doubling of the numbers in this species recorded by WeBS during the last 10 years (Figure 1). Similar population growth has been reported across Europe. Numbers recorded in Northern Ireland were slightly higher than the previous winter, although the species is still scarcer here than in much of the rest of the UK.

Over the past couple of years similar patterns have been evident in the peak counts of Tufted Duck, Scaup, Goldeneye, Red-breasted Merganser and Goosander. Following unusually low totals of these species in 2002/03, numbers recovered in 2003/04, although all remain below their average of recent years. Shoveler numbers fell by around 20% from their record peak of 2002/03 whilst, conversely, Wigeon rose by a similar amount to reach 497,000, their highest total to date. On the minus side, declines were recorded in several other duck species, most notably Pochard, Common Scoter and Velvet Scoter. The government's Ruddy Duck control

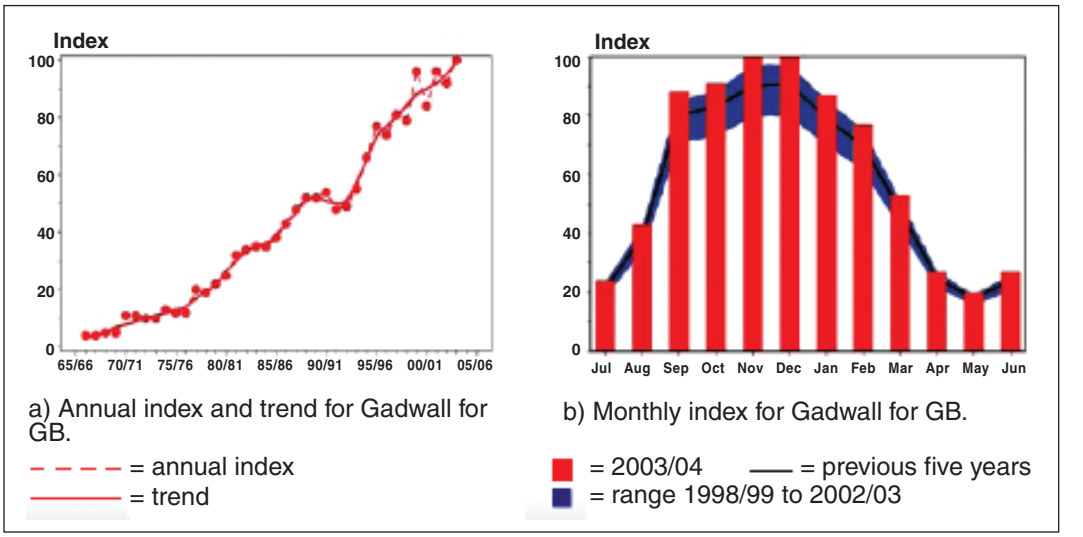

FIGURE 1. Annual and monthly indices for Gadwall.

programme may have contributed to WeBS counters recording its lowest total for eight years.

WADERS

Following a Europe-wide trend, Avocet numbers continued to increase in the UK, both as a breeding species and as a wintering one. Many of the British breeding birds winter between southern Europe and West Africa, whilst our wintering population comprises both remaining breeders and birds from the nearby continent. Britain has experienced a dramatic increase in Avocet numbers over the past 15 years, with nearly 6,000 recorded in December. With this rise, annual indices have more than doubled in the last decade, with 2003/04 seeing a 12% increase on the preceding year. Of the 18 sites that held numbers exceeding the national 1% threshold, 14 were in eastern England, underlining this region's status as the heart of the UK range.

Other species of wader exhibited varying fortunes. Counts of both Oystercatcher and Ringed Plover were slightly below those of the previous year and Grey Plover continued its recent downward trend to a population level more akin to that of 1989/90. More encouragingly, Golden Plover and Lapwing totals both rose by a quarter, although, as ever, large numbers of both these plovers regularly occur on nonwetland habitats that are not covered by WeBS. Knot numbers remained similar to those of 2002/03. The British index for Sanderling fell to its lowest level for over half a decade. Notably, although the overall British Turnstone index has been in steady decline since the high point in 1987/88, there has been an increase over the past two winters in Northern Ireland. Dunlin, Curlew and Redshank counts remained fairly stable, and similar to recent winters, whilst a fall in Bar-tailed Godwit numbers was well within the variability exhibited by the species over recent years. By way of a contrast, Black-tailed Godwit continued its 20-year increase in numbers. The majority of non-breeding Black-tailed Godwits recorded in Great Britain and Northern Ireland are of Icelandic origin (*islandica*). However, a small proportion of passage birds are of the nominate race, occurring mainly in the east and south of England, where small numbers also breed. The species has shown a less consistent increase in Northern Ireland, although index values have risen consecutively for the past three years, and the current value represents the highest ever reported. Peak counts were recorded during autumn passage (August to October) in Great Britain and during November in Northern Ireland.

The forthcoming *Wildfowl and Wader Counts* will cover the fortunes of all species in more detail, and is sent free to all participating counters. In the future, these reports will also be available on the BTO website at www.bto.org/survey/webs/index.htm. The WeBS Office can be contacted by e-mail at webs@bto.org.

The Wetland Bird Survey (WeBS) is entirely dependent on the many thousands of dedicated volunteer ornithologists who supply the data and to whom we are extremely grateful. The Local Organisers who coordinate these counts deserve special thanks for their contribution. WeBS is a joint scheme of the BTO, Wildfowl & Wetlands Trust, RSPB and JNCC.

Bird Populations 8:184-187
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BLACKCAP AND ROSEFINCH — GARDEN STARS

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BTO Research Biologist, *David Glue*, summarises findings from Winter 2003/04 of the Garden Bird Feeding Survey.

LA CURRUCA CAPIROTADA Y EL CAMACHUELO – ESTRELLAS DEL JARDÍN
El biólogo investigador del BTO *David Glue* resume los resultados del programa de conteos en comederos de jardín para el invierno de 2003-04.

The methods, scale and impact of supplementary feeding birds within UK gardens have escalated dramatically over the last 34 years, as shown by latest results from the BTO's Garden Bird Feeding Survey (GBFS). Recent GBFS findings chart fresh species, changes in status and also behaviour at UK birdtables — revealing much to encourage, but with some concerns.

RICH RURAL GARDENS

As ever, weekly counts of all species exploiting supplementary food and water, from October to March inclusive, were kept by householders — 122 in rural villages, hamlets and farmsteads, 143 in areas of high density housing. The sample is considered broadly representative of dwellings overall.

Species richness by site over the winter of 2003/04 varied widely from just six species at a coastal Ramsgate (Kent) garden, to 39 species in Walbottle village (Newcastle-upon-Tyne).

Interestingly, in the 2003/04 winter, rural gardens on average supported more species than those in suburbia (23.0 and 20.8 species respectively). This contrasts with recent winters, when the warmer microclimate of suburban gardens proved more attractive (see *BTO News* 242, 248). A notable feature of the 2003/04 winter was a major influx of finches and thrushes, as well as some waterfowl, tits and buntings into rural gardens during wintry cold snaps in the New Year, when natural foods were prematurely diminished.

Overall, an impressive 81 species were recorded taking food or water. Robin and Blue Tit took food at all the gardens sampled (Table 1). The 'Top Twenty' species in winter 2003/04 took food at half, or more, of sites. A comparison of the relative frequency of feeding by these, with the initial decade of study (1970s), and more recently (1990s), proves illuminating. The majority of species show some measure of greater attendance at feeding stations — most strikingly by Goldfinch, Siskin, Long-tailed Tit, Magpie, Woodpigeon and Sparrowhawk. These reflect healthy populations, range recoveries, a greater tolerance of man (often via reduced persecution), and behaviour shifts to exploit fresh foods. On the debit side, House Sparrow and Starling show a marked decline at feeders, while the Song Thrush decline looks to have arrested at a lower level. Changes in feeding flock-sizes provide a more accurate measure of long-term changes in status at feeders (see Box p39).

TABLE l. GBFS Top Twenty garden birds.

Species	Winter 2003/04 % of gardens	% of 70s gardens(∗)	% of 90s gardens(+)
Robin	100	99	99
Blue Tit	100	99	100
Blackbird	99	99	99
Great Tit	99	93	97
Greenfinch	99	92	96
Chaffinch	98	92	96
Dunnock	98	95	95
Coal Tit	92	70	85
Collared Dove	88	60	86
House Sparrow	83	97	93
Starling	83	96	93
Magpie	74	29	71
Woodpigeon	70	19	53
Goldfinch	67	3	37
Song Thrush	63	88	64
Long-tailed Tit	59	11	44
Wren	54	34	51
Siskin	54	7	52
Jackdaw	52	32	45
Sparrowhawk	50	10	46

(∗)Figures are the average of 10 winters from 1970/71 to 1979/80,
(+) from 1990/91 to 1999/2000.

INDIAN SUMMER HEAT AND NEW YEAR CHILL

Three major features strongly influenced the range of species and flock-sizes at UK birdtables in winter 2003/04:

- modest yields of many wild fruits;
- a poor breeding season in 2003 for most resident tits, thrushes and certain finches;
- an eighth successive relatively mild and wet winter.

Searing heat and the driest August-October quarter since 1972, saw birdbaths in great demand. House Sparrow and Blackbird often dominated, while early Siskin and Redpoll were a bonus for some, with transient Willow Warbler, Black Redstart and Turtle Dove noted by lucky observers. The mildest November since 1994 saw late nesting Greenfinch, Collared Dove and Woodpigeon bringing families to feeders. Food caching by Coal Tit, Marsh Tit and Nuthatch was frenetic in some gardens, with first-ever Jay visits for some, reflecting a scarcity of beech mast and acorns. Chilly episodes, with some heavy snowfalls in early December and over the New Year, saw Blackbird , Starling and winter thrushes quick to plunder garden berry and soft-fruit stocks and swiftly turn to birdtable fare. Severe frosts brought the first Blackcap , Yellowhammer and Reed Bunting to some feeding stations.

Record-breaking high temperatures in early February brought a lull in birdtable activity and some premature successful garden nesting attempts by Blackbird, Robin and doves, with parent birds relying on provided foods to satisfy hungry young (*BTO News* 252).

A swift change to uncomfortably cold arctic air in the final fortnight, with regular night frosts, generated a marked increase in thrush and finch flocks, Blackbird, Chaffinch and Greenfinch invariably dominating. An old-fashioned mixed bag of weather in March, brought Brambling and Siskin into many gardens, as scarce crops of alder, birch and some conifer seeds were exhausted. Goldfinch continued to exploit new birdtables, flocks of 20–30 widely, though nowhere topping the 100 mark as seen in previous winters. Feeding flocks of Long-tailed Tit, similarly, were generally smaller than in recent winters.

TREE SPARROWS GRACE GARDENS

The birdtable community continued to change over winter 2003/04. Among regular feeders, Greenfinch (99%), Dunnock (98%), Coal Tit (92%), Magpie (74%), Woodpigeon (70%) and Jackdaw (52% of gardens) reached all-time high levels of feeding attendance (Table 1), while Great Tit (99%), Pheasant (29%) and Herring Gull (11% of gardens) matched previous record levels. Many observers complained of an increasing physical dominance by larger species at feeding stations, notably from ever-tamer doves (including Feral Pigeon), gamebirds (chiefly Pheasant) and corvids, and a greater need to deploy 'cages', 'baffles' and robust feeders, to limit the hoovering up of expensive food stocks.

On the positive side, Bullfinch (21%), Tree Sparrow (14%) and Grey Wagtail (13%) achieved high attendance levels at feeders, probably helped by improved seed mixes. Equally encouraging was the widespread thin scatter of Green Woodpecker, Treecreeper and Lesser Redpoll (each to 5% of gardens), attracted to windfall apples, fatty items and water. Blackcap patronized birdtables widely (31% of gardens), their highest level since the cold winter of 1995/96, with ringers catching up to a dozen different birds within individual gardens. Some observers attributed the welcome return of Bullfinch, Tree Sparrow and House Sparrow, aided by year-round supplementary feeding with sunflower hearts, hen corn or rape seed. Nonetheless, House Sparrow (83%), Starling (83%) and Mistle Thrush (14% of gardens), dipped to all-time low levels of attendance, adding to recent worries.

JACK SNIPE AND HAWFINCH AMONG FEEDING CELEBRITIES

Yet again, surprise visitors were noted coming to provided food and water. Common Rosefinch (Ipswich, Suffolk), a predicted candidate with expanding UK garden presence, brought the 34-year GBFS tally to 164 species. Elsewhere, feeding Chough (Pwllheli, Gwynedd), Red-legged Partridge (Holyhead, Anglesey), Serin (Blean, Kent) and Hawfinch (Workington, Cumbria) caught the eye. Among water birds , Common Snipe (Andreas, IOM), Jack Snipe (Beccles, Suffolk) and Kingfisher (New Milton, Hants) were attracted to supplementary foods during cold weather. Waxwing (Hyde, Greater Manchester) was part of another major midwinter influx, now seemingly an annual event.

Sparrowhawk easily maintained its status as top diurnal predator, hunting at 50% of feeding stations. Red Kite were attracted to meaty scraps at Little Missenden (Bucks) and Tredegar (Gwent), 20 birds and more circling over favoured gardens. Equally encouraging, Buzzard continued to spread (3% of gardens), tempted to scraps in gardens fringing the New Forest, Welsh Marches, Chilterns and Borders.

Tawny Owl was the most frequent nocturnal predator (hunting in just 2% of feeding stations), often drawn initially to small rodents, notably Wood Mice. Sadly, several observers were forced to limit the scale, or to close ground feeding, due to Brown Rat activity, a product of warmer and wetter winters.

The coming winter is eagerly awaited and likely to include more tales of the unexpected.

THANK YOU

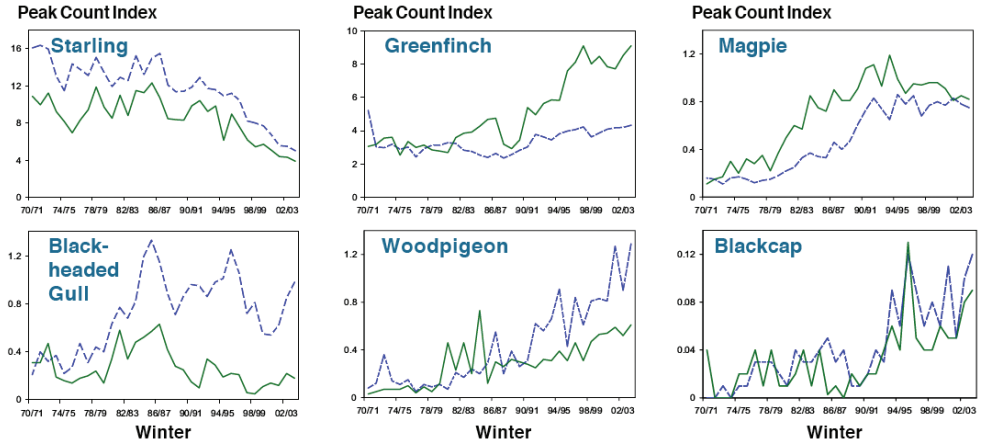
The BTO extends a large measure of thanks to the dedicated team of GBFS counters who carefully and keenly contribute each winter to this small but important Trust survey. Carol Povey, Jacky Prior and Frances Bowman kindly helped with the production and collation of forms, Mike Toms helped with the calculation of Peak Count Indices.

MIXED FORTUNES AT UK BIRDTABLES: GBFS PEAK COUNT INDEX 1970–2004

The BTO's GBFS plays a valuable monitoring role each winter through the Peak Count Index, an assessment of the relative number of birds feeding in the nonbreeding season.

In Winter 2003/04, on the debit side, Starling flock-sizes fell to their lowest levels yet. This dip in feeding numbers, accelerated in the 1990s, and is a feature of both rural and suburban gardens. It parallels declines in breeding populations over much of NW Europe, including losses in UK farms and woods. Fewer soft-bodied invertebrate prey, affecting young bird survival, is a possible causal factor, but further studies are ongoing.

In contrast, Greenfinch has seen a marked upturn in feeding status, most strikingly in open country gardens (alongside Chaffinch), coinciding with increased year-round feeding and the introduction of better seedmixes including sunflower hearts and nyjer. The dramatic surge in feeding numbers of Magpies, that occurred in all garden types since the late 1980s, looks to have reached a plateau, though a few sites continue to record first-time feeders, notably in more remote parts of northwestern UK. Blackheaded Gull respond to cold winters, garden attendance peaking during cold snaps in the mid 1980s (along with species such as Redwing and Fieldfare). In recent years they have tended increasingly to exploit feeding stations in towns and cities, closer to reservoir roosts and municipal rubbish feeding sites. Woodpigeon, likewise, peaked at rural gardens during cold winters in the mid 1980s, but have ventured increasingly into suburban gardens in recent years, shrugging off their shyness of humans and boosted by population surges. Use of birdtables by Blackcaps has been a welcome feature since the 1970s. Their numbers surged in the mid 1990s, being equally at home in the warmer microclimate of suburbia as in village gardens, where they are seen alongside more Chiffchaffs, the occasional Lesser Whitethroat. If warmer wetter winters are sustained, there is the potential for other insectivorous passerines to become birdtable feeders.



The Peak Count Index is the average maximum count per week.
Scales of vertical axes vary greatly between species.

= rural
= suburban

Bird Populations 8:188-193
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RECENT CHANGES IN COMMON BIRD POPULATIONS

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The Breeding Bird Survey has now been running for more than a decade. *Mike Raven* and *David Noble* report on the results from 2004 and review the long-term trends.

CAMBIOS RECIENTES EN POBLACIONES DE AVES COMUNES
El conteo de aves reproductoras (BBS) en el Reino Unido ha sido implementado por más de una década. *Mike Raven* y *David Noble* informan sobre los resultados de 2004 y revisan las tendencias de largo plazo.

The BTO/JNCC/RSPB Breeding Bird Survey (BBS) is the main survey that tracks changes in numbers of widespread terrestrial bird species across the UK. Highquality information on the status of bird populations is fundamental to their conservation. BBS results are used by governments and non-governmental organizations to set conservation priorities.

Although many parts of the country have reached a near-optimum level of coverage, other areas are still in need of participants. We are particularly keen to increase the number of squares surveyed in Northern Ireland, Scotland and North East England, where increasing the coverage would allow us to monitor regional population changes of more bird species.

Do you live in one of these areas? Do you think you could help out? Contact your local Regional Organiser, Regional Representative or Mike Raven for more information about this survey.

SURVEY COVERAGE

Because of its careful design and simple methods, this survey continues to attract many participants. In the spring of 2004, more than 2,000 BBS observers collected information on bird numbers from a record total of 2,512 1-km squares. Record coverage was achieved in England (1,868 squares), Wales (252) and the Channel Islands (11), and there was good coverage in Scotland (274), Northern Ireland (101) and the Isle of Man (6). We are able to calculate population trends for a greater number of species, with trends produced for England, Scotland, Wales and Northern Ireland and the nine English Government Office Regions as well as for the UK overall.

SPECIES AND HABITAT COVERAGE

A total of 219 species was recorded in 2004 and, of these, 100 species were found in at least 40 squares. The population trends of five species of gull (Black-headed, Common, Herring, Lesser Black-backed and Great Black-backed) are no longer reported, as a large proportion of the counts are considered to be of non-breeding, wintering or migratory birds. Trends for Cormorant, Grey Heron and Common Tern are reported with the caveat that counts may contain a high proportion of birds away from breeding sites, and the trend for Tawny Owl with the caveat that the BBS method monitors nocturnal species poorly.

Three species were recorded for the first time on BBS squares in 2004 (Glossy Ibis in Oxfordshire, Wryneck in Hampshire and records

of Bittern from four sites in Suffolk, Norfolk and North Lincolnshire), reflecting the upturn in the fortune of this species in the UK. Following on from the survey's first Hoopoe seen in Hampshire in 2003, another individual was located in Sussex in 2004. On a less positive note, a wide range of presumably escaped species were recorded, including Black Swan, Redbreasted Goose, Bar-headed Goose, Ruddy Shelduck, Wood Duck, Muscovy Duck, Marbled Duck, Reeves's Pheasant, Guineafowl and Peacock.

The habitat details from more than 23,000 200-m transect sections were recorded in 2004. Work is under way to use this extensive data set of habitat information to generate habitat-specific trends for individual species. This will further help us to identify possible reasons for population changes.

POPULATION TRENDS

Table 1 shows the population changes between the last two seasons (2003 and 2004) and for the entire survey period to date (1994 to 2004). Trends are estimated using a log–linear regression model that corrects for differences in coverage among regions. Across the UK, 49 species increased significantly, 23 species declined significantly, and 28 species showed no significant change in numbers between 1994 and 2004. The following are some of the more interesting ups and downs.

MIGRANTS BOUNCE BACK

Several migratory species of bird showed a marked increase in numbers between 2003 and 2004. Over three times as many Sand Martins were encountered (representing a massive increase of 247%) and numbers of Cuckoo (a species in long-term decline) were up by 31%. Whitethroats were up by 19%, Chiffchaff by 17% and Willow Warbler by 12%. Of 25 summer visitors from Africa that are monitored by the BBS, all but three increased in numbers between 2003 and 2004. For many migratory species, this year-to-year variation is driven predominantly by conditions on the African wintering grounds. Whitethroat, Cuckoo, Willow Warbler and Sand Martin all winter south of the Sahara, and years of poor rainfall have been shown to coincide with falls in the British breeding populations. The current increases presumably reflect better-than-averageconditions in Africa during the winter of 2003/04, a good breeding season in 2003, or maybe both.

LESSER REDPOLL

The Lesser Redpoll was newly classified as a distinct species as recently as 2001, and has been amber-listed in *Birds of Conservation Concern* on the basis that nearly one quarter of the European population resides in the UK. Numbers have declined significantly by 21% in the UK since 1994. Regionally, there have been declines of 29% in England and 20% in Scotland and, although neither of these results were significant, they do point towards a downward trend in both countries. Anecdotal evidence strongly suggests that Lesser Redpolls have declined dramatically as a breeding species in most southern and midland counties of England, to the point of near extinction in some. Historically, however, populations have shown cycles of expansion and contraction in lowland England. Numbers declined to a low point during the 1920s, after which an increase and expansion into lowland areas occurred from the 1950s until the mid-1970s, when the population was thought to be higher than at any time during the past 100 years. The joint Common Birds Census/BBS trend shows a massive 97% decline since 1977 and results from the Constant Effort Sites Scheme have shown that both productivity and survival rates have declined since the early 1980s.

YELLOW WAGTAIL

Of the 25 summer-visitor species monitored by the BBS, the Yellow Wagtail was the only one to show a substantial decline in numbers (down 13%) between 2003 and 2004. Numbers of Yellow Wagtail have declined by 27% in the UK since 1994, continuing a trend that started in the 1970s. Britain holds almost the entire population of the distinctive race *flavissima*, (aptly translated as "the yellowest") and so population changes in the UK are of special significance. This species has disappeared or become very scarce in many of the lowland wet meadow haunts where it was traditionally found only 20 years ago. Farmland drainage, the conversion of pasture to arable

land, the change from spring-sown to winter-sown cereals, and the loss of insects associated with cattle have been cited as potential causes. However, this species remains locally common in some intensively farmed areas, such as parts of the East Anglian fens.

SPARROWHAWK

Numbers of one of our most commonly encountered predators, the Sparrowhawk, fell by 17% between 2003 and 2004, accounting for most of the decline of 21% over the entire survey period (1994– 2004). Numbers fell by 21% in England over the same period, and in the English regions where enough records were obtained to calculate a trend, declines were noted in the East of England (down 41%) and South West (down 31%). Sparrowhawk numbers increased strongly in the UK during the 1970s and 1980s as the population recovered from the crash caused by organochlorine pesticides in the 1950s and 1960s. During the recovery period, many eastern counties from which it had all but disappeared were recolonised. Numbers reached a peak in the mid-1990s, after which they have remained relatively stable, until now.

GOOD NEWS FOR CORN BUNTING?

Numbers of Corn Bunting increased by 21% between 2003 and 2004. After many years of decline, the first signs of a possible recovery are emerging from BBS data (see Figure 1). In the period between the mid- 1970s and 2000, Corn Bunting numbers fell by nearly 90%, with many parts of the country being abandoned. The causes of this dramatic decline are linked to agricultural intensification, and in particular, the reduced amount of seed available to them in the winter. However, numbers have begun to stabilise in the last four years, possibly in response to conservation efforts and sympathetic farm management. With the anticipated widespread adoption of newly introduced Government-funded agri-environment schemes, such as the Entry Level Scheme (ELS) in England, which encourage farmers to adopt more 'wildlife friendly' farm management options, we may yet see a recovery in the fortunes of our largest bunting.

PIED FLYCATCHER

Numbers of Pied Flycatcher have declined significantly by 35% on BBS sites in the UK since 1994 (see Figure 2). In common with Wood Warbler, which has experienced a decline of 55% over the same period (see Figure 3), both species have predominantly western distributions. A

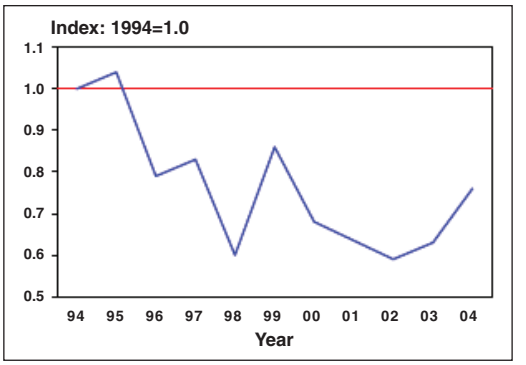

FIGURE 1. Corn Bunting: UK BBS index 1994–2004.

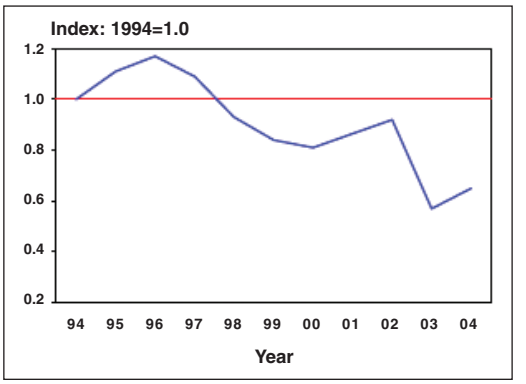

FIGURE 2 .Pied Flycatcher: UK BBS index 1994–2004.

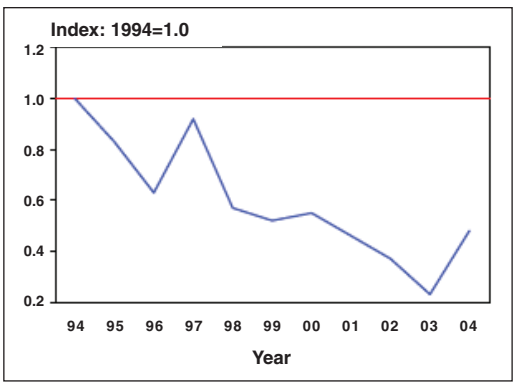

FIGURE 3. Wood Warbler: UK BBS index 1994–2004.

TABLE 1. Population changes of common and widespread species 2003–04 and 1994–2004.

Species	Sample	Change 2003-2004	Change 1994-2004	lcl 1994-2004	ucl 1994-2004
Little Grebe	52	–14	24	–11	73
Great Crested Grebe	58	97*	38*	5	80
Cormorant	166	22	40*	19	66
Grey Heron	513	–16	17*	5	31
Mute Swan	185	–14	0	–14	16
Greylag Goose	99	–5	179*	119	257
Canada Goose	331	–31*	74*	53	98
Shelduck	118	2	–38*	–49	–26
Mallard	982	–2	23*	15	31
Tufted Duck	124	–13	27*	4	56
Sparrowhawk	277	–17	–21*	–32	–8
Buzzard	544	0	53*	38	68
Kestrel	528	–14	–19*	–27	–10
Red Grouse	101	–22	–4	–23	19
Red-legged Partridge	404	18	53*	37	70
Grey Partridge	212	13	–30*	–40	–17
Pheasant	1318	5	39*	32	46
Moorhen	526	–5	25*	13	38
Coot	205	–11	77*	53	105
Oystercatcher	244	9	–5	–14	4
Golden Plover	53	12	2	–23	36
Lapwing	559	–1	–13*	–20	–6
Snipe	124	8	54*	29	84
Curlew	431	–10	–34*	–39	–28
Redshank	70	58	23	–2	54
Common Sandpiper	60	–4	–15	–34	8
Common Tern	48	19	17	–14	59
Feral Pigeon	555	–5	7	–3	17
Stock Dove	618	13	30*	18	43
Wood Pigeon	1913	–2	12*	8	16
Collared Dove	1044	8	41*	34	49
Turtle Dove	183	0	–45*	–54	–34
Cuckoo	712	31*	–19*	–26	–12
Little Owl	91	–17	–14	–34	12
Tawny Owl	77	–13	–38*	–54	–18
Swift	870	8	–22*	–28	–15
Kingfisher	43	–25	–11	–40	32
Green Woodpecker	592	6	34*	23	47
Gt. Spotted Woodpecker	666	13	108*	90	129
Skylark	1407	3	–10*	–13	–6
Sand Martin	99	247*	84*	48	127
Swallow	1486	11	22*	16	28
House Martin	766	11	31*	20	42
Tree Pipit	119	18	16	–4	40
Meadow Pipit	640	–4	0	–5	5
Yellow Wagtail	152	–13	–27*	–38	–14
Grey Wagtail	167	–29	14	–6	38
Pied Wagtail	1015	–10	21*	13	30
Dipper	46	–22	4	–29	52
Wren	1879	–3	14*	11	18
Dunnock	1568	–8	13*	8	19
Robin	1813	–3	15*	11	19
Redstart	132	19	30*	10	55

TABLE 1. (Continued)

Species	Sample	Change 2003-2004	Change 1994-2004	lcl 1994-2004	ucl 1994-2004
Whinchat	74	4	–15	–33	8
Stonechat	94	7	135*	78	209
Wheatear	243	11	7	–6	21
Blackbird	1896	–3	17*	14	20
Song Thrush	1488	–5	14*	8	20
Mistle Thrush	992	–2	–2	–9	6
Grasshopper Warbler	60	54	59*	17	118
Sedge Warbler	248	22	15*	2	31
Reed Warbler	92	28	48*	22	78
Lesser Whitethroat	209	13	–30*	–41	–18
Whitethroat	1024	19*	39*	31	48
Garden Warbler	373	14	–4	–14	9
Blackcap	1123	12	54*	45	63
Wood Warbler	53	109*	–52*	–64	–35
Chiffchaff	1040	17*	76*	66	86
Willow Warbler	1205	12*	0	–4	5
Goldcrest	582	–4	60*	47	74
Spotted Flycatcher	194	12	–35*	–45	–23
Pied Flycatcher	41	14	–35*	–53	–10
Long-tailed Tit	677	0	12*	1	24
Marsh Tit	126	4	26*	1	56
Willow Tit	54	–26	–65*	–75	–50
Coal Tit	585	–12	14*	5	23
Blue Tit	1772	–2	17*	13	22
Great Tit	1632	5	35*	29	41
Nuthatch	325	7	52*	34	73
Treecreeper	276	–5	7	–8	25
Jay	553	5	1	–9	11
Magpie	1470	–3	–1	–5	4
Jackdaw	1256	–3	19*	12	26
Rook	1038	–12	–3	–10	6
Carrion Crow	1795	1	11*	6	17
Hooded Crow	114	–10	–13	–31	9
Raven	182	–6	91*	58	130
Starling	1499	–5	–30*	–34	–25
House Sparrow	1275	–1	–3	–7	2
Tree Sparrow	136	–1	48*	22	80
Chaffinch	1898	0	9*	6	12
Greenfinch	1387	4	37*	30	44
Goldfinch	1104	–6	28*	19	37
Siskin	112	–12	–40*	–52	–25
Linnet	1045	–14*	–14*	–20	–8
Lesser Redpoll	121	–29	–21*	–37	–1
Bullfinch	463	11	–9	–18	2
Yellowhammer	1008	–7	–22*	–26	–18
Reed Bunting	351	–9	4	–6	16
Corn Bunting	138	21	–24*	–35	–10

Population changes of widespread species 2003–04 and 1994–2004. The sample size indicated is the mean number of squares occupied each year over the 10 years (excluding 2001, and squares which were surveyed in only one year). The figures presented are the percentage changes in population levels for the respective time periods: those marked with an asterisk were significantly different at a 5% level. For the 1994–2004 period, the lower and upper 95% confidence limits (lcl, ucl) are given. Species in bold are red-listed, and species in italics amber-listed in *The Population Status of Birds in the UK, Birds of conservation concern: 2002–2007.*

large proportion of the UK Pied Flycatcher population resides in Wales, with smaller numbers in southwest England, the Lake District and southwest Scotland. Even in the Welsh strongholds, where there is not quite enough data to produce trends, the occurrence of this species has declined from 20% of squares in 1994 to only 8% in 2004. Very little historical data exist for Pied Flycatcher, although a small expansion in range was noted between the two BTO breeding atlases (1968–72 and 1988–91), possibly aided by the provision of nest boxes at new sites. The cause of this decline remains largely unknown, but hopefully, results from the Scarce Woodland Bird Survey being run in 2005 and 2006 will shed light on the habitat needs of this species.

BBS-ONLINE UPDATE

Last year (2004) was the first full survey year for which BBS observers were able to submit their counts electronically using the BBS-Online application. Uptake of the new system was higher than anticipated, with data submitted electronically for 29% of the total number of squares surveyed. As well as allowing BBS observers to submit their BBS bird, habitat and mammal data electronically, the application also allows the user to view historical data for their squares. The BBS web pages, which are available to all visitors to the BTO website, provide a wide range of information about the scheme, including details on how to participate, species distribution maps, trends tables and graphs and county and regional species lists. The web pages are proving to be a very successful way of promoting the scheme to potential new participants. To date, more than 170 people have enquired to take part in BBS using the web application. Many thanks to the RSPB for generously funding the development of BBS-Online, and to members of the BTO's Information Systems Unit who have continued to develop the system and provided technical support over the past year. For more information about BBS-Online, visit www.bto.org/bbs

THE FUTURE

The success of BBS in 2004 is mainly due to the BTO's network of Regional Organisers who have recruited many new BBS observers across the UK. Other new volunteers have been encouraged to participate in the scheme via the BTO's website, and by e-mailing Migration Watch users. By continuing to increase BBS coverage across the UK and in a variety of other habitats, we are improving our ability to monitor what is happening to bird populations. Birdwatchers can make few greater contributions to conservation science.

ACKNOWLEDGEMENTS

We are extremely grateful to all the ROs, observers and BTO members who took part in the BBS last year. We would also like to thank the farmers and landowners for their support and co-operation in allowing BBS volunteers onto their land. The BBS continues to be an enormous success and is now the primary source of information on national and regional trends in common breeding birds.

If you would like to take part in the scheme, please contact your local RO, Regional Representative or Mike Raven at BTO HQ (e-mail: bbs@bto.org).

The BBS is a partnership between the BTO, JNCC and RSPB.

FURTHER READING

Baillie, *et al.* (2005) *Breeding Birds in the Wider Countryside: their conservation status 2004.* BTO Research Report 385. BTO, Thetford. (www.bto.org/birdtrends)

Raven, M J, Noble, D G & Baillie, S R (2005). *The Breeding Bird Survey 2004.* BTO Research Report 403. BTO, Thetford. (www.bto.org/bbs/results).

BBS METHODS

The BBS is an annual survey with randomly selected 1-km squares allocated to participants within each BTO Region by volunteer Regional Organisers (ROs). It uses line-transect methods, with each observer visiting their square on two occasions between April and June to count all the birds they see and hear along a 2-km route.

Bird Populations 8:194-197
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BTO News 261:8-10

WATERWAYS SURVEYS IN 2004

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Support for both the BTO's annual breeding surveys along waterways gained strength in 2004, and another stage of Waterways Breeding Bird Survey (WBBS) development went just swimmingly. *John Marchant* reports.

CONTEOS EN CURSOS ACUÁTICOS EN 2004

El apoyo a ambos conteos de aves en cursos acuáticos del BTO ganó fuerza en 2004, y una nueva etapa del conteo de aves reproductoras en cursos acuáticos (WBBS) dio sus frutos. *John Marchant* informa.

Following seven years of overlap between the Common Birds Census (CBC) and the Breeding Bird Survey (BBS), the long-running mapping CBC ceased in 2000 and passed the baton to BBS as the ongoing scheme for bird monitoring in the UK's wider countryside. The process involved a detailed statistical comparison of the trends detected by the two schemes. For nearly every species, it has proved possible to link CBC and BBS trends together to produce a joint trend, beginning in the 1960s and maintained now solely by BBS transects. These joint CBC/BBS trends represent both the history and the future of bird population monitoring in the UK (see www.bto.org/birdtrends).

The mapping Waterways Bird Survey (WBS), covering linear waters (rivers and canals), filled gaps in species and habitat coverage left by CBC and now performs the same valuable function alongside BBS. For 14 species, the headline trends on the BTO's *birdtrends* web pages, are from WBS rather than BBS. WBS now has its own new rival in the shape of WBBS, a transect scheme modelled closely on BBS, that was first trialled seven years ago, in 1998. There are many parallels between CBC/BBS and WBS/WBBS: WBBS brings the same advantages of random plot selection, and a much larger annual sample, that BBS had over CBC. It also brings coverage of all bird and mammal species, whereas WBS mapping includes only waterbirds. Will the pattern now be repeated, with the long-established mapping survey being dropped in favour of the new transect survey?

The outcome is far from clear, however, and in the short term both surveys are planned to continue in 2006. One further field season, in 2005, has already been added to the overlap period and will help to overcome the effects of Foot & Mouth Disease (FMD), which reduced the value of data collection in 2001. Continuation in 2006 will increase to seven the number of seasons in which WBS observers have conducted surveys using both mapping and transect methodologies. A decision on whether to pursue WBBS or WBS into the future will need to be taken within a year or two, during which time we hope that extra valuable data will have been gathered.

WBS LATEST

We were worried this time last year by the recent gradual decline in support for this scheme, evident since the launch of WBBS in 1998. Disregarding 2001, the year of FMD, there was a progressive drop in the number of sites, down to just 85 in 2003 (Figure 1). It is pleasing then that, in 2004, a good number of new plots easily surpassed those dropping out, and the WBS sample rose to 91. There was another large intake of new sites in 2005, which if continued, will greatly aid the comparisons.

For 2003's 85 WBS submissions, all but five observers provided comparable data also for 2004. There were thus 80 plots helping to estimate population change for 2003–04, signifying an increase from the low point of 74 paired sites for the previous year-to-year comparison (*BTO News* 253: 14). The results of this comparison are set out in Table 1.

There were 21 species for which WBS could estimate population change between 2003 and 2004. Of these, two-thirds increased. Increases for Sedge Warbler and Whitethroat, both statistically significant, were the most striking. The upturn for Reed Bunting, a Red-listed species, was also significant. In contrast, Pied and Grey Wagtails both declined significantly. No other decreases reached statistical significance, but the 22% decline estimated for Lapwings is also worthy of note. By far the largest sample sizes among the waterbirds covered are for Mallard, where the almost ubiquitous domestictype birds are included in the counts, and for Sand Martin, where the counts tabulated are of apparently occupied nest holes. Yellow Wagtail, Little Grebe and Redshank have become too scarce now on rivers and canals for annual estimates of change to be made.

Including these three scarce species, there are 24 species for which a long-term estimate of change can be made, typically for the period 1975–2003 (Table 2): seven species require a later start year, having been recorded too infrequently at the start of the survey. Winners and losers more-orless balance in this table. Four species have halved in number, but five have doubled. The virtually complete loss of Yellow Wagtails from the waterway habitat stands out as the most remarkable of these changes, but at the other end of the scale the rapid rise of introduced Greylag Geese is also astonishing — especially given that, as recently as 1992, the species was too infrequent on WBS plots to be indexed.

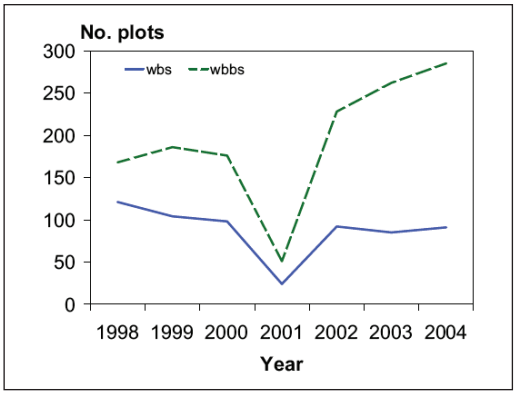

FIGURE 1. Numbers of plots surveyed for WBS and WBBS, 1998–2004.

Table 2 sets the background to the latest annual changes. For example, the decreases among wagtails in 2004 follow a long period of overall decline for these species. Interestingly, however, CBC/BBS has detected little change over the same period for Pied Wagtail in the other habitats in which it occurs. The longterm rises of Canada Goose, along with Oystercatcher, Whitethroat, Goosander, Mute Swan and Reed Warbler were evident on WBS plots in 2004.

WBBS PHASE 3

A further three seasons of WBBS transect fieldwork, funded again by the Environment Agency, were completed in 2004. Our aims for this phase were to develop the overlap between WBS and WBBS, to encourage more volunteer support for WBBS, and to compare population trends emerging from WBBS with those from other monitoring schemes.

Figure 1 charts WBBS development. 2001 aside, the number of stretches covered each year for WBBS has continued to grow, reaching 285 in 2004. We are pleased with this success, and hope this number can grow still further over future seasons. Given that we want both schemes to be operating fully during their overlap period, it was encouraging that both WBBS and WBS enjoyed an upturn in support in 2004. We are very grateful to everyone who helped to achieve this.

With an annual sample size approaching 300, WBBS has the potential to replace WBS as a

TABLE 1. Estimates of population change 2003–04, from WBS data.

Species	Territory totals 2003	2004	% change	lcl	ucl	Number of plots
Mute Swan	90	98	+9	–6	+26	50
Greylag Goose	61	50	–18	–57	+97	15
Canada Goose	166	184	+11	–16	+54	41
Mallard	2085	1987	–5	–11	+2	79
Tufted Duck	74	68	–8	–37	+24	17
Goosander	59	64	+8	–11	+37	24
Moorhen	628	648	+3	–7	+14	71
Coot	242	277	+14	–6	+39	39
Oystercatcher	216	255	+18	–4	+32	23
Lapwing	194	152	–22	–39	+5	32
Curlew	52	54	+4	–19	+27	17
Common Sandpiper	90	96	+7	–5	+17	18
Kingfisher	44	50	+14	–9	+47	36
Sand Martin	1173	1343	+14	–32	+160	18
Grey Wagtail	173	143	–17 *	–30	–3	53
Pied Wagtail	191	152	–20 *	–35	–7	53
Dipper	89	79	–11	–24	+6	28
Sedge Warbler	306	389	+27 *	+9	+50	41
Reed Warbler	265	292	+10	–11	+39	21
Whitethroat	203	252	+24 *	+3	+49	47
Reed Bunting	216	247	+14 *	+1	+32	44

Lcl and ucl = 95% lower and upper confidence limits; * = statistically significant change. Species shown as *italic* are Amber-listed, and those shown as **bold** are Red-listed, according to the 2002–07 assessments. Species with fewer than 15 plots contributing paired data are excluded.

monitoring programme. Comparison of the trends detected by the two schemes is presently hampered by the relatively short overlap of six years — three before and three after 2001, from which year the data could not be used. We are seeking funding to extend this period, so we can compare WBS and WBBS trends more fully.

The results so far are encouraging, however. In Figure 2, trends from WBS mapping data are compared with those from all WBBS sites for a few example species. The data are completely independent between the two trend lines, but about a quarter of the WBBS data have been collected from stretches also covered by the same observers for the WBS mapping survey. Even allowing for this, the similarities in trends are very striking. It is especially pleasing that the Sand Martin graphs, with WBS data drawn from counts of nest holes, and WBBS data being birds seen, show such close correspondence. If the trend data continue to be similar over the rest of the overlap period, there should be no problems in constructing joint WBS/WBBS trend lines like those of CBC/BBS, at least for most of the waterways birds presently monitored. Additionally, WBBS will create new indices for a much wider range of species using the waterside habitat than was possible through the WBS.

Earlier analyses had shown very close similarities, within the WBBS data, between the WBS-linked stretches, selfselected by the observers, and those selected randomly. For this reason, we are happy to combine all the WBBS data for indexing purposes. At the end of this phase of WBBS development, therefore, we know that BTO volunteers can provide enough effort to produce results to match those of WBS, and we know a good deal about how best to use the data.

WATERSIDE MAMMALS

WBBS observers have recorded mammals since 1998, adding to the relatively scant knowledge of distribution and abundance among this group of animals. Riparian species, especially Water Vole, American Mink and Otter, are of particular interest in this context. Power analyses of WBBS data for 1998–2003 for these three species

TABLE 2 Long-term trends from the Waterways Bird Survey

Species	% change
Yellow Wagtail	–92 *
Little Grebe	–74 *†
Reed Bunting	–67 *
Pied Wagtail	–51 *
Redshank	–46 *†
Common Sandpiper	–28 *
Grey Wagtail	–23
SandMartin (1978)	–14 †
Moorhen	–13
Sedge Warbler	–10
Dipper	–7
Lapwing (1980)	–3
Kingfisher	+4
Curlew (1980)	+16
Coot	+34
Tufted Duck	+48
Reed Warbler (1981)	+66 *
Mute Swan	+71 *
Goosander (1981)	+97 *
Canada Goose (1981)	+108 *
Whitethroat	+110
Oystercatcher	+114 *
Mallard	+185 *
Greylag Goose (1993)	+279 *†

Data cover 1975–2003 unless a different start year is given. An asterisk indicates statistical significance, and a dagger warns that the sample size is small. Species shown as orange are Amber-listed, and those shown as red are Red-listed. For more information, see *www.bto.org/birdtrends.*

demonstrate that, with 300 WBBS stretches surveyed annually, the data would allow a 33% decline in presence to be detected. While this is a long way short of what we can do with the bird data, it represents a significant input to mammal monitoring in the UK.

THE 2006 SEASON

WBS and WBBS will enjoy another full season in 2006. New plots would therefore be welcome for both schemes, especially WBBS. The BTO's Regional Representatives have lists of the randomly selected sites that need WBBS transect coverage, with just two counting visits to be made to a stretch that may be as short as 500 metres: WBBS is not open to selfselected sites, unless you also plan to conduct a mapping WBS there.

If you have a stretch of river or canal in mind where you can make a regular birdwatching walk during the spring months, the WBS could be for you. A minimum length of 3 km applies.

Please contact me at the Nunnery for more information, or e-mail wbbs@bto.org.

THANK YOU

We are very grateful to all contributors to waterways monitoring, and to the Environment Agency for funding WBBS.

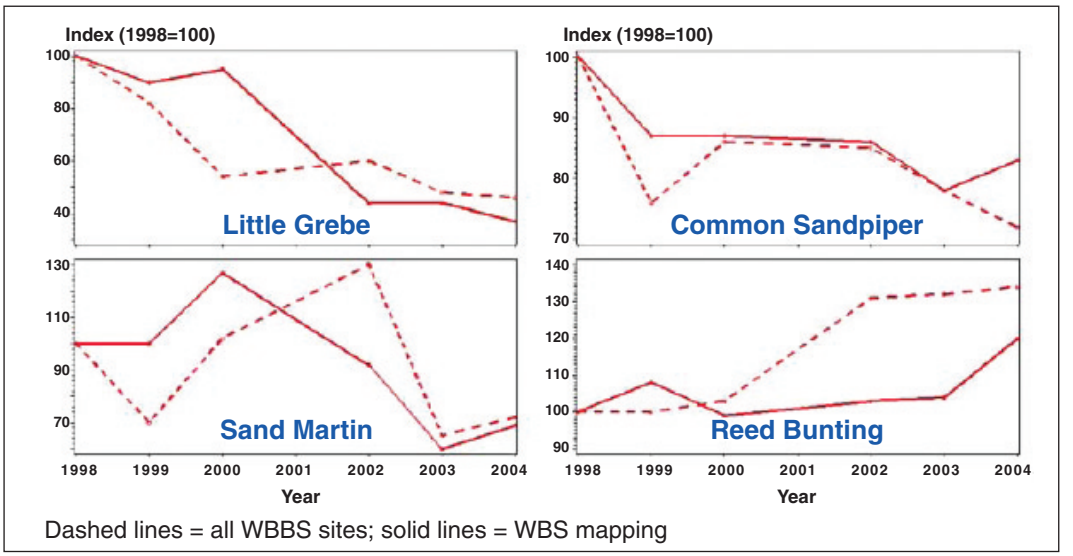

FIGURE 2. Population trends from WBBS transects.

Bird Populations 8:198-201
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BTO News 257:10-11

CLOSER TO HOME

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Mike Toms, organiser of the BTO/CJ Garden BirdWatch, reports on its first 10 years.

MÁS CERCA DE CASA
Mike Toms, organizador del programa de observación de aves en jardines del BTO/CJ, informa sobre los primeros 10 años del programa.

The BTO/CJ Garden BirdWatch is a fascinating project, now with 10 years of excellent data. It is the largest yearround mass participation study of garden birds anywhere in the world.

EXTENSIVE HABITAT

Within the UK, private gardens represent an important habitat for many bird species, occupying somewhere in excess of 500,000 ha. Results from the BTO/JNCC/ RSPB Breeding Bird Survey (BBS), demonstrate that human residential habitats (in which gardens are the primary resource) support important populations of many bird species. Understanding how birds use gardens, particularly in the context of changing bird populations in other habitats, is therefore of tremendous importance and a national scheme to monitor garden birds can make a valuable contribution to our overall understanding of bird populations within the UK.

THE HISTORY OF GARDEN BIRDWATCH

The idea behind the BTO/CJ Garden BirdWatch project arose from discussions between Nigel Clark and the late Chris Mead, both of the BTO, and Chris Whittles of CJ WildBird Foods. Earlier attempts to monitor garden bird populations at the regional level, such as the Garden Bird Enquiry, had always encountered the problem of funding the scheme for more than a couple of years. If we were to look at long-term trends in the use made of gardens by birds, then what was needed was long-term funding. This problem was solved by making what was regarded at the time as a very brave decision — namely to ask participants in the scheme to make an annual contribution towards its running costs. It must have been with some trepidation that the BTO first asked its supporters if they would take part in the project and make a contribution towards costs. However, such is the generosity of BTO supporters that, by the end of the first year of recording, some 5,028 participants had become involved.

Since then, Garden BirdWatch has gone from strength to strength and, with continued growth in the numbers of participants, there has been an associated growth in the resources and range of technologies employed to administer and develop the scheme. There are currently over 17,000 participants in the scheme and in any given week we receive observations from about two thirds of them.

THE GARDEN BIRDWATCH METHOD

Garden BirdWatch gathers information in a way that makes it possible to measure relative change in the use birds make of gardens. This approach is similar to that behind other long-running BTO projects and it is particularly suited to large-scale projects covering a wide range of species at many different recording locations. The sheer size of Garden BirdWatch imposes some constraints on the way in which data may be collected and on the type of research questions that can be addressed. Fortunately, the type of information gathered can be readily coded onto special forms that can be scanned by a machine capable of optical mark recognition.

Garden BirdWatchers are asked to record birds using their gardens, making records from the same place (their defined 'recording area') at more or less the same time or times each week. Continuity of recording effort is more important than the quantity of recording. Nearly 25% of active Garden BirdWatchers submit their weekly observations over the Internet by using Garden BirdWatch Online. Online participation offers greater flexibility in the terms of the range of information being collected and also enables individuals to enter and view all their own data (including those originally submitted on paper forms). In effect, Garden BirdWatch Online acts as an electronic notebook for the observer. Observations are validated as they are entered and the information is then loaded automatically onto the Garden BirdWatch database. Overnight, various computer scripts run to generate web pages containing summary tables, scrolling maps and reporting rate graphs, so the online results are always up to date.

THE SCIENTIFIC VALUE OF GARDEN BIRDWATCH

The wealth of information gathered through Garden BirdWatch is being used to answer a wide range of different ecological questions about the ways in which birds use gardens and how this use may change over time.

The weekly recording allows us to look at seasonal patterns in the use made of gardens by different species at different times of the year. Most of these patterns, such as the spring peak in Goldfinch reporting rate (Figure 1) or the autumn trough in Blackbird reporting rate, are consistent from one year to the next, something that we have commented on previously in *BTO News* (see issue 244) and which can be seen in the reporting rate graphs presented online (www.bto.org/gbw). Other patterns highlight the subtle differences between years that result from the weather and from variations in food availability. Take last autumn for example, an abundance of wild fruit and tree seeds meant that garden feeding stations have been especially quiet over recent months, noticeably so when compared with 2003, and all the more pronounced because of the spell of mild weather in many areas.

We might expect such seasonal patterns to vary between different types of gardens, perhaps because of where they are located (rural vs urban) or because of the features present within the garden itself. An examination of the average seasonal reporting rate for a common species like Robin (Figure 2) shows differences between habitats, being highest in rural gardens and lowest in urban habitats. In all three types of garden there is a similar seasonal pattern, although the magnitude of the summer trough is more pronounced in urban and suburban gardens than rural ones — a clear indication that, while urban and suburban gardens may provide appropriate resources during winter, they provide less suitable habitats for breeding birds. For an urban species like House Sparrow, the pattern of reporting rates is reversed across the three garden types.

We have also been looking in more detail at the way in which birds may respond to habitats in and around gardens. The results of this work, published recently in the journal *Ecography* (Vol 26: 589–600), have highlighted that the likelihood of many species occurring in gardens is dependent on the surrounding local habitat rather than on the habitat features present within the garden itself. By understanding the factors that make gardens more attractive to birds, we may be able to make recommendations about ways in which we can improve the quality of the human environment for wildlife. It is also worth noting that urban bird communities are becoming of increasing

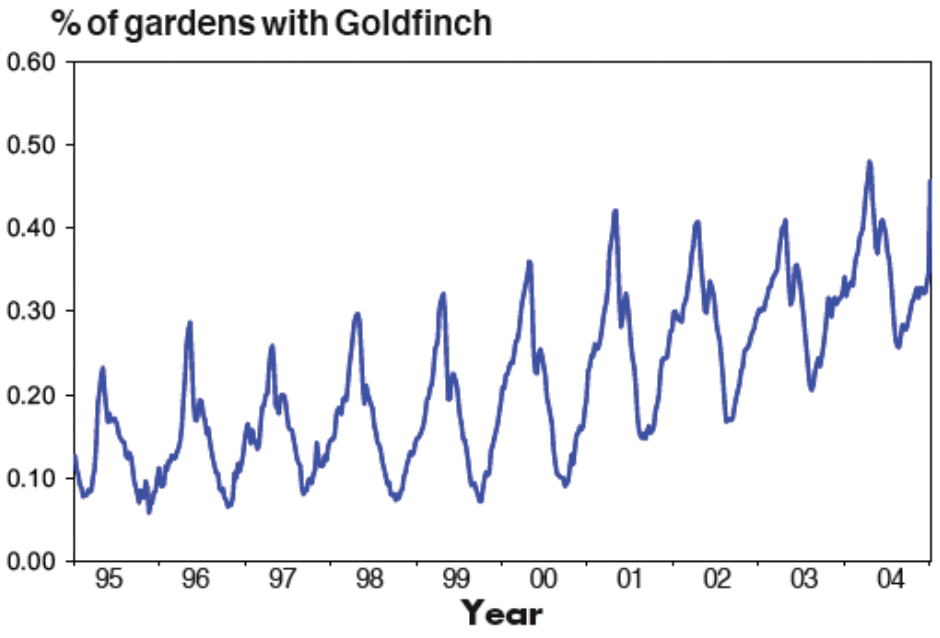

FIGURE 1. Use of Gardens by Goldfinch.

interest to conservation biologists, in part because of concern over urban encroachment into other habitats, but also because we are becoming increasingly aware of the size and value of bird populations within human habitats. In fact, another recently published paper (Bland et al. 2004 *) stemming from the efforts of BTO/CJ Garden BirdWatchers, has caused us to re-evaluate the importance of gardens for supporting breeding populations of many species.

Longer-term patterns are equally important, not least because they may reflect changes in the population sizes of those bird species using gardens. However, it is worth noting that change in the use made of gardens may also reflect changes in behaviour, migration patterns and/or food abundance. Teasing out these different factors would be difficult if Garden BirdWatch existed in isolation. Fortunately, we have information from other BTO schemes and, collectively, this puts us in a strong position to look at changes in garden use and how this may relate to population change in other habitats.

An analysis of trends in Garden BirdWatch reporting rates over the last 10 years has been

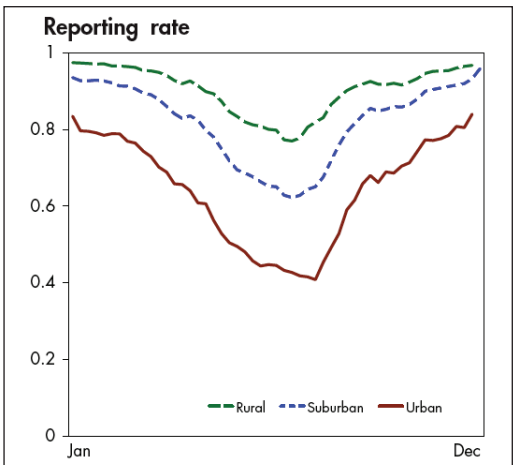

FIGURE 2. Annual patterns in the use of gardens by Robin.

completed and is currently in the process of publication within a leading journal — more evidence of the scientific value of mass-participation surveys like Garden BirdWatch.

THE FUTURE OF GARDEN BIRDWATCH

Garden BirdWatch is all about getting involved and gathering scientifically robust and valuable information. The sheer size of Garden BirdWatch allows us to ask questions at the regional level, something that is very important if we are to address the issues of regional differences in the decline of species like House Sparrow and Starling. The question has sometimes been asked as to how big should Garden BirdWatch be. Well, we are currently able to produce robust reporting rate trends for virtually all of the Government Office Regions. What we want to do next is to get ourselves into a position where we can produce such trends at the county level. We can already do this for some of the larger counties: *e.g.* Norfolk (718 gardens), Hampshire (655 gardens), Greater London (1,031 gardens), Suffolk (584 gardens) and Kent (485 gardens) but we really need to recruit more Garden BirdWatchers in many other counties, for example, places like the Isle of Wight, Pembrokeshire, Durham and the West Midlands. If you, or someone you know, has an interest in garden birds, then Garden BirdWatch could be just the project to support. With your help, Garden BirdWatch looks set to enjoy another decade of success.

* Bland R L, Tully J, Greenwood J J D. 2004. *Bird Study* 51:96–106

Bird Populations 8:202-205
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BTO News 257:4-5

CES NOW MONITORING CETTI'S WARBLER

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Dawn Balmer reports on changes in the populations and productivity of common songbirds between 2003 and 2004 on Constant Effort Sites (CES).

EL PROGRAMA CES MONITOREA AL RUISEÑOR BASTARDO
Dawn Balmer informa sobre cambios poblacionales y productividad en aves canoras comunes entre 2003 y 2004 según los Sitios de Esfuerzo Constante (CES).

After a below average breeding season in 2003 for many of the common songbirds monitored by CES, ringers headed out with high hopes for a better year. Each year between May and September, trained and enthusiastic ringers visit their wellestablished sites about once every ten days. Nets are erected in the same place on each visit and run for the same length of time. This standard approach allows us to compare catches from one year to the next and therefore get a good estimate of changes in adult numbers and breeding success. We can also use these captures of ringed and retrapped birds to investigate changes in survival; recent work developing this was described in the last issue of *BTO News*. For most ringers, 2004 was a busy season with many species having a successful breeding year.

UPS AND DOWNS FOR ADULTS

The results we present here come from standardised catches at 105 sites that submitted data for 2004 by early January. As in previous years, the majority of sites were in England (81 sites) with smaller numbers in Scotland (15), Wales (five) and Ireland (four). Table 1 shows the changes on CE sites between 2003 and 2004.

Two factors can influence the level of the adult population each year: breeding success in the previous year, with subsequent recruitment into the adult population, and over-winter survival. There were statistically significant increases in the numbers of adults caught between 2003 and 2004 for Sedge Warbler, Reed Warbler, Whitethroat, Blackcap, Willow Warbler and Reed Bunting. Interestingly all these species had a below average breeding season in 2003 which implies over-winter survival must have been good. All, except Reed Bunting, are longdistance migrants, and may have benefited from high rainfall in Africa in 2003. Four species showed a statistically significant decline in the number of adults caught between 2003 and 2004: Dunnock, Blackbird, Song Thrush and Blue Tit.

Dunnock is currently amber-listed on the *Population Status of Birds in the UK* list on the basis of a moderate (25–49%) decline in the UK breeding population in the last 25 years. The Dunnock population fell substantially during the late 1970s and early 1980s (Common Birds Census data) after a period of stability. Since the late 1990s there has been some recovery. The long-term trend in adult abundance on CE sites (Figure 1) shows a shallow decline during the 1980s followed by a shallow increase from the early 1990s. The decline in 2004 may be a knock-

TABLE 1. Changes in captures on CE sites from 2003 to 2004.

Species	Adults n 2004	Juveniles n 2004	Adult % change vs 2003	Trend	Productivity % change vs 2003	Productivity % change vs 83-03	Trend
Wren	100	101	–7	↑	+15 *	0	↔
Dunnock	98	96	–13 *	↔	+33 *	+10	↔
Robin	96	100	–10	↑	+16 *	–3	↓
Blackbird	100	97	–9 *	↓	+41 *	+10	↓
Song Thrush	85	77	–22 *	↓	+57 *	+40	↓
Cetti's Warbler	11	14	–2	↑	+113 *	+63	↔
Sedge Warbler	64	67	+31 *	↔	+7	+1	↓
Reed Warbler	56	55	+22 *	↓	+1	+4	↔
Lesser Whitethroat	37	45	+15	↓	+14	–12	↔
Whitethroat	63	69	+33 *	↓	+9	+7	↓
Garden Warbler	53	62	+2	↓	+19	+3	↓
Blackcap	90	95	+18 *	↑	+19 *	+4	↔
Chiffchaff	87	90	–3	↑	+39 *	+11	↔
Willow Warbler	84	90	+30 *	↓	–19 *	–7	↓
Long-tailed Tit	77	80	–4	↑	+27 *	–5	↔
Willow Tit	9	14	+41	↓	–45	–50	↔
Blue Tit	97	100	–11 *	↔	+58 *	+16	↓
Great Tit	96	100	–5	↔	+56 *	+24	↓
Treecreeper	41	67	+1	↔	+7	+24	↔
Chaffinch	81	71	–6	↔	+22	+51	↔
Greenfinch	46	42	+1	↑	–6	+8	↓
Goldfinch	44	21	+30	↔	–57 *	–45	↔
Linnet	18	14	–14	↓	–33	–29	↓
Bullfinch	77	62	–3	↓	–4	0	↔
Reed Bunting	62	46	+25 *	↓	+6	–10	↓

n 2004 = number of sites operated in 2004 at which the species was captured
vs 2003 = percentage change between 2003 and 2004
vs 83–03 = % change with respect to 1983–2003 average
* = significance (at the 5% level) of increase/decrease with respect to previous year only
Long-term trend = long-term trend during the period of CES ringing
↑ = long-term trend shows an increase, ↓ = decrease, ↔ = stability

on effect from a poor breeding season in 2003.

Figure 1 also shows the long-term trend in catches of adult Robins. Like the Dunnock, the Robin is a fairly common resident insectivore with a similar breeding ecology. On CE sites, Robins have increased steadily since the inception of CES in 1983. It is interesting to note how similar the pattern in adult numbers is for Robin and Dunnock, particularly in the early years. Declines due to the cold winter of 1990/91 and the poor breeding season in 1996 (reflected in a decline in adult numbers in 1997) can be clearly seen. The long-term trend for Robin from CBC/BBS data shows a large increase since the mid- 1980s. Information from the Nest Record Scheme suggests improved breeding success (reductions in nest failure rates at both egg and chick stages) although the CES productivity index (Figure 2) shows a shallow decline over the same period. Recent research (see *BTO News* 255) shows that the number of snow days in a year is the key variable that affects survival for Robins and Dunnocks. Long-term survival is tending to increase for Robins but decrease for Dunnocks.

GOOD BREEDING SEASON

Looking back over the weather reports for spring and summer 2004 (*British Wildlife*) highlights what a mixed season it was and how extreme regional variation can be. March started off with high pressure, producing sunny spells and overnight frosts, but became unsettled mid-

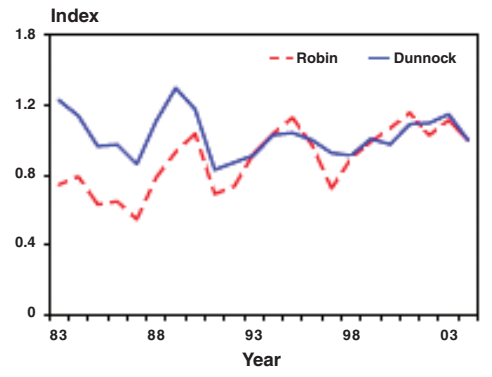

FIGURE 1. Robin and Dunnock adult. abundance.

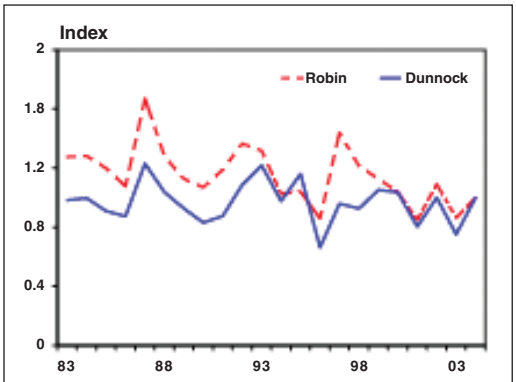

FIGURE 2. Robin and Dunnock productivity.

month. April and May were generally fine mild months but there were periods of very heavy rain and some flooding, particularly in the north and west. The first half of June was generally mild in England and unsettled in Scotland and later a cold front moved in bringing rain and gales to northern Britain. July started off unsettled but, by mid-month, high pressure had moved in over most of Britain, although cold fronts continued in the north. For many, August was the wettest month since 1956 and the floods at Boscastle in Cornwall will be long remembered; Scotland, though, had below average rainfall.

It is somewhat surprising, given the mix of weather, that productivity was quite good for most species. Comparing productivity with that of 2003 (which was below average) 11 species showed a statistically significant increase: Wren, Dunnock, Robin, Blackbird, Song Thrush, Cetti's Warbler, Blackcap, Chiffchaff, Long-tailed Tit, Blue Tit and Great Tit. Table 1 also presents a measure of how good or bad the breeding season was in 2004 compared with the average in previous years (1983–2003). This helps us to put the results from the 2004 breeding season into a long-term perspective. For many species, breeding success in 2004 was above average.

Resident insectivores had a good breeding season, compared to 2003, although Robin productivity was slightly below the long-term average. Blackbirds had a slow start to the season with some failure of first broods; subsequent broods were more successful and overall productivity was 10% above the long-term average. Song Thrush had an excellent breeding season with productivity 40% above the long-term average, which is a welcome upturn in fortunes. Despite increasing trends in adult abundance for Chiffchaff and Blackcap, breeding success remains fairly constant with large annual fluctuations.

Only Willow Warbler and Goldfinch showed a statistically significant decline in productivity between 2003 and 2004 and for both species breeding success was below the long-term average. Willow Warbler shows a long-term decline in productivity although in 2002 and 2003 productivity was actually above average. Goldfinch shows quite large annual variation in breeding success and has shown a shallow increase over the last 10 years.

CES MONITORS CETTI'S WARBLER

For the first time CES has been able to monitor Cetti's Warbler. Sufficient numbers are now caught on CE sites for us to be able to produce an index of adult abundance and productivity. The number of birds caught at present is quite low, with most sites catching just one or two birds. The CES at The Nunnery in Thetford caught its first Cetti's Warbler in late July; a dispersing juvenile male that stayed around for a few weeks. We will monitor closely the number of sites contributing records and the usefulness of these data. The long-term trend in adult Cetti's Warbler is presented in Figure 3. They have really taken off since 1998.

Cetti's Warblers have been expanding their

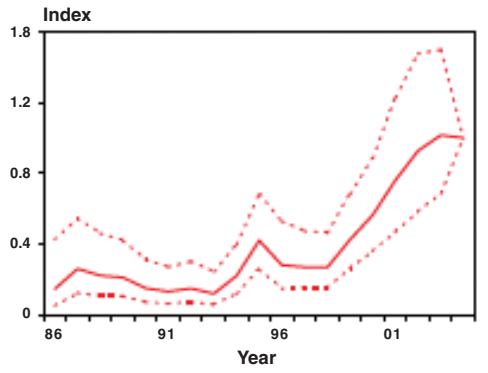

FIGURE 3. Adult Cetti's Warbler abundance.

range over the last few years. Productivity from CES is fairly constant so it is likely that the expansion has been partly fuelled by mild winter weather and good over-winter survival.

Cetti's Warbler is not currently monitored by any other scheme, although their distribution and numbers are reasonably well covered by county bird reports. It will be interesting to see what happens when (if!) we get a really cold winter like the one in 1981/82.

In 2000 we dropped Redpoll from the list because too few sites caught them to be able to confidently report on their fortunes. Willow Tit is perilously close to dropping off as well. It is pleasing, therefore, to be able to report on a species such as Cetti's doing so well.

FIND OUT MORE AND GET INVOLVED

The CES Scheme is a key component of the BTO's Integrated Population Monitoring programme. Results from CES, together with information from other longrunning BTO schemes can be found in the *Wider Countryside Report* on the BTO website www.bto.org/birdtrends.

To find out more about ringing and how to become a trainee ringer visit the website www.bto.org/ringing or contact the Ringing Unit at BTO Thetford HQ.

ACKNOWLEDGEMENTS

Many thanks to Rob Robinson for overseeing the running of the CES Scheme and for contributing to this report and to Steve Freeman for help with analysis. Jane Waters kindly entered CES data received in a noncomputerised format.

The Constant Effort Sites Scheme was undertaken within the Partnership between the BTO and JNCC as part of its programme of research into nature conservation.

THANK YOU

As with all ongoing BTO projects, the success of the CES Scheme depends entirely on the dedication, enthusiasm and skill of its volunteers. We are grateful to all the ringers and helpers who participated in the scheme in 2004, some of whom are listed here.

Aylesbury Vale RG, Barnsley RG, Brandon RG, John Calladine, Jim Cobb, Dartford RG, Durham RG, Durham Dales RG, Dave Francis, Ian Grier, Steve Hales, Chris Harris, Keith Herber, Chris Hughes, Bob Husbands, Tom Kittle, Simon Lane, Market Weston RG, Doug Miller, Natural History Society of Northumbria, Newbury RG, North Lancashire RG, Northumbria RG, Nunnery RG, Runnymede RG, Rutland Water RG, Chris Sharpe, Brian Shaw, Roger Short, Bob Swann, Nick & Gill Tardivel, Tay RG, Bill Taylor, Tring RG, Chris Wernham, Mark Woodhead, Wychavon RG.

(RG= Ringing Group).

Bird Populations 8:206-209
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BTO News 265:10-11

RAS COMES OF AGE

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For several years now, many BTO ringers have been assiduously catching adult birds each summer to gather data on annual survival rates. Now, thanks to all their hard work, we are in a position to produce estimates of annual survival for a number of species. *Rob Robinson, Stuart Newson* and *John Marchant* report.

EL PROGRAMA RAS ALCANZA LA MADUREZ

Durante varios años ya, numerosos anilladores del BTO han estado capturando asiduamente adultos en la temporada de cría para recopilar datos sobre tasas de sobrevivencia. Ahora, gracias a sus esfuerzos, podemos generar estimas de sobrevivencia anual para varias especies. *Rob Robinson, Stuart Newson* y *John Marchant* informan.

Populations usually change in size for one of two reasons: there has been a change in either the productivity of breeders, or their survival rates. Recent analyses of data gathered by BTO volunteers show that the importance of each of these differs between species, depending on its particular ecology. One of the great strengths of BTO data is that, through our various schemes, we can monitor changes in both productivity and survival on a more or less annual basis. In this article, we present some of the first results from Retrapping Adults for Survival (RAS), one of our newest monitoring schemes.

Through the RAS scheme, licensed ringers are encouraged to focus their efforts on collecting data that can be used to monitor the survival rates of breeding birds. In a series of independent RAS projects, ringers concentrate on a particular species within a defined area, which might be a collection of farms, or an area of woodland. Each breeding season, the project attempts to record every breeding adult within the study area as an individual — by ringing it or by noting a ring or colour rings placed earlier. The turnover of breeding adults between seasons measures survival rates, site by site, in a way that is not possible through general ringing. The procedures for estimating annual rates are quite datahungry — that is they require information about a lot of birds, over a number of years in order to produce reliable estimates of survival.

Although RAS was started in 1998, many people were, in effect, running RAStype studies already, and they have kindly submitted their data from previous years, greatly increasing the value of their project. In one case, data stretch as far back as 1968, pre-dating RAS by 30 years!

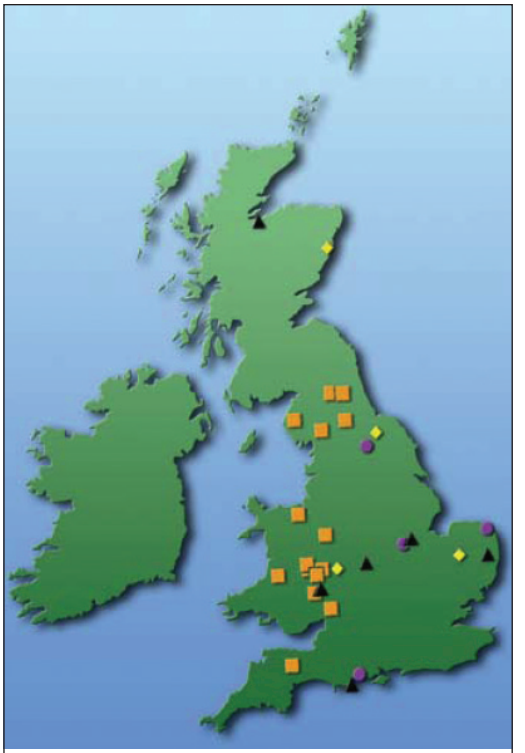
RAS is especially useful for species that are not caught as part of other programmes, particularly the Constant Effort Sites (CES) scheme. The species for which we are most keen to get RAS studies going are listed in the box below — some of these will certainly be more challenging than others! Ideally, we would like to see at least five studies for each of these

species, spread throughout their range, so we can gauge whether regional differences are likely to be important. So far, the species inspiring the most projects have been Pied Flycatcher, Sand Martin, Swallow and House Sparrow.

PIED FLYCATCHERS

First, we looked at survival rates in Pied Flycatcher, which is one of the most popular species for RAS. We were able to update the analysis that we ran a few years ago. Because there are so many sites (more than 15), some with data going back to 1980 or even earlier, the analysis represented a real challenge for our computers. Locations of these projects are mapped in Figure 1.

The average adult survival rate over all sites is shown in Figure 2. There does not seem to have been much change overall; since 1980, annual survival has remained at around 35–40%, which is about what would have been expected from other, mostly Scandinavian studies. Most of the individual sites are correlated with this overall trend, although on three sites the pattern of survival appears to differ somewhat. Perhaps unexpectedly, geographically close sites, except those in northeast England, do not seem to show especially similar patterns between years. This may indicate that other factors, such as habitat type, are often more important than region.



RAS projects that contributed to the analyses reported here: black triangle = Sand Martin; yellow diamond = Swallow; purple circle = House Martin; orange square = Pied Flycatcher. These are a small subset of around 100 projects currently active across Britain & Ireland.

FIGURE 1. Locations of RAS projects.

HIRUNDINES

We also looked at adult survival rates in the three hirundine species: Sand Martin, House Martin and Swallow. Sand Martin is the second most popular species for RAS projects, and capture totals can be well into treble figures each year. Although we have fewer sites for the other two species, and each site tends to catch fewer birds, we can estimate survival rate reasonably well for these too (Figure 3). Average survival rates over the whole period are broadly similar to those in Pied Flycatcher, probably because all four are trans-Saharan migrants (we might expect annual survival rates of resident birds to be around 50–60%). The estimate for House Martins, averaging 28% over all years, does seem to be rather lower, however. This might be a real difference in survival, or an indication that House Martins are less site-faithful than the other species – our methods cannot distinguish between deaths and permanent emigration from a site, since in neither case will a bird be recaptured.

Only for Sand Martin do we have enough historical data to calculate reliable estimates of survival before 1998. Since then, however, the patterns of survival rate between years for each of the three species have been remarkably similar (Figure 3). This is perhaps surprising, given that they winter in different areas, but on the other hand all hirundines do share a generally very similar ecology. Initial results suggest that these changes in survival are not related to rainfall in the Sahel region, as has been reported for example for UK Sedge Warblers, Hungarian Sand Martins, and Dutch Purple Herons. Interestingly, the annual changes

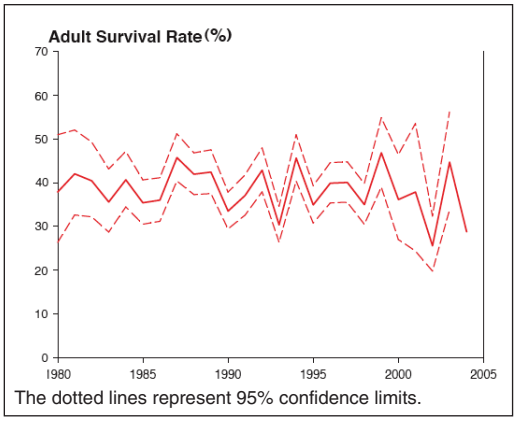


FIGURE 2. Adult survival rates of Pied Flycatcher from RAS studies.

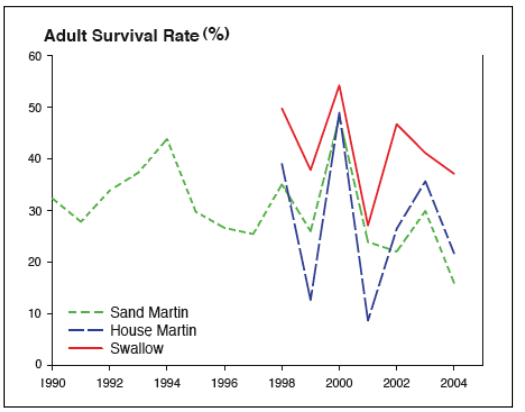


FIGURE 3. Adult survival rates of hirundines from RAS studies.

in survival rates of hirundines and Pied Flycatcher do not seem to follow a similar pattern, which also suggests that mortality on migration may be relatively less important. These results will clearly repay further analysis.

Recent comprehensive assessments of the population status of woodland birds in Britain, and of birds more generally across Europe, have highlighted the finding that many long-distance migrant birds have declined markedly. The Wider Countryside Report www.bto.org/birdtrends suggests that Pied Flycatcher and Sand Martin have undergone declines in the last ten years, while Sand Martin experienced a big decline in the late 1980s and early 1990s and Swallow numbers, though variable between years, have experienced no overall trend. On the basis of these results, the decline in numbers of Pied Flycatcher does not appear to be related to changes in survival, and nor do the changes in the two martin species, though we do not really have a long enough time series to say this with much confidence.

There is good evidence, however, that Pied Flycatchers may be responding adversely to climate change. The timing of peak caterpillar abundance is occurring earlier each year, as spring temperatures increase, and birds are not able to adjust their laying schedules accordingly, meaning there is a shortage of food for the chicks when they hatch. In the latest development to a long-running study of Pied Flycatchers and caterpillars at nine sites in the Netherlands, Christian Both and colleagues have recently reported (*Nature*, May 2006) that population decline has occurred mostly at those sites where the peak of caterpillar abundance has advanced markedly and where breeding attempts are most mistimed. A decline in productivity, rather than survival, may be the key to population change, therefore.

If you are a ringer and would like a challenging but rewarding project, and think you could catch enough breeding adults of any of the species listed in the Box to generate at least 25 retraps each year within a study area then contact the RAS organiser (ras@bto.org) for more details.

We would like to thank all those who have taken part in RAS so far for all their efforts, particularly those whose studies we have used in these analyses, including David Boddington, whose Pied Flycatcher study dates back to 1968.

TARGET SPECIES FOR RAS

New RAS projects for the following species would be especially welcome (number of projects known to be active in 2005 in brackets).

- Seabirds: Eider (4), Manx Shearwater (1), Kittiwake (1), Common and Arctic Terns (0)
- Waders: Ringed Plover (1), Common Sandpiper (2) and Oystercatcher (0)
- Hirundines: Sand Martin (15), House Martin (3), Swallow (6)
- Open-ground nesters: Whinchat (0), Stonechat (1), Wheatear (2)
- Finches & sparrows: House Sparrow (4), Tree Sparrow (0), Chaffi nch (3), Linnet (0)
- Hole-nesters: Starling (1), Pied Flycatcher (17)
- Other species: Dipper (2), Ring Ouzel (0).

Bird Populations 8:210-212
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BTO News 252:22

MILD CONDITIONS BENEFIT BREEDING OWLS

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BTO Research Biologist, *David Glue*, presents the fieldworkers' view of the breeding activity since autumn 2003.

LAS BENÉVOLAS CONDICIONES METEOROLÓGICAS BENEFICIAN LA REPRODUCCIÓN DE BÚHOS Y LECHUZAS

El biólogo investigador del BTO *David Glue* presenta la visión del ornitólogo de campo de la reproducción desdel el otoño de 2003.

During the course of the breeding season, a number of BTO members, nest recorders and ringers contact us to let us know how the season is progressing. Nest records from 2003 are being collated and readied for formal analysis. These observations contribute to the following report.

Unseasonal nesting, mainly from October through to February, often involving grebes, ducks, doves and some finches, has long been an occasional feature. Increasingly, it appears that nesting attempts during the 'non-breeding' season by a range of species, including some waterfowl, owls and thrushes, may be a more regular event and worthy of a careful eye. This apparent trend, in tandem with increased numbers of certain insectivorous species over-wintering (notably warblers), is due primarily to increasing winter temperatures, although the increase in supplementary feeding during the winter, may also have played a role.

Winter temperatures may also be influencing breeding ranges. In 2003, extralimital nesting attempts by Avocet (Wales), Peregrine (Lincs) and Gannet (Orkney) stole the limelight, but range extensions on a local scale emphasized the speed of change currently among the UK's avifauna. Buckinghamshire, for example, noted first-time successful breeding in the modern era by five species — Little Egret, Raven, Herring Gull, Lesser Black-backed Gull and Dartford Warbler.

BARN OWL AND FINCHES PROFIT FROM LATE SUMMER HEAT

Overall, BTO nest recorders charted a below-par breeding season for many species in 2003 (especially compared to 2002). This was notable for many resident insectivores and most migrant songbirds, with mixed fortunes for many raptors, waterfowl and gamebirds (*BTO News* 250, 251).

Thanks to consistent dry summer heat, it appeared to be a more productive year for certain resident seed-eaters (including Chaffinch, Greenfinch and Goldfinch). Triple-brood successes were reported among Tree Sparrows and Yellowhammers during Indian Summer warmth in September, parallelling events of the hot dry summer of 1976. A warm November, with daily temperatures 2°C above normal, helped Great Crested Grebe, Grey Heron, diving duck and doves that were tending late families.

The BTO Barn Owl Monitoring Programme also noted a welcome late upturn in fortunes. A very poor breeding season had been reported for 2003, with lightweight females and non-breeding pairs a feature. A number of Barn Owl clutches, laid from July–August 2003, were reported, from North Lincs and Cambridge to Norfolk and East Sussex (*pers comm* Peter Beaven, Colin Shawyer), with clement weather aiding foraging parents with broods during November and early December.

TAWNY OWL AND WARBLERS AMONG YULETIDE STARS

Many insectivorous summer visitors, including flycatchers, Redstarts and some species of warbler, prematurely vacated the increasingly parched UK countryside in autumn (in contrast to 2002). Healthy populations of Cetti's Warbler and Dartford Warbler had shown further gains. Some House Martins and Swallows successfully raised late broods into October, as far afield as Shetland and South Hams (Devon).

These were replaced by an impressive spectrum of vagrant insectivores, chiefly warblers. An influx of scarce eastern vagrants reached unprecedented levels, notably Yellow-browed Warbler and Pallas's Warbler and Hume's Leaf Warbler. Many were assisted by stiff easterly airstream in mid October. Other migrants lingered well into the winter, helped by an absence of sustained mid-winter cold spells.

Given ongoing warmer winters, other species may join established populations of Blackcap and Chiffchaff in the UK's winter gardens and countryside. Meanwhile, balmy episodes in December, culminating in the warmest Christmas break in a decade, led to regular reports from Garden BirdWatch observers of Woodpigeon and Collared Dove bringing young to feeding stations. Less unexpected were clutches started by Mallard (several sites), Pheasant (Oxon), Tawny Owl (Cheshire) and Blackbird (Co Kerry).

TROPICAL AIR TRIGGERS FALSE SPRING HOPES

Frequent spring-like -spells in January, with temperatures 1.2°C above long-term average, led to further nesting attempts. Most were located in warmer suburbia alongside man, with regular food supplies. Doves dominated, but other species included Mallard and Blackbird (several sites), Muscovy Duck (window box — Okehampton, Devon), Robin (garden plant centre — Newbury, Berks) and Mistle Thrush (lamp standard — Liverpool city).

Two nestbox checks provided remarkable revelations. Ring-necked Parakeets (Burnham, Bucks) were actively egg-laying mid month, while Blue Tits in south Kent were found with four downy young. Bubble-wrapping the box and supplying live food for the parents saved the day. Further nest-building, cavity claiming and song was depressed prematurely as January closed with a raw blast of arctic air, snow, blizzards, thunder and lightning, as temperatures dipped to –7°C at Carter Bar in Cheviot Hills on 28th. Temperatures recovered in spectacular style and the UK was blanketed by a warm southwesterly airstream of tropical Atlantic origin in first week of February, with record temperatures.

An unprecedented influx to southcoast counties of over 40 House Martins, some Swallows and Wheatears caused a stir. Doves and thrushes were prompted to start laying, Long-tailed Tit, Starling, Rook and Raven to repair and line nests. By St Valentine's Day an impressive 17 species were reported with active nests. Colder weather in the second half of February failed to offset an abnormal start, with vegetation some 2–3 weeks advanced, but wintery chill in March appeared to slow nesting operations. This is perhaps no bad thing, with 2003 and other recent years, demonstrating how New Year warmth and early spring heat are not necessarily the prime ingredients for a highly productive breeding season.

THE NEST RECORD SCHEME (NRS)

The NRS plays a vital role in monitoring changes in the breeding performance of the UK's birds.

This is one survey in which anyone can participate. Each nest record details a single breeding attempt at a nest. Observers record visit date, nest contents, location and habitat on standardised nest record cards or a new computer program IPMR (Integrated Population Monitoring Reporter). Nest recorders are encouraged to visit the nest on at least two occasions, preferably during both the egg and the chick stages, to give an estimate of hatching/fledging success.

Productivity tables are produced for the annual *Breeding Birds in the Wider Countryside* report www.bto.org/birdtrends/index.htm

To obtain a free 'Starter Pack', an IPMR disc or further information, please contact the Nest Records Unit nest.records@bto.org. *Peter Beaven*

Bird Populations 8:213-214
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BTO News 255:26

WHITE STORK FAILS TO DELIVER

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Intriguing New Year breeding successes, exciting range extensions, and productive nestbox projects: all features of an upbeat 2004 breeding season, outlined by BTO Research Biologist, *David Glue*.

LA CIGÜEÑA BLANCA NO CUMPLE

Intrigantes éxitos reproductivos en Año Nuevo, excitantes extensiones de rango, y productivos proyectos con cajas nido: características de una temporada 2004 muy animada, resumida por el biólogo del BTO *David Glue*.

Following the relatively poor breeding season for many species in 2003 (*BTO News* 249), it is pleasing to outline a more productive current season for many of the UK's breeding birds. The early breeding events were reported in *BTO News* 252.

MANDARIN AND STONE CURLEW OCCUPY FRESH HAUNTS

A dull, wet April was tempered by regular warmth, 1–2°C above average. Attempts by a pair of White Stork to breed in the Calder Valley, west of Wakefield (West Yorks) atop a hastily erected pole and pallet, substituting for an electricity pylon, led to frustration and failure. They carried Continental rings, the female fitted near Lille (France) and male at Mechelen (Belgium).

Wandering birds elsewhere in the UK suggest that the first successful breeding, since that on St Giles' Cathedral (Edinburgh) in 1416, may not be far away. The naturally recolonising Chough, on the Lizard peninsula (Cornwall) were more successful with four young hatched in this, the third year.

Periodic heavy rains mid month and during the last week, with flash-flooding in the Severn Complex and northeast, led to locally heavy losses among nesting duck, Black-headed Gull, plovers and Reed Bunting. Sadly, yet another spring buildup of water in the Ouse Washes washed out a nationally significant population of more than 1,000 pairs of waders, including Lapwing, Redshank, Snipe and Blacktailed Godwit.

Stone Curlew fared better in Breckland and Wessex populations, with signs that a 'dumbell' distribution may form via the Ridgeway counties. Warm spells in the final week, with temperatures touching 23°C in London on 24th, saw a surge in reported active nests of dabbling duck, tits, thrushes and finches. Those checking nestboxes were delighted to find Goosander (Devon, Montgomery), Mandarin (Bucks, Hants) and Black Redstart (Birmingham). Among spring migrants, Chiffchaff and Blackcap maintained their recent strength, Yellow Wagtail and Tree Pipit reappeared in improved numbers but Cuckoo were again woefully few in parts.

WARM MAY SUITS OWLS, TITS AND FLYCATCHERS

May was the driest such month since 1998 and the warmest and sunniest since 1991. Consistent comfortable heat, moist soils and clear blue skies favoured early nesting residents and summer visitors alike. Daily temperatures 1–2°C above average in all regions, topping 25°C in Greater London on 24th, boosted aphid, caterpillar and midge prey. The mercury dipped to –4°C at Kinbrace (Sutherland) early on 27th, but fortunately the spring remained largely frost-free (unlike 2003).

Tits survived the winter in modest numbers and average sized clutches were laid. Fledging success though was generally high, with relatively few broods of Great Tit, Blue Tit, Long-tailed Tit and Pied Flycatcher predated by weasel, pine marten, wood mouse or Great Spotted Woodpecker, in contrast with the previous season. Checking nestboxes in rampant vegetation was hard work, but lush grass growth resulted in plenty of prey that fuelled egg-laying Buzzards, Kestrels, Tawny Owls and Long-eared Owls.

Progressively drier conditions, especially in western parts, checked some invertebrate numbers and limited mud for nest building supplies, but rain-bearing Atlantic fronts from the 28th relieved matters.

A warm first-half to June, with temperatures topping the 30°C mark, helped Swallow, Dipper, Pied Wagtail and Spotted Flycatcher to fledge first broods and to lay repeat clutches. Delighted homeowners in Liss Forest (Hants), Great Gaddesden (Herts) and Church Stretton (Shrops) attracted families of Siskins to feeders.

Elsewhere, onlookers in Chichester (Sussex), inner city Gloucester and Nottingham, watched nesting Peregrine. Melodious Warbler (Cornwall), Icterine Warbler (Suffolk) and Great Reed Warbler (Essex) sang well but failed to attract mates, Spotted Crake, Serin and Common Rosefinch in new haunts proved successful.

OSPREY AND HOBBY CHECKED BY MIDSUMMER RAINS

Winds veered to the north on 17th June, introducing sharp showers and a cooler theme, revitalizing parched soils and drying water-bodies. The period mid-June to mid- July proved the chilliest since 1981 (daily temperatures 0.7°C below average) but many thrushes, Robins, Wrens, hirundines, chats and pipits reared successive broods. Avocet, Little Egret and Mediterranean Gull made significant range extensions, chiefly to the northeast, inland, and south coast populations respectively. A record-breaking 'autumnal' low, crossed southern parts on 7/8th, with torrential rains and winds to 50 knots. Crown-heavy trees were uprooted, with young Grey Heron, Cormorant, Osprey, Hobby and doves reported lost, as well as swamped broods of ground-nesting divers, Merlin, Hen Harrier and Nightjar, among others. Some Barn Owl young starved, but the Barn Owl Monitoring Programme reported modest numbers of free-flying youngsters, eclipsing the grim season 2003 (*pers com*. Colin Shawyer, Peter Beaven).

Seabirds, as ever, enjoyed mixed fortunes, but 'catastrophic' stories from northern sites dominated. Initially east coast mixed colonies, including Sandwich Tern and Little Tern, were decimated at the chick stage by tidal storm surges. Longterm nest-recorder Eric Meek, on Orkney, described "the worst season in living memory", with thousands of Guillemot, Shag and Kittiwake missing from traditional ledges. Arctic Tern, Arctic Skua and Great Skua were inactive, while starving chicks were a feature. Debate centred around climate change and a northward shift of plankton and fish prey to warmer waters. Gannet provided one bright spot, 14 pairs occupying the UK's newest colony on The Noup, Westray. On land, healthy nestbox broods of Great Tit, Pied Flycatcher and Nuthatch in the third week of July, reflected repeat layings and second brood successes. Gathering heat in late July, temperatures clipping 30°C at the month's end (Cardiff), boosted aerial insect supplies, enabling martins, Spotted Flycatcher and Nightjar, among others, to fledge late broods in August, before nesting activity wound down in torrential midsummer rains, the wettest August since 1956.

Bird Populations 8:215-218
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BTO News 261:18-19

NEST RECORD SCHEME BREEDING TRENDS — LATEST RESULTS

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Dave Leech and *Humphrey Crick* summarise the latest findings from the Scheme.

TENDENCIAS REPRODUCTIVAS DEL PROGRAMA DE REGISTRO DE NIDOS – ÚLTIMOS RESULTADOS
Dave Leech y *Humphrey Crick* resumen los últimos hallazgos del programa.

One of the perks for the predominantly desk-bound staff working at the BTO is the chance to experience the birding year by proxy via the many e-mails, phone calls and letters received from nest recorders, ringers and surveyors out in the field. This summer, for example, fewer Long-tailed Tits were caught at our regular ringing site on The Nunnery reserve, an interesting observation in itself, but one made all the more intriguing by the fact that several nest recorders have mentioned that it has been a productive year for the species on their local patches.

So, was it a good year for Long-tailed Tits or not? While knowledge of what is happening locally is important, it is vital that we collate and analyse the information we receive at a national scale if we are to identify species that are in need of conservation action. This is where the *Breeding Birds in the Wider Countryside Report* (WCR) comes in. The purpose of this web-based report (www.bto.org/birdtrends2005) is to summarise and to publicise annual trends in population sizes and breeding success for over 100 British bird species. Information about the success of individual breeding attempts is provided by the Nest Record Scheme (NRS) and each year trends in laying date, clutch size, brood size and nest failure rates for over 90 species, based on information collected by nest recorders, are published in the WCR. And what a data source this is — the most recent analysis utilised over 365,000 records collected between 1966 and 2004!

CHANGES TO THE NRS CONCERN LIST

Each year the BTO produces the *NRS Concern List* incorporating those species that are currently demonstrating statistically significant declines in both breeding performance and abundance (see Box 1 for details). The list is intended to act as an early-warning system, focusing attention on those species that may be in greatest need of conservation action in the future and, as such, it is sent to the Joint Nature Conservation Committee (JNCC), the UK government's conservation adviser and joint funding body of the NRS under the BTO/JNCC partnership.

The number of species on the latest *NRS Concern List* (Box 2) has increased by two, with two species being dropped and four being added, bringing the total to 17. The reasons for the inclusion of Moorhen, Ringed Plover, Yellow Wagtail, Grey Wagtail, Dunnock, Willow Warbler, Linnet, Yellowhammer and Reed

BOX 1 – NRS DATA ANALYSIS

NRS data for 94 species were analysed using the methods outlined in a recent review paper in *Bird Study* 50: 254–270. Trends in laying date, clutch and brood sizes, and in daily nest failure rates over the egg and chick periods are described by linear or quadratic regression, as appropriate. Failure rate trends were not calculated for those species having a mean annual sample size of fewer than 20 records and species with a mean annual sample size of fewer than 10 records were excluded from analyses of laying date, clutch size and brood size.

Relative breeding performance in the current year was assessed by comparing the mean values for laying date, clutch/brood size and failure rate in 2004 with those values predicted from the trend calculated between 1966 and 2003.

Species are placed on the *NRS Concern List* if a) they demonstrate significant declines in some aspect of breeding performance over at least the last 15 years, and b) they are on the Red or Amber *Birds of Conservation Concern* list or there is some uncertainty over their population status.

BOX 2 – NRS CONCERN LIST

Species	Years on list	Significant decline in:	Population trend
Moorhen	12	Clutch size & Nest survival (E)	Fluctuating
Ringed Plover	8	Nest survival (E)	Uncertain
Barn Owl	*1*	*Brood size*	*Amber List*
Skylark	**New**	**Nest survival (E)**	**Red List**
Yellow Wagtail	*5*	*Brood size*	*Amber List*
Grey Wagtail	*2*	*Clutch size & Brood size*	*Amber List*
Pied Wagtail	1	Clutch size & Brood size	Fluctuating
Dunnock	*6*	*Nest survival (E)*	*Amber List*
Wheatear	1	Brood size	Possible decline
Mistle Thrush	*New*	*Brood size*	*Amber List*
Willow Warbler	*6*	*Nest survival (E)*	*Amber List*
Spotted Flycatcher	**New**	**Brood size & Nest survival (C)**	**Red List**
Starling	**New**	**Brood size**	**Red List**
House Sparrow	**1**	**Brood size**	**Red List**
Linnet	**13**	**Brood size and Nest survival (C)**	**Red List**
Yellowhammer	**2**	**Nest survival (E & C)**	**Red List**
Reed Bunting	**13**	**Nest survival (E)**	**Red List**

(E) indicates nest survival at the egg stage and (C) indicates nest survival at the chick stage. Population trends are taken from www.bto.org/birdtrends. Criteria for inclusion on the Red (**bold**) and Amber (*italic*) Lists (High and Medium Conservation Concern respectively) are explained in *BTO News* 242: 11–14.

Bunting, all of which have been included on the list for at least three consecutive years, are discussed in *BTO News* 249: 4–5. Barn Owl, Pied Wagtail, Wheatear and House Sparrow were all added to the Concern List last year. The reasoning behind these additions is discussed in *BTO News* 255:18–19.

Both Lapwing and Bullfinch were added to the list in 1996 but have been dropped in 2005. Lapwing was originally placed on the *Concern List* due to a steady increase in egg-stage failure rates between the mid-1980s and late 1990s, possibly related to increasing rates of predation and destruction by livestock (Chamberlain & Crick 2003). However, success rates at the egg stage have been consistently higher over the last four years and the trend is no longer statistically significant. While this could be good news for Lapwings, it is important to remember that improvements in average breeding performance might also be due to decreasing competition between individuals as

NEW ADDITIONS

Three of the four species added to the Concern List this year are on the *Birds of Conservation Concern* Red List as they have exhibited population declines of greater than 50% over the last 25 years:

Skylark: Common Birds Census (CBC) and Breeding Bird Survey (BBS) data indicate that Skylark numbers in England fell by 59% between 1978 and 2003. An increase in the sowing of winter cereals over this period may have decreased the availability of stubble fields in winter and also reduced opportunities for late-season breeding attempts (Chamberlain & Siriwardena 2000). It is therefore worrying that the latest NRS trends suggest that eggstage failure rates have increased significantly over the last 15 years, although both clutch and brood sizes are currently increasing.

Spotted Flycatcher: This is one of the UK's most rapidly declining species, with a decline of 81% over the past 25 years. The fall in numbers has been linked to declining survival rates of first-year birds (Freeman & Crick 2003). Now we find that productivity in the UK also seems to be falling, with brood sizes declining significantly since the mid-1990s (Figure 1) and failure rates at the chick stage increasing slowly but steadily since the mid-1960s.

Starling: While it is still thought of as a relatively common garden bird, CBC/ BBS trends indicate that the breeding Starling population in England has decreased by 78% over the last 25 years. During this period, clutch sizes and brood sizes increased and failure rates fell, indicating that falling survival rates, and not a reduction in productivity, were responsible for the decline (Freeman et al. 2002). However, since the mid-1990s brood sizes have started to fall rapidly (Figure 1) and the species has now been added to the NRS *Concern List*.

Mistle Thrush: This Amber-listed species, which has declined by 32% in the UK over the last 25 years, has also been added to the *Concern List* due to a significant decline in brood size of greater than 5%, despite an increase in average clutch size over the same period. This decline appears to have been particularly severe over the last 10 years (Figure 1).

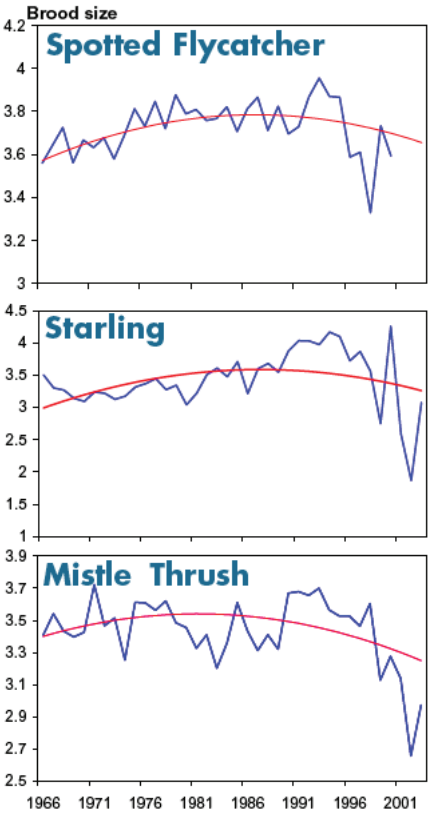

FIGURE 1. Changes in brood size.

the population declines, or to a decreased proportion of birds breeding in marginal habitats as the population contracts. Bullfinch was also previously included on the *Concern List* because of increasing egg-stage failure rates but, again, failure rates for this species have decreased over the last five years (see New additions box).

THE 2004 SEASON

The 2004 season appeared to get off to a bit of a

slow start, with eight species breeding on average later than was predicted from laying dates in previous years, and only two — Kestrel and Reed Bunting — breeding earlier. In terms of clutch sizes, larger birds seemed to have a better year, with Barn Owl, Little Owl, Jackdaw and Magpie all laying relatively large clutches whilst clutch sizes were comparatively small for Skylark, Chiffchaff and House Sparrow. Brood sizes were lower than predicted for eight species, but were high relative to previous years for Wheatear, Whinchat and House Sparrow (despite smaller clutch sizes for House Sparrow, suggesting that hatching success was actually rather high). In general, failure rates seemed to be relatively low, with the proportion of nests failing at the egg stage lower than predicted for nine species and the proportion failing at the chick stage lower than predicted for 13 species. In comparison, egg-stage failure rates exceeded predictions for five species and chick-stage failure rates exceeded predictions for only two species.

THANK YOU

None of this research would be possible without the fantastic amount of time and energy that nest recorders invest in collecting these data each year, so thank you very much to everyone who has contributed to the NRS data set. If you have not yet contributed, but would like to in the future, contact us at nest.records@bto.org or look at our web pages at www.bto.org/survey/nest_records/index.htm for more information.

Thanks to Dorian Moss for his help in producing the latest NRS trends. Thanks also to Mark Cubitt for the design and continued development of the IPMR home-inputting program, which has revolutionised record submission, to Karen Wright for all her work on the NRS database and to David Glue for his contributions to the Scheme. The Nest Record Scheme is funded by the BTO/ JNCC partnership.

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Bird Populations 8:219-220
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BTO News 269:18

WEBS ALERTS: WATERBIRD TRENDS ON PROTECTED AREAS

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Ilya Maclean and *Graham Austin* describe how data collected as part of the BTO/WWT/RSPB/JNCC Wetland Bird Survey are used to help the government monitor protected areas.

ALERTAS DE WEBS: TENDENCIAS DE AVES ACUÁTICAS EN ÁREAS PROTEGIDAS
Ilya Maclean y *Graham Austin* describen cómo los datos colectados a través del programa de conteo de aves de humedales de BTO/WWT/RSPB/JNCC son utilizados para ayudar al gobierno a monitorear las áreas protegidas.

The UK hosts internationally important numbers of overwintering waterbirds. In total about 100 sites have been designated as protected areas because of the waterbirds present there. The government has a legal obligation to monitor these sites and ensure they are maintained in a favourable status. If their status becomes unfavourable, the causes of declines must be identified and remedial action taken.

WEBS ALERTS

WeBS Alerts is an online information source that allows users to check how waterbird species are faring in protected areas and is used by government bodies such as JNCC. It is updated annually, and the updated report, which covers the winter of 2004/05 is now available online.

The WeBS Alerts system was developed to provide a standardised method of identifying the direction and magnitude of changes in bird numbers at a variety of spatial and temporal scales for a range of waterbird species. For each protected area monitored by the WeBS and for each waterbird species for which an area is designated, a statistical technique is used to smooth out short-term fluctuations in numbers and produce a trend line. Site trends are then compared to regional and national trends, allowing distinction between declines due to site-specific factors and those driven by large-scale population changes. Species that have undergone major declines can then be flagged by issuing an Alert.

WATERBIRD TRENDS

Two major conservation issues have been highlighted by this year's Alerts report. The first is that Pintail numbers wintering on the Mersey Estuary have declined precipitously (see Figure 1). Almost 20,000 used to overwinter in the early 1980s, but numbers have declined to about 200. This site, which once hosted almost half the UK population, now no longer hosts even nationally important numbers of Pintail. The other major cause for concern is the continued decline in Pochard at Loughs Neagh and Beg. In the mid 1990s, these Loughs hosted almost 30,000 Pochard, but numbers have subsequently

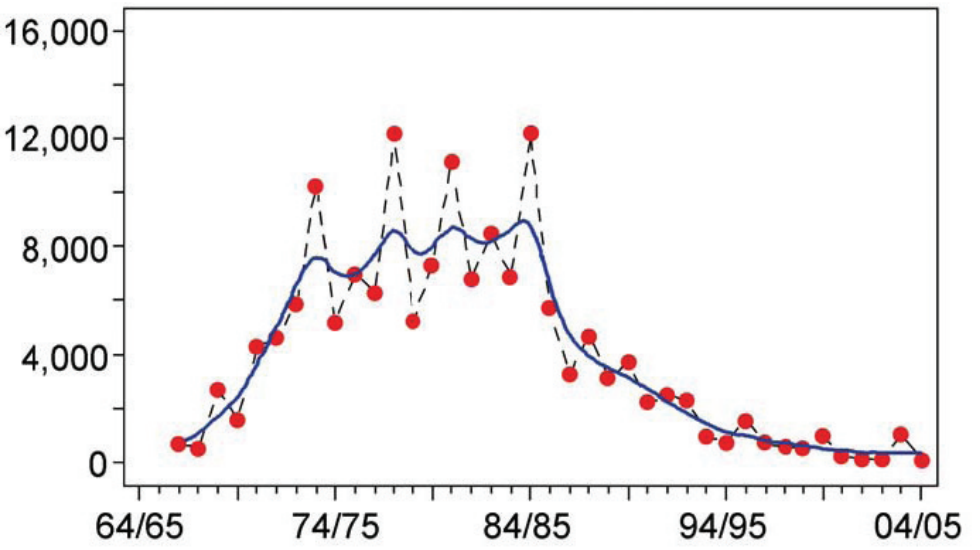

FIGURE 1. Wintering Pintail on the Mersey Estuary.

dropped to fewer than 7,000.

There is some good news though. There is evidence the declines in other diving ducks at this site have ceased. Goldeneye and Tufted Duck numbers are slightly up on the winter of 2003/04 and Scaup numbers on the site are higher than ever before.

The full report can be obtained by going to the following webpage: www.bto. org/webs/alerts/alerts/index.htm.

ACKNOWLEDGEMENTS

We are extremely grateful to all the volunteers who take part in the Wetland Bird Survey (WeBS). WeBS is a joint scheme of BTO, WWT, RSPB and JNCC. If you would like to take part in the scheme contact your local WeBS organiser or Andy Musgrove at the BTO Thetford HQ, or email: webs@bto.org.

FURTHER READING

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Bird Populations 8:221-224
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BTO News 260:8-9

BLACK REDSTARTS BRIGHTEN WINTER BIRDTABLES

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For 35 years, the BTO's Garden Bird Feeding Survey has been monitoring garden birds in winter. BTO Research Biologist, *David Glue*, looks at the findings of winter 2004/05.

LOS COLIROJOS TIZONES DAN COLORIDO A LOS COMEDEROS DE INVIERNO
Durante 35 años, el conteo de aves de jardín en comederos ha monitoreado las aves de jardín en invierno. El biólogo investigador del BTO *David Glue* revisa los resultados del invierno 2004-05.

The UK garden bird care market continues to expand. It is currently considered to be worth some £150–180 million per annum, with in excess of 18 million home-owners providing supplementary food of some type. The BTO's Garden Bird Feeding Survey (GBFS), which started in winter 1970/71, has provided long-term data for this increasingly important habitat.

BARE UK BIRDTABLES COUNTRYWIDE

In winter 2004/05, observers recorded all species coming to take food or water provided, on a weekly basis from October to March inclusive. The gardens sampled totalled 241, with 113 in rural villages, hamlets and farmsteads and 128 of city houses, suburban semis and maisonettes. Collectively these are considered to be broadly representative of UK dwellings by type across all regions. Garden species richness was comparatively low for this winter, on average just 16.7 species in suburban and 19.8 species in rural sites, compared to the previous winter 2003/04 (20.8 and 23.0 species for suburban and rural respectively). This is generally 2–3 species fewer than has been recorded in recent winters (see *BTO News* 242, 248, 254) and is largely a consequence of prolific fruiting yields in UK hedges and woods and a mild winter.

As ever, species richness varied widely between gardens, extreme examples featuring familiar long-term core counters. A coastal garden in Ramsgate (Kent) attracted a meagre four species (House Sparrow and Collared Dove being the highlights). The richest suburban garden in Walbottle Village (Newcastle-upon-Tyne) attracted 34 species (including Grey Wagtail and Yellowhammer). This total of 34 species was matched by the top rural garden in Mold (Flint), a mobile miniwaterfall feature attracting Chiffchaff, Meadow Pipit and Linnet to drink.

In total, a modest 76 species were charted taking food or water. Robin was the only species to feature at every feeding station (Table 1). The 'Top Twelve' species, by composition and relative frequency, were very similar to that of winter 2003/04 (*BTO News* 254). Compared to winters averaged across the 1990s, though, Collared Dove, Coal Tit and Magpie showed increased attendance, while House Sparrow and Starling continued to slip back, probably as a result of population declines (Table 1).

TABLE 1. GBFS Top Twelve 1994–2004 garden feeding species.

		Winter 2004/05 and average for 1990s	
Rank	Species	% of gdns 2004/05	% of gdns 1990s*
1	Robin	100	99
2	Blue Tit	99	100
3	Blackbird	99	99
4	Great Tit	98	97
5	Greenfinch	97	96
6	Dunnock	97	95
7	Chaffinch	95	96
8	Collared Dove	91	86
9	Coal Tit	88	85
10	House Sparrow	86	93
11	Starling	81	93
12	Magpie	75	71

(*) Figures are the average of 10 winters from 1990/91 to 1999/2000.

CHILLY WINTER EPISODES LEAD TO BUSIER FEEDERS

Four major features moulded the spectrum of species feeding and flock sizes of birds at UK birdtables in winter 2004/05:

- an autumn legacy of unharvested arable crops in open country: chiefly oilseed rape and spring-sown barley, following a protracted wet summer.
- widespread high yields of many woodland and hedgerow fruits, notably beech mast (best crop since 2000), acorns, cob nuts, hips and haws.
- prolific conifer seed yields, notably spruce, pine and larch, the largest for a decade.
- another largely mild winter, lacking any prolonged spells of lying snow and ground-penetrating frosts.

Several noteworthy weather events affected feeding patterns of birds over the winter. Initially, a balmy warm start to October, adding to an Indian Summer in September, saw Collared Doves, Stock Doves, Greenfinches and Tree Sparrows bringing families to feeders. A chilly, stiff easterly continental wind during 9–ll October swept a large movement of winter thrushes (chiefly Redwing) and Goldcrest to UK, eventually some turning to feeding stations. Food hoarding by Coal Tit, Marsh Tit, Magpie and a few other species remained low key. Persistent mild westerly winds during much of the mid winter (November–January) depressed numbers of tits, thrushes, Starlings and finches at feeders. A bitter blast of arctic air during 19–23 November enticed the first Blackheaded Gull, Blackcap, Pied Wagtail and Reed Bunting to favoured sites. This same weather pattern also prompted a major influx of Waxwings, exceeding that of recent winters and that of 1985/86. New Year monsoon-like downpours, which saturated gardens, and caused serious flooding in Snowdonia, Cumbria and West Highland, brought Mallard, Moorhen, Grey Wagtail, and other less usual birds to feeding stations. Violent storms in mid January, hurricane force in western parts (rivalling conditions in 1987 in some areas), damaged housing fabric, flattened fencing and feeders, and depressed bird feeding activity.

Spring-like heat early in February limited further feeding by tits, thrushes (notably Blackbirds), corvids and finches. Premature nesting saw Collared Dove, Woodpigeon and Robin bringing young to feeders (*BTO News* 258). From 10 February, cold arctic air from Greenland, then North Russia, brought an uncomfortable four-week late winter snowy spell. Livelier birdtables supported winter thrushes, Long-tailed Tits, Yellowhammers and Reed Buntings but Brambling, Redpoll and Siskin remained in short supply. Spring proper arrived around 16–l8 March, with southerly winds sweeping warm tropical air to UK. Many feeders were vacated, residents paired and eggs laid, though parent Robin and Greenfinch, among others, relied on suitable extra food rations.

GOLDCREST AND LONG-TAILED TIT ADD SPARKLE TO EXTRA FEEDERS

The status of birdtable visitors, and aspects of their behaviour, continued to change in winter 2004/05. Among the regulars, opportunistic Long-tailed Tit (69% of sites), Carrion Crow (38%), Pheasant (32%) and Goldfinch (72%) equalled or exceeded alltime high levels of attendance at GBFS feeders, contrary to the general downward trend in feeding rates. Encouragingly, adaptable Great Spotted Woodpecker (50%), Jackdaw (51%) and Woodpigeon (69%) now feed at half or more

FLUCTUATING FORTUNES AT UK BIRDTABLES: GBFS PEAK COUNT INDEX 1970–2005

GBFS continues to provide the BTO with a valuable indicator of the changing status of garden birds in the non-breeding season.

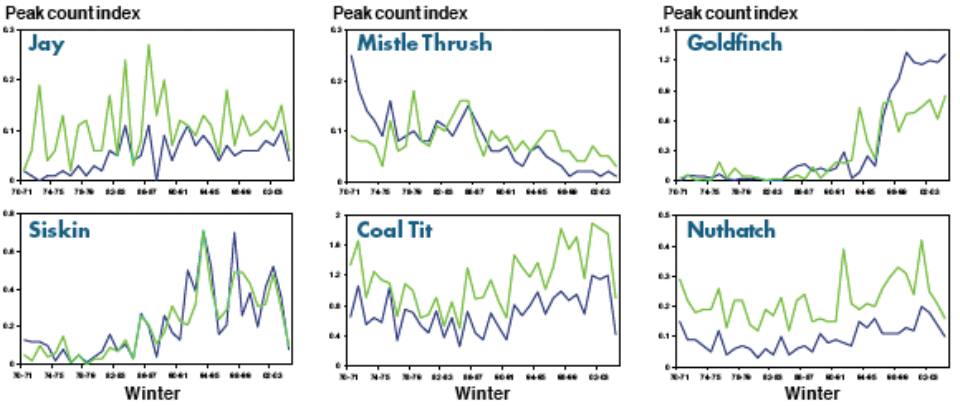
Jay numbers at feeders fluctuate erratically by winter, inversely related to the volume of the acorn crop. Birds from parks and cemeteries, especially in suburbia, have turned increasingly to birdtable fare: a modest corvid success story compared to other corvids — Rook, Carrion Crow, Magpie, Jackdaw, and even Raven in places.

Mistle Thrush, like its cousin the Song Thrush, has been on the slide in gardens long-term; today it is absent from most feeding stations in towns and cities.

Coal Tit and Nuthatch (like Great Tit), display marked peaks and troughs in winter attendance levels at seed feeders and nut baskets, dictated by the volume of beech mast (and other woodland tree fruits) available in the countryside. Low levels of feeder visits in winter 2004/05 were similar to the patterns in previous winters with beechnut bonanzas, notably 1976, 1985, 1991 and 2000.

Siskin numbers, similarly, dipped sharply in winter 2004/05, reflecting the largest conifer seed yield in a decade, following a marked upturn in this fine-billed finch's fortunes since the 1990s.

Goldfinch, in contrast, sustained its recent meteoric rise in UK garden feeder-use, flocks 20–30 strong reported widely in winter 2004/05 though none exceeded the 100 mark.



The Peak Count Index is the average maximum count per week.
Scales of vertical axes vary greatly between species.

= rural
= suburban

garden feeding stations, while Tree Sparrow (10%), Goldcrest (13%) and Bullfinch (20%) now feed at onetenth or more. In Kyle, Ross-shire, Waxwings drank at a bird bath 'puddle', part of the recordbreaking influx (see above).

Sparrowhawk (53% of sites) comfortably maintained its status as chief diurnal garden avian predator and was observed taking prey ranging in size from Blue Tit to Pheasant and Herring Gull (the latter two being lame and emaciated individuals respectively). Observers noted Sparrowhawks, variously, hunting 'in tandem', ground-running through bushes to snatch songbirds, and repeatedly claiming Collared Doves that had been dashed and dazed against windows and walls. Kestrel (just 4% of sites), with its perch-and-pounce hunting strategy, is less well suited to operate effectively within the garden environment. Buzzards (2% of sites) scavenged for food at a scatter of gardens, from the fringes of Dartmoor and Welsh Marches, to New Forest and Borders. Red Kites visited gardens in the Chilterns, Thames Valley and Mid Wales. Elsewhere, lucky observers

observed hunting Hen Harrier (Castletown, Isle of Man), Peregrine snatching Feral Pigeon (Canterbury, Kent) and Merlin (Holyhead, Anglesey).

Winter 2004/05 brought further cases of the unexpected at UK birdtables. The transient Quail attracted to grain at Runcton, Chichester (Sussex) in late October (sadly later found dead on a nearby road), brought the 35-year GBFS tally to 165 species. Elsewhere, Black Redstarts (Tredegar, South Wales; Budleigh Salterton, Devon) helped to liven lacklustre winter birdtables.

Some GBFS observers complained, variously, of feeding stations 'dominated' or 'plagued' by a spectrum of birds, hoovering up costly materials. These range from 'problem' Woodpigeon, Feral Pigeon and Pheasant (many sites), local Herring Gull, Black-headed Gull, Rook and Mallard, even Red-legged Partridge (Rhostyllen, Wrexham), Goldfinch (Hillsborough, Co Down) and Tree Sparrow (Gresford, Clwyd) — but one man's perceived 'problem species' surely provides another with 'treasured pleasure'. Achieving a comfortably diverse and attractive feeding community close to hand via a range of feeders and foods, for bird conservation and human satisfaction is a laudable aim. GBFS will continue to chart the changing picture in winter 2005/06, that beckons.

THANK YOU

The BTO extends a huge measure of thanks to the dedicated team of GBFS counters, a small key core extending back to formative years of this survey: one that has yielded much useful data for the Trust. Thanks also go to Jacky Prior, Carol Povey, Margaret Askew and Frances Bowman who helped to distribute and collate forms, and to Mike Toms for help in calculation of Peak Count Indices.

Bird Populations 8:225-227
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BTO News 251:22-23

NEW WILD BIRD INDICATORS FOR ENGLAND

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The BTO's *David Noble, Alex Banks* and *Stuart Newson* explain how these new indicators will be used.

NUEVOS INDICADORES DE AVES SILVESTRES PARA INGLATERRA
David Noble, Alex Banks y *Stuart Newson,* del BTO, explican cómo estos nuevos indicadores serán utilizados.

BTO volunteers have a long history of collecting valuable survey data, allowing us to generate long-term trends and so monitor the status of birds in the UK. These are reviewed annually, species by species (see www.bto.org/birdtrends) and were recently used to update the red and amber lists (see *The Population Status of Birds in the UK*).

For this information to be readily accessible at a government level, masses of data must be condensed into simple statistics. Bird population trends, summarised into wild bird indicators, simplify patterns of change in groups of species. These have been adopted for the government's headline indicators of sustainable development and 'Quality of Life', alongside similar trends for other social, economic and environmental factors (www.sustainabledevelopment. gov.uk/ar2002/index.htm). The 'wild bird index' incorporates the population trends of 105 UK breeding species, with separate trends for farmland and woodland species.

INDICATORS FOR THE ENGLISH BIODIVERSITY STRATEGY (EBS)

Recently, BTO, together with RSPB, developed new wild bird indicators for the government's new strategy for biodiversity in England, 'Working With the Grain of Nature'. Launched in December 2003, the strategy aims to engage society in biodiversity issues, and specifically to make biodiversity an essential consideration in the management of key habitats. To help achieve this goal, we developed wild bird indicators for the five broad habitats in the strategy:

- Agricultural land
- Marine/coastal environment
- Urban areas
- Water and wetlands
- Woodland

These indicators will be used to monitor progress towards specified biodiversity targets.

CONSTRUCTING WATER & WETLAND BIRD INDICATORS

Following the techniques used for generating 'Quality of Life' indicators, we relied upon those data sources most appropriate for the target habitat. For the water and wetland indicator, data from the BTO's Common Birds Census (CBC) and Waterways Bird Survey (WBS) were used. We calculated population trends for species typically associated with wetlands or

waterways, where data were sufficient to do so, for the period 1975 to 2000. From these individual species indices, a mean trend across species was calculated.

This trend was positive (see Figure 1), increasing 7% by 2000. One of the disadvantages of 'all species' trends is that they can mask interesting patterns of change, because rapidly increasing populations of one bird species can hide the declines of other species. More than a third of the species were actually declining over the same period (see Figure 2).

To explore these differences, we produced separate trends for birds connected with running water, birds of slow moving or still water, and birds of wet meadows (Figure 1). These trends reveal that species of slow or still water have increased markedly over the past 25 years, largely due to the influence of rising populations of Mallard, Mute Swan, Tufted Duck and also Cetti's Warbler — a species that colonised England within the last 30 years. However, fast water species — essentially birds of upland streams such as Common Sandpiper, Dipper and Grey Wagtail — have declined by over 20% (see also Marchant, 2001; *BTO News* 236), and populations of wet meadow species — predominantly waders such as Lapwing, Redshank and Snipe counted in floodplains — have declined by more than 50%. Although the latter two groups feature only four species each, these indicators nevertheless raise concerns about these habitats, confirmed by the results of the recent survey of breeding waders on lowland grassland (Wilson & Vickery, 2003; *BTO News* 247).

As the UK also provides important habitat for non-breeding waterbirds, such as waders and geese from all over Europe, Greenland and Canada, a second indicator was produced to illustrate trends in wintering populations (see Figure 3). This indicator utilises data collected from the BTO/WWT/RSPB/JNCC Wetland Bird Survey and the WWT/JNCC National Goose Counts. Non-breeding waterbirds underwent consistent increases over the period 1970/71–1997/98. Although that is a positive message, these counts are derived mainly from large concentrations on estuaries. Analyses of counts that also include nonestuarine coastline have revealed declines in a number of wintering wader species such as Turnstone and Purple Sandpiper (see Rehfisch et al., *BTO News* 248)

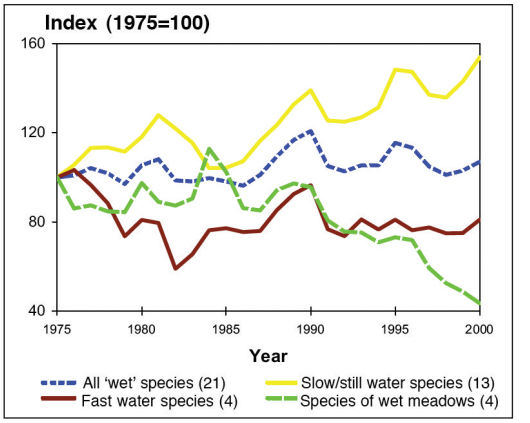

FIGURE 1. Water and wetland indicator.

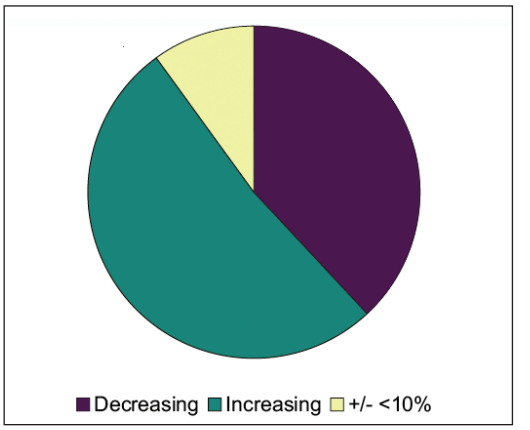

FIGURE 2. Status of populations in water and wetland indicator.

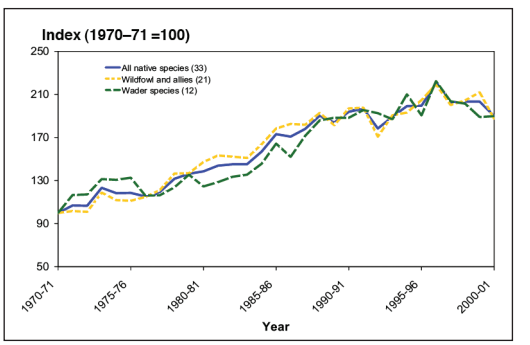

FIGURE 3. Wintering waterbird indicator.

CONSTRUCTING THE REMAINING EBS INDICATORS

Like the 'Quality of Life' indicators, provisional farmland and woodland bird indicators for

England were based on a combination of CBC and BTO/JNCC/ RSPB Breeding Bird Survey (BBS) data covering the period 1970 to 2002, and were separated into generalist and specialist species (depending on nesting habitat and feeding preferences). The farmland bird indicator declined by almost 50% and the woodland bird indicator by almost 20%. In both habitats, specialist species are declining more steeply.

To formulate an indicator for town and garden birds, we looked at the results of public-participation surveys such as the BTO's Garden BirdWatch (GBW) and the RSPB's Big Garden Bird Watch (BGBW). Focusing on common species in participants' gardens, these surveys compensate for their non-random design with the sheer amount of data. The GBW version, based on reporting rates in participating gardens of 16 common species, showed a slight decline between 1995 and 2002. The BGBW version, based on maximum numbers during a single timed count in each garden since 1979, fluctuated but showed little overall change in a suite of 10 species. In both versions, House Sparrows and Starlings showed steeper declines than other species.

For the coastal and seas indicator, trends in marine bird species were calculated using data from the JNCC Seabird Monitoring Programme and special surveys such as tern nest counts on RSPB reserves. The provisional indicator, based on population trends of nine species, was broadly stable between 1986 and 2002.

THE FUTURE FOR EBS INDICATORS

The government will use these wild bird indicators, along with other information on the status of wildlife, to monitor progress towards their biodiversity targets. The EBS indicators described here are provisional, and new data sources will be incorporated as they become available, to update trends on a yearly basis. None of this could be accomplished without the huge effort of the network of volunteers associated with the BTO and other organisations. Your contributions to BTO surveys, and initiatives such as the development of indicators, should have increasingly important and direct consequences for bird conservation in the UK.

ACKNOWLEDGMENTS

Work on the EBS wild bird indicators was supported by Defra, and carried out in collaboration with RSPB.

REPORT AVAILABILITY

The biodiversity strategy for England, containing these indicators is available at: www.defra.gov.uk/wildlife-countryside/ewd/biostrat/indicators031201.pdf

Bird Populations 8:228-229
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BTO News 256:15

EUROPEAN BIRD INDICATORS

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David Noble reports on the development of wild bird indices across Europe.

INDICADORES DE AVES EUROPEAS
David Noble informa sobre el desarrollo de índices de aves silvestres en toda Europa.

In November 2004, the European Commission adopted six new structural indicators for assessing progress towards its policy targets. In their 'long list', alongside such measures as 'high tech exports' and 'life expectancy' is the 'Farmland Bird Index' — based on population changes in a suite of farmland bird species monitored across Europe since 1990. The EU has set an objective to halt loss of biodiversity by 2010 and this index, if it progresses to the 'short list', will be used as a proxy for overall biodiversity with which to assess progress towards that goal. This is an important milestone for the Pan European Common Bird Monitoring (PECBM) project because it raises the profile of the plight of farmland birds across Europe (which have declined by almost 30% since 1980, see Figure 1) and increases the pressure for individual countries to support their bird monitoring programmes. We also hope that funds might be raised from European sources to initiate some level of bird monitoring in countries without such schemes, such as many of the countries recently joining the EU (e.g. Slovenia) or in line for accession (e.g. Romania).

THE NEW INDICES

Producing habitat-based European-scale indicators is a complex process. First, national trends for bird species typical of the habitat are aggregated into a supranational index for each species, using methods that take into account the relative population size in each country. Where the species is absent or rare, such as Redbacked Shrike in the UK, it does not contribute to the trend. The supranational species indices are then combined in the same way as the UK Quality of Life wild bird indicators to produce multi-species indices for Europe — such as the Farmland Bird Index and the Woodland Bird Index shown in Figure 1. In contrast to the declining Farmland Bird Index, the Woodland version shows surprisingly little evidence of decline. Disaggregation of this index

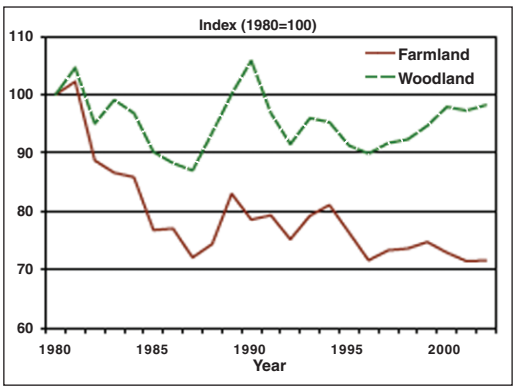

FIGURE 1. European bird indices.

suggests a decline in forest specialists and an increase in more generalist species associated with woodlands, parks and gardens, and work is to continue to explore this issue. The start year for European bird indicators is usually set to 1980 but because countries differ in the duration of their long-term bird monitoring schemes, trends for missing country-year combinations have to be interpolated from trends in adjacent countries within the same geographic region. Details and plots of all the supranational species trends (for 47 species) can be viewed on the EBCC website (www.ebcc.info).

FUTURE DEVELOPMENTS

Those involved with the PECBM project are extremely pleased with this development, but there are plans to continue to develop these indicators further, to re-assess species inclusion across countries, to consider the use of other landscape classifications and to constantly improve methods for calculating the population trends. Workshops are planned where national bird monitoring coordinators can discuss the protocols for species selection and potential outputs of the project.

ACKNOWLEDGEMENTS

The PECBM project, funded by RSPB, is coordinated by a partnership between the European Bird Census Council (EBCC), RSPB, Statistics Netherlands, Birdlife International and the Czech Society for Ornithology, with scientific and technical input from SOVON in The Netherlands and BTO in the UK. The data were kindly provided by national monitoring schemes in more than 18 countries, including the UK, themselves dependent on the efforts of an army of volunteer birdwatchers. Further information can be obtained from the PECBM coordinator, Dr Petr Vorisek (EuroMonitoring@birdlife.cz) or on the EBCC website (www.ebcc.info).

SPECIES IN THE EUROPEAN INDICES

FARMLAND

Kestrel	Yellow Wagtail	Tree Sparrow	Hobby
Whinchat	Greenfinch	Lapwing	Whitethroat
Goldfinch	Woodpigeon	Red-backed Shrike	Linnet
Turtle Dove	Magpie	Yellowhammer	Little Owl
Jackdaw	Reed Bunting	Skylark	Carrion Crow
Corn Bunting	Swallow	Starling	

WOODLAND

Sparrowhawk	Redstart	Willow Warbler	Buzzard
Blackbird	Chiffchaff	Gr Sp Woodpecker	Song Thrush
Goldcrest	Wryneck	Mistle Thrush	Long-tailed Tit
Tree Pipit	Wren	Great Tit	Jay
Spotted Flycatcher	Blue Tit	Dunnock	Blackcap
Coal Tit	Robin	Garden Warbler	Chaffinch

Bird Populations 8:230-232
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BTO News 265:14-15

WILD BIRD INDICATORS FOR THE ENGLISH REGIONS

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Sarah Davis, David Noble and *Andrew Joys*, of the BTO's Census Unit, report on the generation and value of these new indices.

INDICADORES DE AVES SILVESTRES PARA LAS REGIONES INGLESAS

Sarah Davis, David Noble y *Andrew Joys*, de la unidad de censos del BTO, informan sobre el desarrollo y el valor de estos nuevos índices.

In March 2006 Defra released updated regional wild bird indicators for England. These are produced by the BTO, in collaboration with the RSPB, and are based primarily on data from the BTO/JNCC/ RSPB Breeding Bird Survey (BBS). The BBS is a national survey, which started in 1994, designed to monitor changes in the breeding populations of widespread bird species in the UK. There are currently more than 2,200 participants, the vast majority being volunteers, who survey over 2,800 randomly selected 1 km by 1 km squares across the UK. This provides enough data to monitor the population trends of over 100 bird species. These population trends are generated, not only for the UK, but also for England, Scotland, Wales and Northern Ireland, and the nine English Government Office regions.

The English regional versions of the wild bird indicators cover the period of 1994– 2004 and are calculated for North West, North East, Yorkshire and Humberside, East Midlands, West Midlands, East of England, South East, South West and London. The London region indicator uses a relatively large proportion of data from neighbouring areas, potentially biasing the indicator, and so has not been included in this report. They are produced using a similar approach to that used to produce the UK Sustainable Development Framework wild bird indicators, with separate composite indices for all native bird species, for farmland species and woodland species. The index is therefore an 'average trend' being composed of the population trends for each constituent species.

Due to the relatively short time period covered by the regional indicators caution must be used in their interpretation. The large declines in farmland and woodland birds, which occurred between the mid 1970s and early 1990s, as can be seen in the England Biodiversity Strategy Indicator (see Figure 1), have slowed down, and populations have stabilised at a much lower level than in 1970.

The indicators for several regions have changed by more than 10% over this 10-year period, which earlier work suggests represents a significant change.

Interestingly, there appears to be a roughly north–south pattern in the changes in bird populations between 1994 and 2004 (see Figure 2). However, drawing comparisons between regions should be undertaken with some caution as some species do not occur in all regions, leading to small differences in species composition. Moreover, for a species where

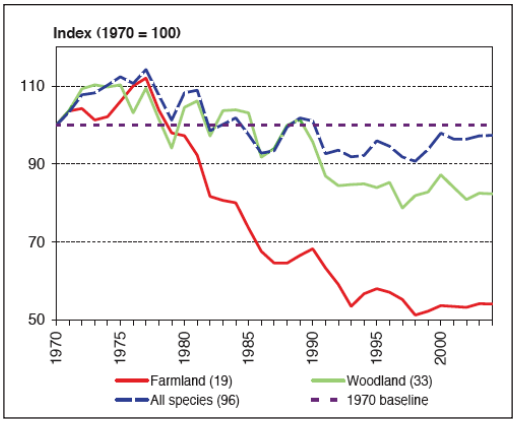

Figure 1. England Biodiversity Strategy Indicator for farmland, woodland and all species.

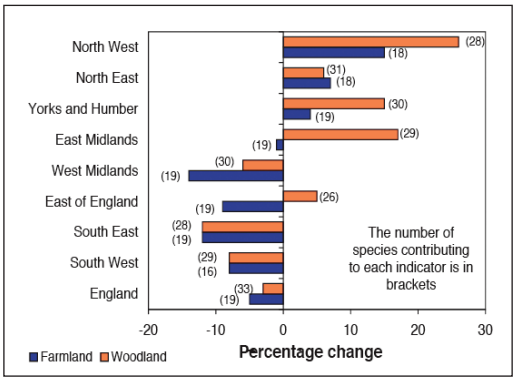

Figure 2. Percentage change in wild bird indicators by region between 1994 and 2004.

there are insufficient data to generate a regional trend, estimates of population changes in areas outside the specific region are incorporated, in order to generate a population trend for a broader region. This approach was employed to minimise differences in species composition.

FARMLAND BIRD INDICATORS

The regional farmland bird index increased by 15% in the North West, decreased by 14% in the West Midlands and 12% in the South East, whilst changing less than 10% in the other regions between 1994 and 2004.

Comparison of the regional farmland bird indices are probably fairly reliable as five of the regions include all 19 farmland species, including two of the three regions that show the most significant changes (West Midlands and

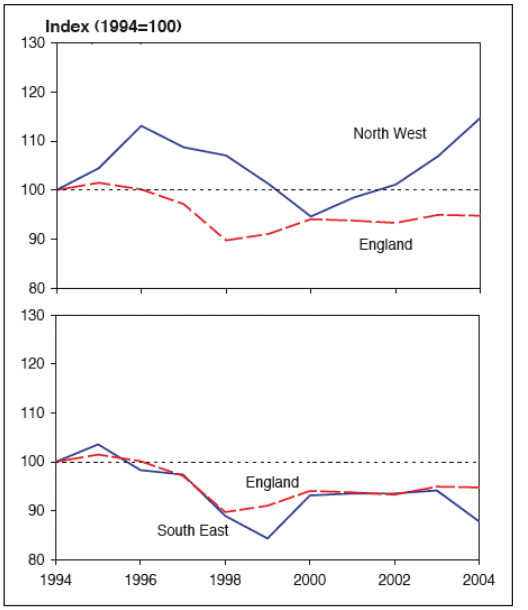

Figure 3. Farmland bird indicators for the North West and the South East compared to the England indicator.

South East). Due to scarcity (defined as occurring on less than 2% of the BBS squares surveyed in that region) Turtle Dove is excluded from the North West and North East regions and Turtle Dove, Tree Sparrow and Yellow Wagtail are excluded from the South West region. However, as Turtle Dove and Yellow Wagtail are declining, and Tree Sparrow is increasing in England, if these species had been included then the South West regional index would probably be slightly more negative. Including Turtle Dove in the North West and North East indices would make them slightly less positive.

The reason for the north–south gradient in farmland bird change (partly reflected by regional trends for Kestrel and Stock Dove) is not clear. Skylark, Yellowhammer and Starling do not show this north–south gradient and declines are similar across England.

WOODLAND BIRD INDICATORS

The regional woodland bird index increased by 26% in the North West, 17% in the East Midlands, and 15% in Yorkshire and Humberside, and decreased by 12% in the South East, whilst changing less than 10% in the other regions between 1994 and 2004.

None of the regional indices include all of the woodland bird species used to generate the England woodland bird indicator. However, of the species used for the woodland bird index, Nightingale, Lesser Spotted Woodpecker and Hawfinch are too scarce to be included in any of the regional indices, and therefore do not affect regional comparisons. Also, of the regions with greater than 10% changes in woodland bird populations, only the North West and South East are missing any species with significantly changing English populations (Willow Tit and Redstart respectively). The reason for the north–south gradient in woodland bird population changes is also not clear. Both resident species such as Jay, Chaffinch and Long-tailed Tit, as well as migrants such as Willow Warbler and Chiffchaff exhibit this trend.

USING THIS INFORMATION

Indicators such as these are very useful in providing a 'snapshot' of the state of the environment and wider countryside, as they summarise complex information, which often differs across species. However, because of this approach, the trends for individual species are, to an extent, hidden. It is usually necessary to carefully investigate the changes in the abundance of particular species to best understand responses to changes in land management practices.

The Farmland Bird Indicator has been adopted by the government as a Public Service Agreement target, with a commitment to reverse the decline in farmland birds by 2020. The Forestry Commission also has a target to reverse the decline in numbers of woodland birds, by 2020, using the woodland bird indicator.

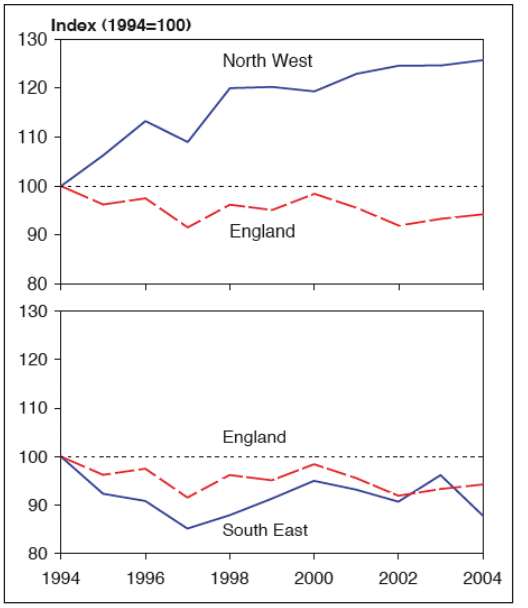

Figure 4. Woodland bird indicators for the North West and South East regions compared to the England indicator.

Further information on wild bird indicators can be found on the BTO website (www.bto.org/research/indicators/index. htm) and the full report on the production of these BBS-based Regional Indicators is available on the Defra website www.defra.gov.uk/news/2006/060316a.htm

ACKNOWLEDGEMENTS

Like their constituent BBS trends, the production of these indicators is dependent ultimately on the hard work of BBS participants and we thank them all for that.

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DETERMINING THE EFFECTIVENESS OF ENVIRONMENTAL STEWARDSHIP

JULIET VICKERY, DAN CHAMBERLAIN AND DAVID NOBLE
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Juliet Vickery, Dan Chamberlain and *David Noble* review the new scheme and explain the BTO's involvement in assessing its effectiveness.

DETERMINACIÓN DE LA EFECTIVIDAD DE ACTIVIDADES DE PROTECCIÓN AMBIENTAL
Juliet Vickery, Dan Chamberlain y *David Noble* revisan el nuevo programa y explican el papel del BTO a la hora de evaluar su efectividad.

Agri-environment schemes currently exist in 26 out of 44 European countries, costing the European Union (EU) over 24 billion Euros since 1994. Despite the cost and the importance of such schemes in maintaining healthy wildlife populations within farmland, very few rigorous, scientific studies have attempted to assess their effectiveness, and those that exist have yielded equivocal results (Kleijn & Sutherland 2003). As a result, key questions such as " is this money well spent?" and "are the options within these schemes delivering their wildlife targets, and if not why not?" remain largely unanswered.

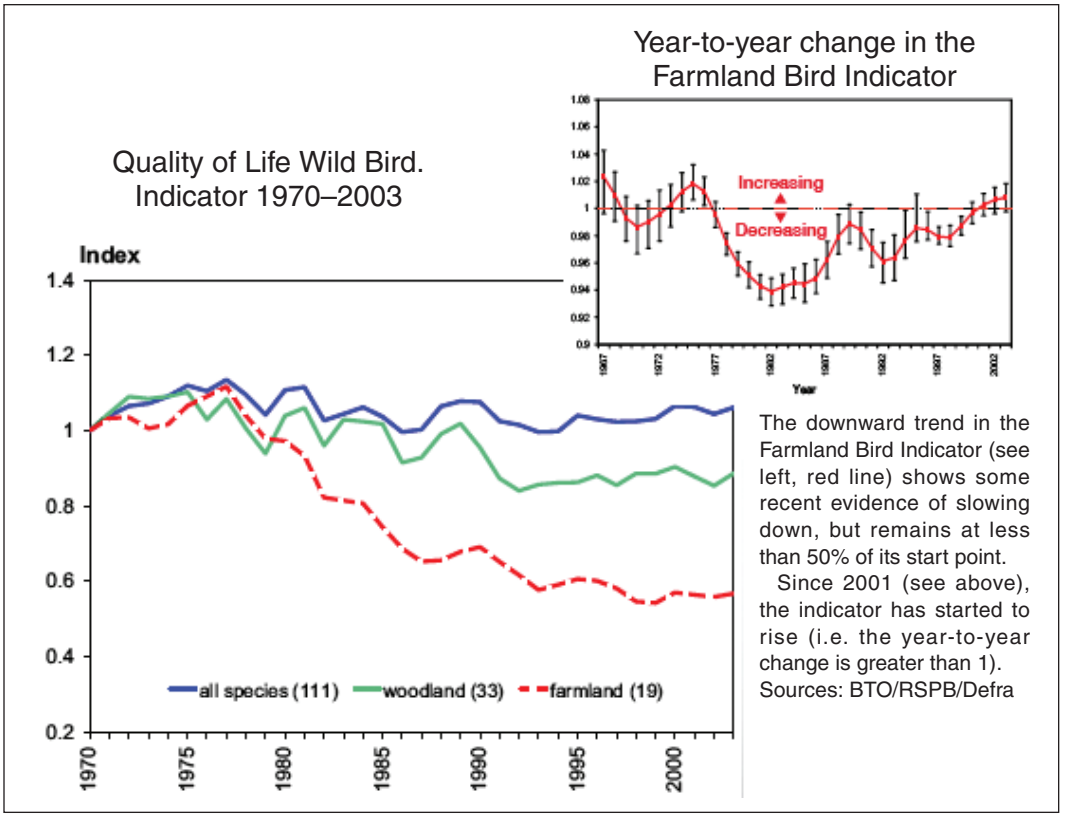
THE NEW SCHEME

In March 2005, Defra launched Environmental Stewardship (see Box 1), an agri-environment scheme that could herald big changes in the farmed countryside in England. Not only has Defra committed a great deal of money to the scheme itself, it has also now committed to research designed to monitor the effectiveness of the entry level component through an exciting new BTO project.

Environmental Stewardship has a number of primary objectives, one of which is wildlife conservation (see Box 1). An index of long-term trends in farmland bird populations has been adopted by the UK government as one of the 15 headline Quality of Life Indicators — an indicator in this case of declines in biodiversity in the wider countryside (see Figure 1). Of the 19 species in the Farmland Bird Indicator (FBI), seven (Woodpigeon, Stock Dove, Jackdaw, Rook, Whitethroat, Goldfinch and Greenfinch) have increased, and 12 (Grey Partridge, Kestrel, Lapwing, Turtle Dove, Skylark, Yellow Wagtail, Starling, Tree Sparrow, Linnet, Yellowhammer, Reed Bunting and Corn Bunting) have declined since 1970. The government has set a target of reversal of the decline in the FBI by 2020 and sympathetic habitat management, under Environmental Stewardship, will be a key tool in achieving this goal.

ASSESSING ITS EFFECTIVENESS

The FBI is now based largely on data from the BTO/JNCC/RSPB Breeding Bird Survey (BBS), so this survey will provide the means by which the long-term success of Entry Level Stewardship is judged with respect to farmland biodiversity. However, 2020 is a long way off and it is



The downward trend in the Farmland Bird Indicator (see left, red line) shows some recent evidence of slowing down, but remains at less than 50% of its start point.

Since 2001 (see above), the indicator has started to rise (i.e. the year-to-year change is greater than 1).

Sources: BTO/RSPB/Defra

FIGURE 1.

clearly important to assess the effectiveness of the scheme in the shorter term in order, for example, to modify or promote certain key management prescriptions. To this end, Defra approached the BTO with the question: How many BBS squares would be adequate to detect population changes in farmland birds (as a result of ELS) with a 90% degree of certainty? Power analysis (see Box 2) estimated that 2,000 BBS squares would provide adequate power to detect short-term population changes over time in two important landscapes — arable and pastoral farmland. This sample size would also allow the detection of differences between ELS and non-ELS squares for two key species, Skylark and Yellowhammer, and for at least one of Lapwing, Starling and Linnet.

A crucial component of a rigorous assessment of the effectiveness of ELS is to have a baseline in place before any habitat management occurs. Although ELS was launched in March, there will be little management on the ground until after harvest 2005. This summer was then a crucial baseline year during which these 2,000 BBS squares needed to be surveyed. BTO volunteers currently cover c. 1,000 arable or pastoral farmland squares in lowland England. Finding volunteers to cover the 1,000 extra BBS squares required, at relatively short notice, was obviously going to be impossible, so Defra agreed to fund professional fieldworkers to undertake the task of surveying the extra squares in spring and summer 2005. Even so, finding a team of fieldworkers was still a major undertaking, but we managed to get a team of 24 ornithologists out in the field by early April. As the data were to be used to augment the standard BBS sample, the methods were identical. Squares were selected randomly, the only caveats being that each square had to be lowland and predominantly farmland (66% coverage of arable or pastoral land) and within England (Wales, Scotland and Northern Ireland are covered by different agri-environment schemes).

BASELINE DATA

The outputs from this year will be summary statistics of the current state of England's farmland bird populations, based jointly on the data gathered by the professional fieldworker and the core BBS data. Funding permitting, these same squares will be re-surveyed in 2008 and 2011. The scheme will be reviewed in 2010 and thus data from the 2008 resurvey will be fed into this review process. Next year the RSPB will commence a parallel study focusing on the effectiveness of Higher Level Stewardship (HLS), carrying out more intensive studies on key target bird species, in a smaller number of locations. Once again this will ensure a good baseline year as HLS will only be available at the end of this year.

Scientists and policy makers have been calling for effective monitoring of ELS and HLS for some time now. This Defrafunded package paves the way for just this and provides added optimism that Environmental Stewardship really will deliver the goods for farmland birds.

REFERENCE

Kleijn, D & Sutherland, W J. 2003. How effective are European agri-environment schemes in conserving and promoting biodiversity? *Journal of Applied Ecology* 40, 947–969.

BOX 1
ENVIRONMENTAL STEWARDSHIP

The 'Curry Report' (Curry 2000) made two key recommendations with respect to Agri-Environment Schemes (AES). First, that there should be a new 'broad and shallow' scheme available to all farmers and landowners and second, that current schemes (such as Environmentally Sensitive Areas [ESA] and Countryside Stewardship Scheme [CSS]) should be streamlined into a single scheme (to act as the higher level of the broad and shallow scheme). These recommendations have largely shaped the new AES launched in March 2005 — Environmental Stewardship. The scheme has three elements: Entry Level Stewardship (ELS), Organic Entry Level Stewardship (OELS) and Higher Level Stewardship (HLS). (For more details see www.defra.gov.uk/erdp/schemes/es/default.htm)

ENTRY LEVEL STEWARDSHIP is a 'whole farm scheme' open to all farmers and land managers in England. In line with the idea of a 'broad and shallow' approach it is designed to encourage as many farmers as possible to adopt simple environmental management options. The scheme has four objectives, to: (i) conserve wildlife; (ii) protect historic features; (iii) maintain landscape character; and (iv) improve water quality and reduce soil erosion.

Farmers can choose from a range of options including in-field, margins or boundary options, each of which earns a number of points per hectare. Once a farmer has selected enough of these options to score the minimum of 30 points per hectare, entry to the scheme is guaranteed resulting in a flat-rate payment of £30 per hectare per year. Agreements last five years and there is a total of 60 options to choose from, including options for hedgerow or ditch management, protecting in-field trees, historic and landscape features (e.g. managing scrub on archaeological sites), buffer strips, beetle banks, wild bird seed mix, Skylark scrapes, stubbles, soil protection and grassland management (lowlands and uplands). Farmers can earn points for any of these already in place on a farm.

ELS will cost around £150 million annually and hopes for 'delivery' are high. Evaluation of the ELS pilot showed that the scheme was practical and farmers were positive about it. Defra predict an uptake of around 80% of farmers/land owners over the next five years. If this proves to be the case, it will pave the way for major change in the farmed environment. (For more details see www.defra.gov.uk/erdp/ schemes/els/default.htm)

HIGHER LEVEL STEWARDSHIP has the same four objectives as ELS (although 'improve water quality and reduce soil erosion' is replaced with 'natural resource protection') but it

BOX 1
(Continued)

includes a fifth of 'promoting public access and understanding of the countryside'. Farmers will usually have to be in ELS or OELS in order to enter HLS. HLS will be offered to farmers from November 2005.

HLS is designed to deliver significant environmental benefits in high priority sites. The management is more complex, often requiring a higher level of advice and support. Thus, while ELS options are referred to as 'broad and shallow', HLS options are 'narrow and deep'. Agreements last for 10 years and must be accompanied by a Farm Environmental Plan (FEP) which identifies features on the farm, their condition and the most appropriate management. Entry to HLS is not guaranteed. It is awarded on merit depending on where the most environmental benefit is likely to be achieved. As for ELS, there is a very wide range of options including creation and maintenance of wood pasture, restoration of traditional orchards, maintenance of traditional water meadows, fallow plots for ground nesting birds ['Lapwing plots'], low input cereal followed by stubble and a spring crop, arable reversion to unfertilised grass, maintenance of species rich seminatural grassland, creation of wet grassland for breeding waders, maintenance or creation of upland heath for rough grazing, educational access, maintenance or restoration of lowland heath, creation of inter-tidal saline habitat on grassland, and maintenance or creation of reed beds.

HLS options will also be more 'targeted' and tailored to meet the needs of priority species and habitats. Targeting for the scheme will be done on the basis of Joint Character Areas. These were first devised as a means of describing the essential character of distinct areas of the English Countryside, based on the landscape, wildlife and natural features (www.defra.gov.uk/erdp/schemes/sssis/ default.htm). For birds, the targeting is partly based on the Farmland Bird Database (FBD) which identifies regions (and JCAs) with the highest concentrations of target farmland bird species (see *BTO News* 255 p25). Existing ESA and CSS schemes will be allowed to run to their conclusion, agreement holders will then have to decide whether ELS only or ELS and HLS is most appropriate for their holding.

The amount of money spent annually on HLS will be £15 million plus the money 'released' from expiring ESA and CSS agreements. (For more details on HLS see www.defra.gov.uk/erdp/schemes/

BOX 2
POWER ANALYSIS

Put simply, power analysis is a statistical way of answering questions such as "how many BBS squares would I need to detect a given change in bird numbers (i) over six years and (ii) between 1-km squares with land under ELS and 1-km squares with no land under ELS?" Power to detect change tends to increase as sample size increases. A high level of power (90%) was used in the analysis, giving us a 90% chance of detecting an existing effect of ELS on bird populations. The analysis uses current abundance for each species as the basis for simulating different scenarios based around assumptions about the likely effect of ELS. In this case, it was assumed that the uptake of ELS would be 70% of farms, that ELS would result in 10% more birds on these farms and that overall population increase (ELS and non-ELS land combined) would be relatively subtle i.e. 5% over a period of six years. These figures are conservative and the level of power is high. It is quite conceivable that the ELS may result in population increases of over 5% for certain species, in which case, the chances of detecting significant effects are higher than 90%.