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LONG-TERM POPULATION TRENDS OF FOREST-DWELLING NEARCTIC-NEOTROPICAL MIGRANT BIRDS: A QUESTION OF TEMPORAL SCALE[1]

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Abstract. Analyses of trends in the populations of nearctic-neotropical migrant birds using 1930s-1960s data have indicated declines in many cases. More recent reports, however, suggest that populations of most forest-dwelling migrants are stable or increasing. Our analyses of Breeding Bird Census data, 1940-1995, for 46 sites in the eastern and central United States indicate that 6 of 10 mature forest-dwelling nearctic-neotropical migrants exhibited significant declines over this period, and none increased. However, when only the recent (>1966) portion of data-sets were used, no significant declines were evident and one species increased. Standard errors did not differ between the two sample periods, so lack of significant trends during the latter period was not the result of increased variability in trend estimates due to reduced sample size. Rather, trend analyses appear to be affected by survey period, and our results indicate that population declines in the eastern and central United States are not evident in recent data (>1960s) because the bulk of declines had already occurred. Our conclusion emphasizes that an awareness of the limitations imposed by temporal scale is critical to the valid interpretation of avian population trends.

Key words: Bird declines, Forest birds, nearctic-neotropical migrant, North America, Bird surveys

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TENDENCIAS POBLACIONALES A LARGO PLAZO DE AVES DE BOSQUE MIGRATORIAS NEARTICAS-NEOTROPICALES: IMPORTANCIA DE LA ESCALA TEMPORAL

Resumen. Los análisis de tendencias poblacionales de aves migratorias neárticas-neotropicales utilizando datos de las décadas de 1930 a la de 1960 han identificado declives en muchos casos. Sin embargo, informes más recientes sugieren que las poblaciones de la mayoría de las especies de bosque se mantienen estables o van en aumento. Nuestros análisis de los datos del Breeding Bird Census entre 1940 y 1995 de 46 sitios en estados del este y centro de EE.UU., indican que 6 de 10 especies migratorias de bosque maduro mostraron declives significativos durante este periodo, y ninguna aumentó. Sin embargo, cuando utilizamos únicamente los datos recientes (>1966), no detectamos declive alguno y una de las especies aumentó. Los errores estándard fueron similares en ambos periodos de muestreo y por tanto la falta de resultados significativos durante el periodo reciente no se debe al aumento de variabilidad en la estimación de tendencias a raiz de la reducción en el tamaño de muestra. Por el contrario, los anáisis de las tendencias parecen estar influidos por el periodo de muestreo, y nuestros resultados indican que los declives poblacionales en el este y centro de EE.UU. no son aparentes en los datos recientes (>1960) porque gran parte de los declives ocurrieron antes. Concluimos que es necesario ser consciente de las limitaciones impuestas por la escala temporal a fin de interpretar tendencias poblacionales correctamente.

Palabras clave: Declives en aves, aves de bosque, migratorias neárticas-neotropicales, América del Norte, conteos de aves.

INTRODUCTION

The conservation of nearctic-neotropical migrants (hereafter neotropical migrants) has become a significant issue in conservation biology over the past several decades. The origin of this interest can be traced to early reports in which researchers noted the decline or disappearance of mature forest dwelling migrant birds from parks and preserves in the eastern United States (Briggs and Criswell 1979; Robbins 1979). Various factors have been implicated in these declines, including loss and fragmentation of temperate breeding habitat (Robinson et al. 1995, Trzcinski et al. 1999), destruction of tropical wintering habitat (Briggs and Criswell 1979; Hall 1984, Rappole et al. 2003), the combined effects of breeding and non-breeding habitat destruction (Sherry and Holmes 1995), or mortality during migration (Sillett and Holmes 2002).

Population trends of neotropical migrants exemplify the situation in which long-term studies are required to provide the context for interpreting local or shorter-term trends (Hill and Hagan 1991). Studies of forest migrant populations in eastern North America report evidence of population declines during the early 20th century (Rappole 1995), and in part this prompted the initiation of the Breeding Bird Survey (BBS) throughout the United States and Canada in 1966 (Droege 1990). Many of the earlier studies of migrant bird populations were limited by inadequate experimental design (James et al. 1996), and thus, the veracity of the declines reported is subject to debate (Hutto 1988, James et al. 1992). In contrast, the design of the more recently instituted BBS is statistically rigorous (Droege 1990), but it encompasses a relatively short time period (36 y) compared to the time-scale at which the destruction of temperate and tropical habitats has been progressing (Smith 1954, Sader and Joyce 1988, Dirzo and Garcia 1992, DeGraaf and Miller 1996, Askins 2001). Data from the BBS for this period indicate that overall population trends of neotropical migrants are stable (Sauer and Droege 1992)

In order to evaluate long-term trends in forest bird populations, we analyzed data from the Breeding Bird Census (BBC) for the years 1940-1995 using non-linear route regression. In addition, we compared our results with the results of the BBS for the years available (1966-1995) in order to evaluate the potential that results were affected by the time scale of analysis.

METHODS

We analyzed data from 46 sites in 19 U.S. states and one Canadian province (Appendix 1)

following a standardized protocol. A BBC is conducted using the spot-mapping method, in which observers compile a record of locations of singing male birds during 8-10 visits to a single study plot each breeding season (Robbins 1970). Clusters of locations on composite maps of the study plot created at the end of each season designate breeding territories defended by individual birds (Robbins 1970). Although Verner and Milne (1990) reported substantial variation in survey results among observers, they concluded that for surveys such as ours in which the observers did not change among years, spot mapping is a valid and effective procedure (Verner and Milne 1990). BBC data were obtained from published summaries in Audubon Field Notes, American Birds, and the Journal of Field Ornithology, as well as from the U.S. Geological Survey (USGS) web site (http://www.mp1-wrc.usgs.gov/birds/bbc.html). We checked a subset of the data obtained from the USGS against the original published accounts and found no errors. There is a 4-y gap in the data between 1984 and 1989, and there were no data available after 1995. Most (70%) of the sites we used were in deciduous forest, fewer (22%) were in coniferous forest, and the remainder (8%) were in mixed deciduous coniferous forest. Site descriptions were reviewed, and any site that had undergone any substantial natural or anthropogenic disturbance, such as catastrophic wind-throw or clearcut timber harvest, was eliminated from consideration. All but 2 sites had been surveyed for ≥10 y between the first and last census, and all sites had been visited for ≥3 breeding seasons.

We restricted our analyses to the 10 most frequently encountered, mature forest-dwelling migrant species. Although we assumed that analysis of the 10 selected species would be sufficient for heuristic purposes, there remains the potential that population change patterns for species having patchy distributions or narrow geographic ranges may be fundamentally different from more widely distributed species (Wilcove and Terborg 1984). The bird species included were Eastern Wood-Pewee, Blue-gray Gnatcatcher, Wood Thrush, Yellow-throated Vireo, Blue-headed Vireo, Red-eyed Vireo, Black-and-white Warbler, Ovenbird, Hooded Warbler, and Scarlet Tanager (scientific names in Table 1).

The BBC data were analyzed using the standard non-linear route-regression used in the BBS analyses, where the number of territories on each BBC study plot C in year y is estimated with the model $C = ab^y$, where a is the intercept and b is the slope term, or trend estimate. Values of $b > 1$ indicate that the population is increasing, whereas values of $b < 1$ indicate decline. For each site for each species, this nonlinear model was fit using weighted non-linear least squares (PROC NLIN; SAS Institute 1989), where the weight was based on assuming that the variance in the errors was proportional to the mean. This turns out to be equivalent to the estimating equation approach used in the current BBS analyses (Geissler and Sauer 1990, Link and Sauer 1994). For each site, this analysis also produced an estimated standard error for the trend that was used to create an approximate test that the trend equals 1 (i.e., no trend) and/or to find an approximate confidence interval for the trend.

We did not add a term to the regression to account for the variability among observers in survey ability as is customary in this type of analyses (Geissler and Sauer 1990). Most of the surveys were done by single individuals, or groups of individuals of relatively stable membership, such that the inclusion of a term for observer added little relative to the loss of precision attributable to the inclusion of this term (James et al. 1996). Sites for which data did not conform to the assumptions of linearity [by examining log (C) versus time], or to the non-linear model $C = ab^y$ (as determined by examination of residuals) were eliminated from the analyses.

As in analyses of BBS data, the overall population trend b_p is estimated as a weighted average of trends on individual routes (or in our case, sites). That is:

$$b_p = \Sigma\ (w_i b_i),$$

where weights are proportional to the inverse of the variance of the trend estimate and to the abundance of each species at the median year (Geissler and Sauer 1990). So,

$$w_i = c_i / (\Sigma\ c_i),$$

where $c_i = a_i b_i y_0 / v_i$, with $a_i b_i y_0$ being the estimated abundance at y_0 = the midyear of the survey and v_i = variance associated with the estimated trend b_i. Bootstrapping was used to estimate variances of overall trends (Geissler and Sauer 1990), where the resampling involves resampling of sites. Statistical significance was

TABLE 1. Trend estimates (SE) and 95% confidence intervals from route-regression analyses of Breeding Bird Census (BBC) data from 46 sites in North America, as well as trend estimates (SE) from the Breeding Bird Survey (BBS). Trend values >1 indicate the population is increasing, whereas values of <1 indicate the population is declining (see text). Significant trends (α= 0.05) are indicated by an asterisk (*).

	Survey		
Species	BBC (1940-1995)	BBC (1966-1995)	BBS (1966-1995)
Eastern Wood-Pewee *Contopus virens*	0.99(0.01)* (0.98-0.99)	1.00(0.01) (0.98-1.03)	0.983(0.0003)*
Blue-gray Gnatcatcher *Polioptila caerulea*	0.93(0.05) (0.87-1.01)	1.00(0.01) (0.98-1.04)	1.013(0.0001)*
Wood Thrush *Hylocichla mustelina*	0.77(0.11)* (0.73-0.99)	0.97(0.02) (0.94-1.00)	0.982(0.0001)*
Yellow-throated Vireo *Vireo flavifrons*	0.94(0.02)* (0.92-0.97)	0.99(0.03) (0.94-1.06)	1.007(0.0001)
Blue-headed Vireo *Vireo solitarius*	0.77(0.11) (0.75-1.02)	0.96(0.08) (0.75-1.05)	1.052(0.0001)*
Red-eyed Vireo *Vireo olivaceus*	0.99(0.01)* 0.97-0.99)	0.98(0.03) (0.99-1.01)	1.012(0.0001)*
Black-and-white Warbler *Mniotilta varia*	1.01(0.01) (0.99-1.02)	1.01(0.00)* (1.01-1.02)	1.005(0.0002)
Ovenbird *Seiurus aurocapillus*	0.96(0.02)* (0.93-0.99)	0.99(0.02) (0.96-1.03)	1.008(0.0006)*
Hooded Warbler *Wilsonia citrina*	0.96(0.04)* (0.88-0.99)	0.98(0.01) (0.93-1.03)	1.004(0.0000)
Scarlet Tanager *Piranga olivacea*	0.98(0.02) (0.95-1.01)	1.00(0.01) (0.98-1.02)	1.000(0.0000)

determined by calculating 95% confidence intervals on the population trend and declaring significance if that interval does not include 1 (which represents no trend.) This procedure was used to calculate trends for two time periods, the entire period for which we were able to obtain data (1940-1995) and a shorter period corresponding to that for which BBS data were available (1966-1995).

The results of the BBS analyses were obtained from the USGS website (Sauer et al. 2005). In contrast to BBCs, which are conducted away from roads, the BBS is conducted on ~ 4100 39.5-km stratified-randomly located survey routes along roads. Furthermore, BBCs yield counts of territories on each study plot derived from 10 or so visits repeated each season, whereas observers on BBS routes record numbers of birds detected during a 3-min interval within 386 m of the roadside sampling points on a single annual visit (Droege 1990). Both surveys are conducted annually during the temperate breeding season (typically June and July). We compared our results with BBS data from the combined Eastern and Central regions designated by the BBS despite the fact that more BBC studies were located in the eastern U.S. The results of our comparisons, however, were unchanged if we used only BBS data from the Eastern region.

Trends for all species were compared between surveys (BBC vs BBS) or time periods (1940-1995 vs 1966-1995) using two-sample t-tests. Trends of individual species were compared between surveys or time periods using Z-tests (where Z = the difference between the two trend estimates divided by the square root of the sum of the squared standard errors of the two trends). Statistical tests were considered significant at $\alpha < 0.05$.

RESULTS

We found that six of the 10 most frequently encountered mature forest migrant species

(Eastern Wood-Pewee, Wood Thrush, Yellow-throated Vireo, Red-eyed Vireo, Ovenbird, and Hooded Warbler) exhibited declines from 1940-1995 (Table 1). No species exhibited a significant increase for this period. In contrast, from 1966-1995 no migrants declined significantly in our analyses, and one (Black-and-white Warbler) increased (Table 1). Furthermore, declines of the Red-eyed Vireo were significantly greater (the trend estimate was smaller) from 1940-1966 than from 1966-1995 (Z = 1.92, P = 0.05). Combined analyses indicated that declines of all species together were greater from 1940-1995 than from 1966-1995 ($t_{(9)} = 2.63$, $P < 0.05$). The variance of the trend estimates was greater for the longer (1940-1995) than for the shorter study period (1966-1995; $F_{(9,9)}$ = 6.18, P = 0.01). This suggests that the lack of significant trends evident during the shorter period was not due to lower power because the trend estimate for the shorter period was actually more precise than that for the entire study period.

Bird population declines were more evident in the entire BBC data set (1940-1995) than they were from results of the BBS analyses 1966-1995. Whereas six species exhibited declines in the BBC analyses from 1940-1995 and none increased, only two species (Eastern Wood-Pewee and Wood Thrush) declined significantly in the BBS analyses, and four increased significantly (Blue-gray Gnatcatcher, Blue-headed Vireo, Red-eyed Vireo and Ovenbird; Table 1). Similarly, declines of five species (Wood Thrush, Yellow-throated Vireo, Blue-headed Vireo, Red-eyed Vireo and Ovenbird) were greater (the trend estimate was smaller) in our analyses than in the BBS analyses (Z-tests, P <0.05). Combined analyses indicated that declines of all species together were greater in the BBC data from 1940-1995 than in the BBS analyses for 1966-1995 ($t_{(9)}$ = 2.74, P <0.05).

The results of our analyses of the BBC data for 1966-1995 were more similar to the results of the BBS analyses for 1966-1995 than were the results of the BBC analyses for the entire study period (1940-1995). Trends for only one species differed significantly between the two analyses for the shorter time-period (increases of Black-and-white Warbler was greater in our analyses; Z = 2.07, P <0.04). Overall, declines in our data did not differ significantly from the BBS analyses for the shorter time period ($t_{(9)}$ = 1.98, P >0.05).

DISCUSSION

Evidence of declines in migrant populations at the 46 forest study sites is consistent with reports of forest migrant declines from sites all over eastern North America (Rappole 1995). Neotropical migrant birds comprise as much as 70% of individuals in forest bird communities (Rappole 1995), and potentially dampen outbreaks of defoliating insects (Crawford and Jennings 1989). Thus, reports of catastrophic declines and even local extirpation of these species from many temperate breeding sites have potentially far-reaching ecological implications.

Long-term studies have an essential role in ecology in cases where changes are slow, exhibit large annual variability, or are prone to episodic events (Likens 1983, Strayer et al. 1986). Our observation that population declines were pronounced during the entire 56-y study period, but were not evident in the analyses of the most recent 30 y of BBC data, demonstrate that the length of the study period can critically affect the outcome of trend analyses. This result is consistent with results of other analyses of long-term bird population data. Hill and Hagan (1991) found that restricting their analyses to the most recent 10 years of data from a 53-y data set revealed only 38% of the trends that were apparent over the entire period, and that the inclusion of the next 10 years only increased that proportion to 69%. Similarly, Ballard et al. (2003) reported that capture rates of neotropical migrants were stable for the first decade of their study; however the addition of an addition 10 years of data revealed significant population declines. Extensive anthropogenic changes in the availability of migrant breeding and wintering habitats have occurred over a long time-scale relative to our awareness of conservation issues concerning these species. For example, the forest cover in Cuba had been reduced to 15% of its original extent by the 1950s (Smith 1954), and over half of the forest cover had been cleared by the 1960s in Costa Rica (Sader and Joyce 1988) and the Tuxtlas region of Veracruz (Andrle 1964, Dirzo and Garcia 1992). Similarly, the extent of temperate breeding habitat in eastern North America was reduced by 50% during the period between the arrival of European colonists and the early 19th century (Pimm and Askins 1995). The possibility that the

important habitat changes responsible for migrant declines occurred before widespread population monitoring was instituted in the mid 1960s is consistent with reports of the local extirpation of migrant populations during the early 20th century (e.g., Robbins 1979, Serrao 1985, Johnston and Winings 1987).

Migrant populations vary among years in relation to a variety of biotic and abiotic factors, such as food (Holmes et al. 1986, Crawford and Jennings 1989) as well as short-term (Holmes et al. 1986, Blake et al. 1992) and long-term (Sillet 2000) weather patterns. These sources of variability can confound efforts to discern longer-term patterns. For example, Sauer and Droege (1992) reported that overall population trends of neotropical migrants were stable from 1966-1988; however, within this period migrant populations increased from 1966-1978, but declined thereafter (Robbins et al. 1989). A variety of explanations have been offered to account for these trends including recovery from pesticide use (Robbins et al. 1989) or response to spruce budworm (*Choristoneura fumiferana*) outbreaks during the earlier years of the survey. Evidence for short-term responses to these factors, however, does not preclude the possibility that migrant populations might be exhibiting directional population changes over a longer time-scale (Blake et al. 1992), and the results of our analyses suggest that this is, in fact, the case.

We tried to minimize differences between the BBC and BBS analyses by employing the same type of route-regression analyses. Differences in the spatial and temporal scales at which the data were collected, however, limit the degree to which the results can be compared between these two data sources. Nevertheless, several statistically significant increases were apparent in the BBS data that were not indicated by the BBC analyses (Eastern Wood-Pewees, Blue-headed and Red-eyed vireos, and Ovenbirds). BBS routes are located along roads, which are typically subject to higher levels of habitat disturbance than non-roadside areas where the BBC surveys are conducted (Bart et al. 1995; Trombulak and Frissell 2000). Thus increasing trends of mature forest birds on BBS routes may reflect the local response of these species to the maturation of roadside habitats over the sampling period rather than actual regional trends (Askins et al. 1990, Bradstreet and Dunn 1997).

Reliable information on population trends is critical to efforts to prioritize species for conservation and identify agents of population change (Sauer and Droege 1990). Long-term, geographically extensive databases, currently available in the form of the BBC and BBS, are an important contribution in this regard, and we recommend that the ornithological community encourage the continuation of the BBC program. The utility of these data sources, however, is dependent on an understanding of their biases and limitations (Sauer and Droege 1990). Our conclusions that the results of bird-trend analyses are affected by the length of the survey period, and that the absence of declines in more recent studies might be due to the fact that declines occurred before widespread monitoring efforts were instituted, indicate that even the most extensive long-term data sets can be limited by temporal scale and, thus, that an awareness of these limitations is critical to their valid interpretation.

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LITERATURE CITED

ANDRLE, R. 1964. A biogeographical investigation of the Sierra de Tuxtla in Veracruz, Mexico. Ph.D. Dissertation, Louisiana State University, Baton Rouge, Louisiana.

ASKINS, R. A. 2001. Restoring North America's Birds: Lessons from Landscape Ecology. (Yale University Press, New Haven).

ASKINS, R. A., J. F. LYNCH, AND R. GREENBERG. 1990. Population declines in migratory birds in eastern North America. Current Ornithology 7:1-57.

Ballard, G., G. R. Geupel, N. Nur, and T. Gardali. 2003. Long term declines and decadal patterns in population trends of songbirds in Western North America 1979 – 1999. Condor 105:737-755

BART, J., M. HOFSCHEN, AND B. G. PETERJOHN. 1995. Reliability of the breeding bird survey: effects of restricting surveys to roads. Auk 112:758-761.

BLAKE, J. G., G. E. NIEMI, AND J. A. HANOWSKI. 1992. Drought and annual variation in bird populations. Pp. 419-430 *in* J. M. Hagan, J. M. III and D. W Johnston, editors. Ecology and conservation of Neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

BRADSTREET, M. S. W., AND E. H. DUNN. 1997. Using breeding season surveys to monitor changes in Canadian landbird populations. Canadian Wildlife Service Papers No. 95:30-35.

BRIGGS, S. A., AND J. H. CRISWELL. 1979. Gradual silencing of spring in Washington: Selective reduction of species of birds found in three woodland areas over the past 30 years. Atlantic Naturalist 32:19-26.

CRAWFORD, H. S., AND D. T. JENNINGS. 1989. Predation by birds on spruce budworm Choristoneura fumiferana: functional, numerical and total responses. Ecology 70:152-163.

DEGRAAF, R. M., AND R. I. MILLER. 1996. The importance of disturbance and land-use history in New England: implications for forested landscapes and wildlife conservation. Pp. 3-35 *in* R. M. DeGraaf and R. I. Miller, editors. Conservation of Faunal Diversity in Forested Landscapes. Chapman and Hall, New York.

DIRZO, R. AND M. C. GARCIA 1992. Rates of deforestation in Los Tuxtlas, a Neotropical area in southeast Mexico. Conservation Biology 6:84-90.

DROEGE. S. 1990. The North American Breeding Bird Survey. Pp. 1-4 *in* J. R. Sauer and S. Droege, editors. Survey Designs and Statistical Methods for the Estimation of Avian Population Trends. U.S. Fish and Wildlife Service Biological Report 90(1).

GEISSLER, P. H. AND J. R. SAUER. 1990. Topics in route-regression analysis. Pp. 54-57 *in* J. R. Sauer and S. Droege, editors. Survey Designs and Statistical Methods for the Estimation of Avian Population Trends. U.S. Fish and Wildlife Service Biological Report 90(1).

HALL, G. A. 1984. Population decline of Neotropical migrants in an Appalachian forest. American Birds 8:14-18.

HILL, N. P. AND J. M. HAGAN, III. 1991. Population trends of some northeastern North American landbirds: A half-century of data. Wilson Bull. 103:165-182.

HOLMES, R. T., T. W. SHERRY, AND F. W. STURGES. 1986. Bird community dynamics in a temperate deciduous forest: Long-term trends at Hubbard Brook. Ecological Monographs 56:201-220.

HUTTO, R. L. 1988. Is tropical deforestation responsible for the reported declines in Neotropical migrant populations? American Birds 42:375-359.

JAMES, F. J., D. A. WIEDENFIELD, AND C. E. MCCULLOCH. 1992. Trends in breeding populations of warblers: Declines in the southern highlands and increases in the lowlands. Pp. 43-56 *in* J. M. Hagan III, and D. W. Johnston, editors. Ecology and conservation of Neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

JAMES, F. J., C. E. MCCOLLOCH, AND D. A. WIEDENFIELD. 1996. Trends in breeding populations of warblers: declines in the southern highlands and increases in the lowlands. Ecology 77: 13-27.

JOHNSTON, D. W., AND D. L. WININGS. 1987. Natural history of Plummer's Island, Maryland. XXVII. The decline of forest birds on Plummer's Island, Maryland and vicinity. Proceedings of the Biological Society of Washington 100:762-768.

LIKENS, G. E. 1983. A priority for ecological research. Bull. Ecol. Soc. Am. 65: 234-243.

LINK, W. A. AND J. R. SAUER. 1994. Estimating equations estimates of trends. Bird Populations 2:23-32.

PIMM, S. L. AND R. A. ASKINS. 1995. Forest losses predict bird extinctions in eastern North America. Proceedings of the National Academy of Sciences USA 92:9343-9347.

RAPPOLE, J. H. 1995. The ecology of migrant birds: A Neotropical perspective. Smithsonian Institution Press, Washington, D.C.

RAPPOLE, J. H., D. I. KING, AND J. DIEZ. 2003. Winter versus breeding habitat limitation for an endangered avian migrant. Ecological Applications 13:735-742.

ROBBINS, C. S. 1970. Recommendations for an international standard for a mapping method in bird census work. Audubon Field Notes 24:723-26.

ROBBINS, C. S. 1979. Effect of forest fragmentation on bird populations. General technical report NC-51. U.S. Forest Service, Minneapolis, Minnesota.

ROBBINS, C. S., J. R. SAUER, R. GREENBERG, AND S. DROEGE. 1989. Population declines in North American birds that migrate to the Neotropics. Proceedings of the National Academy of Science U.S.A. 86:7658-7662.

ROBINSON, S. K., F. R. THOMPSON, III, T. M. DONOVAN, D. R. WHITEHEAD, AND J. FAABORG. 1995. Regional forest fragmentation and the nesting success of migratory birds. Science 267:1987-1990.

SADER, S. A. AND A. T. JOYCE, A. T. 1988. Deforestation rates and trends in Costa Rica, 1940 to 1983. Biotropica 20:11-19.

SAUER, J. R., AND S. DROEGE. 1990. Survey Designs and Statistical Methods for the Estimation of Avian Population Trends. U. S. Fish and Wildlife Service, Biological Report 90(1).

SAUER, J. R., AND S. DROEGE. 1992. Geographic patterns in population trends of Neotropical migrants in North America. Pp. 26-42 *in* J. M. Hagan, J. M. III and D. W Johnston, editors. Ecology and conser-

vation of Neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

SAUER, J. R., J. E. HINES, AND J. FALLON. 2005. The North American Breeding Bird Survey, Results and Analysis 1966 - 2004. Version 2005.2. USGS Patuxent Wildlife Research Center, Laurel, MDSerrao, J. 1985. Decline of forest songbirds. Records of New Jersey Birds 11:5-9.

SERRAO, J. 1985. Decline of forest songbirds. Records of New Jersey Birds 11:5-9.

SHERRY, T. W., AND R. T. HOLMES. 1995. Summer versus winter limitation of populations: What are the issues and what is the evidence? Pp. 85-120 *in* T. E. Martin and D. M. Finch, editors. Ecology and Management of Neotropical Migratory Birds: a synthesis and review of critical issues. Oxford University Press, New York.

SILLETT, T. S., R. T. HOLMES, AND T. W. SHERRY. 2000. Impacts of a global climate cycle on population dynamics of a migratory songbird. Science 288:2040-2042.

SMITH, E. E. 1954. The forests of Cuba. Maria Moors Cabot Foundation Publication No. 2.

STRAYER, D. J. et al. 1986. Long-term ecological studies: an illustrated account of their design, operation, and importance to ecology. Institute for Ecosystem Studies Occasional Publications 1.

TROMBULAK, S.C., AND C.A. FRISSELL. 2000. Review of ecological effects of roads on terrestrial and aquatic systems. Conservation Biology 14:18-30.

TRZCINSKI M. K, L. FAHRIG, AND G. MERRIAM. 1999. Independent effects of forest cover and fragmentation on the distribution of forest breeding birds. Ecological Applications 9:586-593.

VERNER, J. AND K. A. MILNE. 1990. Analyst and observer variability in density estimates from spot mapping. Condor 92:313-325.

WILCOVE, D. S. AND J. TERBORGH. 1984. Patterns of population decline in birds. American Birds 38:10-13.

APPENDIX 1. Survey information for 46 Breeding Bird Censuses included in our analyses.

Site Number[a]	State/Province	Citation[b]	Duration	No. Visits	Latitude	Longitude
CO0000001	CO	AFN 22:673	1968-1984	16	39.2	104.4
CO0000003	CO	JFO 62:56	1980-1995	8	38.57	104.5
CO0000020	CO	AB 36:90	1981-1992	7	39.58	105.2
CT1253099	CT	OEC 49:32	1953-1990	20	41.22	72.07
CT1261011	CT	AFN 15:8	1961-1973	4	41.06	73.43
CT2765006	CT	AFN 19:5	1965-1995	30	41.42	73.12
CT2765008	CT	AFN 19:11	1965-1995	29	41.43	73.12
CT2778262	CT	AB 33:62	1978-1990	13	41.42	73.1
DC0461014	DC	AFN 15:5	1961-1990	21	38.57	77.02
DC1060009	DC	AFN 14:31	1960-1983	24	38.55	77.05
GA0000001	GA	AFN 23:771	1969-1979	22	not available	
GA0000010	GA	AFN 18:555	1963-1973	11	31.58	81.04
IL3141003	IL	AM 43:30	1941-1983	37	40.08	88.08
KS0000001	KS	AB 33:66	1978-1991	7	38.48	95.12
KS0000002	KS	AB 33:66	1978-1991	7	38.48	95.12
MD0447015	MD	AFN 1:22	1947-1989	6	38.53	76.45
MD1047016	MD	AFN 1:23	1947-1990	38	38.58	77.08
MD1071036	MD	AB 25:10	1971-1990	10	39.13	76.55
MI1666034	MI	AFN 20:10	1966-1975	10	42.13	83.44
MN2048026	MN	AFN 9:1	1948-1960	7	45.25	93.12
NC0000001	NC	AB 31:41	1976-1995	15	35.21	79.01
NC0000002	NC	AB 32:63	1977-1995	14	35.53	79
NJ1064032	NJ	AFN 7:340	1964-1995	32	41.04	74.11
NM0000001	NM	AB 32:93	1959-1979	3	35.19	108.12
NY0000001	NY	AB 29:994	1975-1991	4	41.46	74.09
NY1674105	NY	AB 32:3	1974-1987	4	43.25	76.3
NY2471049	NY	AB 26:1	1971-1985	5	42.28	74.56
OH2237200	OH	AM 43:32	1940-1994	51	40.11	82.18
PA1377204	PA	AB 33:70	1982-1993	15	41.04	76.07
PA1377205	PA	AB 33:70	1982-1993	14	41.05	76.08
PA1382312	PA	AB:37:55	1982-1995	10	40.44	75.5
PA1382313	PA	AB 37:55	1982-1995	10	not available	
PA2274131	PA	AB 28:8	1974-1983	7	40.44	79.42
PA2474133	PA	AB 28:10	1974-1984	6	40.07	79.1
PA2474135	PA	AB 28:55	1974-1984	6	40.07	79.1
QU0000001	QU	not available	1964-1972	9	47.16	73.37
TN0000001	TN	AFN 19:593	1965-1974	10	35.55	83.56
UT0000001	UT	AB 38:137	1983-1995	7	38.48	109.35
VA1083031	VA	AB 38:76	1988-1995	8	38.24	78.29
VA1087013	VA	AB 38:76	1983-1995	9	38.24	78.29
VA1379356	VA	JFO 62:57	1979-1992	7	38.33	79.04
VA1391037	VA	AB 36:68	1981-1991	4	38.27	79.15
WV1366086	WV	AFN 20:13	1966-1981	3	37.55	80.17
WV1366087	WV	AFN 20:14	1966-1981	3	37.54	80.15
WV2464044	WV	AFN 18:20	1964-1988	4	38.37	79.5
WV2468079	WV	AFN 22:18	1968-1988	4	38.36	79.51

[a] Designation in USGS database.

[b] Journal, volume and page number of original site description. AB = *American Birds*; AF = *Audubon Field Notes*; AM = *Audubon Magazine*; JFO = *Journal of Field Ornithology*; OEC = *Oecologia*.

Bird Populations 7:10-20

BIRD COMMUNITIES BEFORE AND AFTER A CATASTROPHIC BLOWDOWN IN A GREAT LAKES PINE FOREST[1]

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Abstract. We carefully inventoried the bird communities in a mature jack pine - black spruce forest (*Pinus banksiana - Picea mariana*) before (1997 - 1999) and after (2000 - 2003) a major blowdown in northern Minnesota. Because of known similarities in bird species diversity and abundance in the first year following a disturbance, bird data collected in 2000 are reported but not included in the comparisons between pre- and post-blowdown. Within our 6.25 ha study plot, a total of 19 territorial bird species were recorded before compared to 17 species after the storm. Eight species that held territories before the storm did not establish territories afterwards, in contrast to six species without territories before but having them afterwards. Magnolia Warbler (*Dendroica magnolia*), White-throated Sparrow (*Zonotrichia albicollis*), and Winter Wren (*Troglodytes troglodytes*) increased the most following the disturbance, whereas Blackburnian Warbler (*Dendroica fusca*) and Golden-crowned Kinglet (*Regulus satrapa*) did the opposite. The Bay-breasted Warbler (*Dendroica castenea*), which held territories in every year leading up to the storm, completely disappeared afterwards. Thirteen of the 18 habitat variables examined changed significantly after the disturbance. These changes reflect a 60% destruction of the overstory and a 500% increase in the shrub level of the forest, and demonstrate experimentally the importance of vegetative structure in the composition of forest bird communities.

Key words: Bird communities, blowdown, wind disturbance, Great Lakes Transition Forest, Magnolia Warbler, Winter Wren, White-throated Sparrow, Blackburnian Warbler, Golden-crowned Kinglet, Bay-breasted Warbler

COMUNIDADES DE AVES ANTES Y DESPUÉS DE UNA CATASTRÓFICA CAÍDA DE ÁRBOLES POR VIENTO EN UN BOSQUE DE PINO EN LA REGIÓN DE LOS GRANDES LAGOS DE LOS ESTADOS UNIDOS

Resumen. Realizamos un minucioso inventario de la comunidad de aves en un bosque maduro de pino-picea (Pinus banksiana – Picea mariana) antes (1997-1999) y después (2000-2003) de un gran derribo de árboles por viento en la parte norte de Minnesota. Por las similitudes conocidas en la diversidad y la abundancia de aves en el primer año después de un disturbio, los datos de aves recopilados en el año 2000 son reportados pero no incluidos en las comparaciones pre y post caída de árboles. Dentro de nuestra área de estudio de 6.25

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ha, registremos 19 especies de aves territoriales antes de la tormenta contra 17 especies después de la misma. Ocho especies que mantenían territorios antes de la tormenta no establecieron territorios después, en contraste a seis especies sin territorios antes de la tormenta que sí establecieron territorios después. Dendroica magnolia, Zonotrichia albicollis, y Troglodytes troglodytes fueron las especies que exhibieron un mayor incremento en abundancia después del disturbio, mientras que Dendroica fusca y Regulus satrapa mostraron lo contrario. Dendroica castanea, que tenía individuos con territorios en cada año previo al vendaval, desapareció por completo posteriormente. Trece de las 18 variables del hábitat medidas cambiaron significativamente después del disturbio. Estos cambios reflejan una destrucción de 60% del dosel y un aumento de 500% en la cobertura del nivel arbustivo del bosque y demuestran la importancia de la estructura de la vegetación en la composición de las comunidades de aves de bosques.

Palabras claves: Comunidades de aves, caída de árboles por viento , disturbio eólico, transición forestal de los Grandes Lagos, Dendroica magnolia, Troglodytes troglodytes, Zonotrichia albicollis, Dendroica fusca, Regulus satrapa, Dendroica castanea.

INTRODUCTION

Forest composition and structure in the Upper Great Lakes is greatly influenced by disturbances, which include primarily fire, insect outbreaks, logging, and wind (Van Wagner and Methven 1978, Bonan and Shugart 1989, Bergeron 1991, Drapeau et al. 2000; Haney et al., unpubl. data). Fire and insects affect forest structure most frequently, and are well studied, but although large-scale wind events are thought to play a significant role in canopy reduction, they occur so infrequently — at the scale of 1000 years or more — we know little about them (Frelich and Reich 1996, Larson and Waldron 2000, Frelich 2002). A number of studies have examined the effects of disturbance on avian communities in the Upper Great Lakes region (Apfelbaum and Haney 1986, Schulte and Niemi 1998, Drapeau et al. 2000), but not surprisingly few have examined the effects of wind (Smith and Dallman 1996, Dyer and Baird-Philip 1997).

On 4 July 1999 a microburst, or *derecho*, resulting in straight-line winds >145 km hr^{-1}, impacted approximately 200,000 ha of forest in northeastern Minnesota (USDA Forest Service 2002). One severely impacted stand, which we have studied >16 yr, contained one of our permanent 6.25 ha study plots. The permanent plot, first established in a mature jack pine – black spruce forest (*Pinus banksiana - Picea mariana*) in 1983, was resurveyed in each of the three years before the 1999 storm thereby providing an uncommon opportunity to compare vegetation and bird community structure pre- and post-wind disturbance.

Our objective was to compare the structure of the bird community and vegetation before and after the wind-storm reduced the canopy by approximately 60 %. Because the wind removed >50% of the tree cover, with a corresponding increase in shrub cover from fallen trees or tree-tops, we expected a shift from tree foliage-searching to ground-brush foraging species. We further anticipated an increase in woodpeckers with the increase in coarse woody debris (Lohr et al. 2002).

STUDY AREA AND METHODS

Surveys. The study was conducted in a relatively homogeneous, mature, upland jack pine – black spruce forest in northeastern Superior National Forest, MN (Fig. 1). Bird populations were estimated by plotting territories in a 250 x 250 m (6.25 ha) grid surrounded by a 25 m habitat buffering zone to reduce the effects of edge. Plots were subdivided, with flagging, into 50 x 50 m cells (Fig. 2).

Bird surveys were conducted once per day during the early morning over five days in late May through mid-June in each of the three years before (1997 – 1999) and four years after (2000 – 2003) the disturbance. Surveys were performed using a modification of Kendeigh's flush-plot technique (Kendeigh 1944, Apfelbaum and Haney 1986). Each survey consisted of one or two experienced birders plotting all birds seen or heard from grid vertices on data sheets similar to Figure 2. Surveys, which were restricted to days without significant wind or

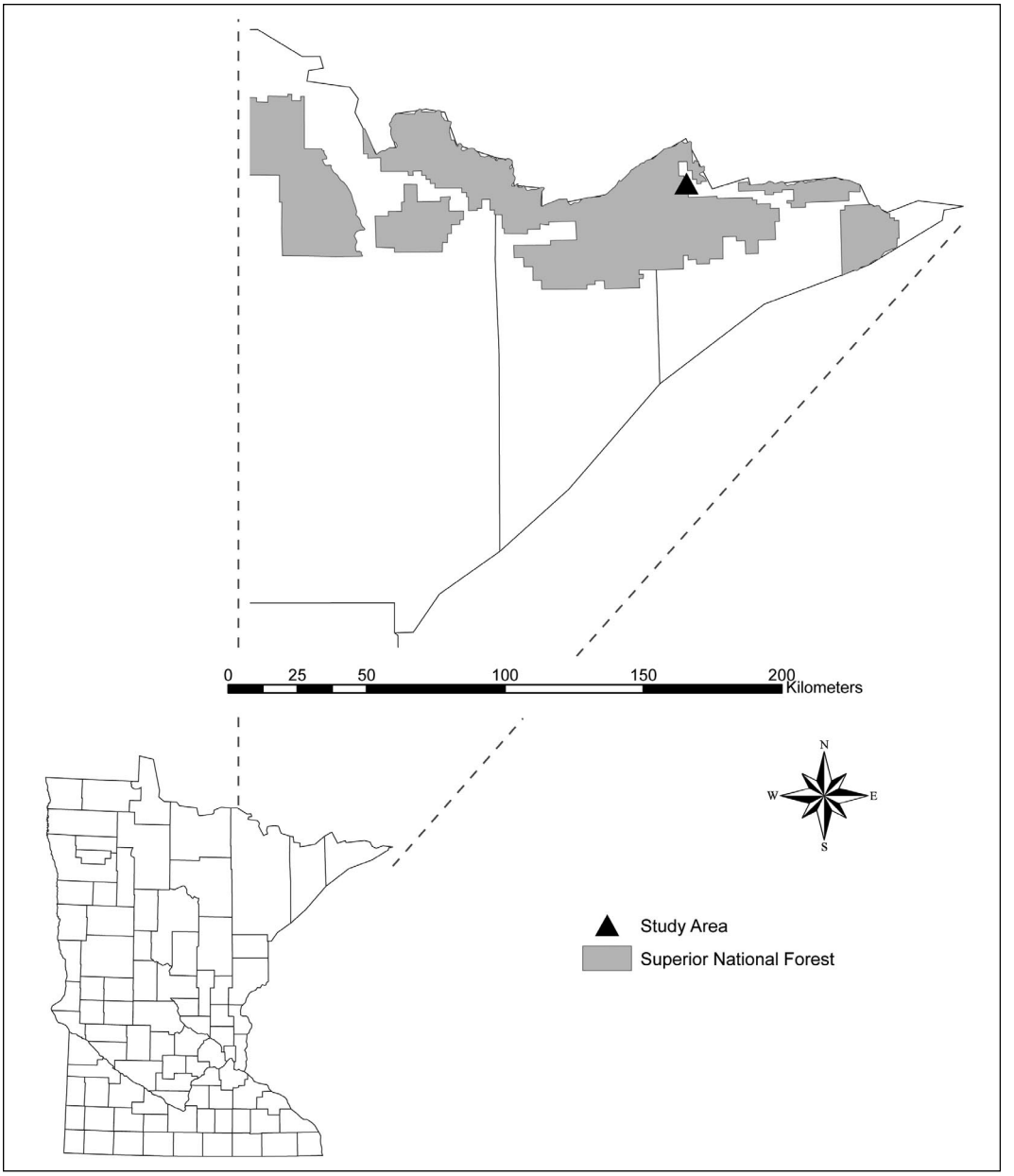

FIGURE 1. Location of study area in northeastern Superior National Forest, MN.

rain, averaged about six person-hours each with the aim of plotting every territorial male using the area.

After the completion of all five daily surveys, locations of birds on the grid and within 25 m of the grid's perimeter were compiled onto summary sheets. Territories were delineated from clusters of survey registrations and other evidence of established territories such as active nests, adults carrying food, or fecal sacs. Species were considered transient, or with territories too large to determine with our method, unless they were recorded in the same location on at least three of the five survey days. Species that were

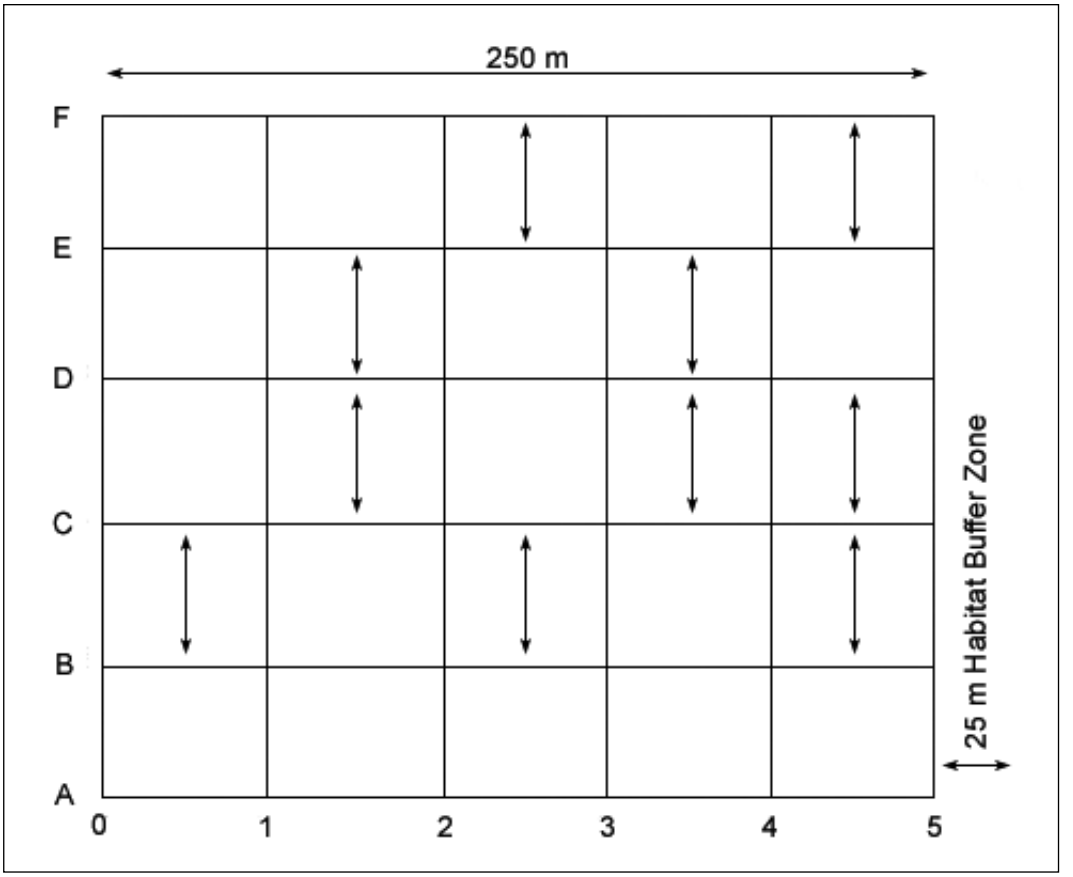

FIGURE 2. The survey grid, 250 x 250 m (6.25 ha), with each cell measuring 50 x 50 m. The total area, including a 25 m habitat buffering zone to reduce the effects of edge, is 9 ha. Ten of the 25 grid cells were randomly selected before each vegetation survey and 50 m transects (shown as arrows within the grid cells below) are used to perform the vegetation sampling.

plotted in the grid, but which did not meet the aforementioned criteria, were recorded as visitors (V). Species with territories outside the grid but in the same habitat were recorded as peripherals (P).

Four vegetation surveys, in 1997, 2000, 2001, and 2003, were conducted with each consisting of 50-m transects through 10 randomly selected grid cells (Fig. 2). Because grid cells were re-selected before each survey, some cells may have been repeatedly surveyed while others may have been surveyed only once. Cover for each vegetative species was estimated using the line intercept method. Trees were defined as stems standing more than 45° perpendicular to the ground with a d.b.h. of at least 5 cm. Shrubs were identified as all stems with a height >1 m and a d.b.h. <5 cm or as those trees that were still alive but standing <45° from vertical. Dead trees were considered coarse litter if standing <45° perpendicular and snags if standing >45°. Tree and shrub density was estimated by recording the number and diameter (rounded to the nearest 5 cm) of live and dead trees rooted within 1 m either side of the transect, as was the number of live and dead shrub stems within 1 m of the right side of the transect. Five 1 m^2 circular plots centered at 5, 15, 25, 35, and 45 m along the transect line were used to estimate percent cover of herbs (height <1 m), exposed mineral, bryophytes, coarse litter (diameter >5 cm) on the ground, and fine litter (diameter <5 cm; Fig. 3).

Data analysis. Determined for each bird species was density (the number of territories

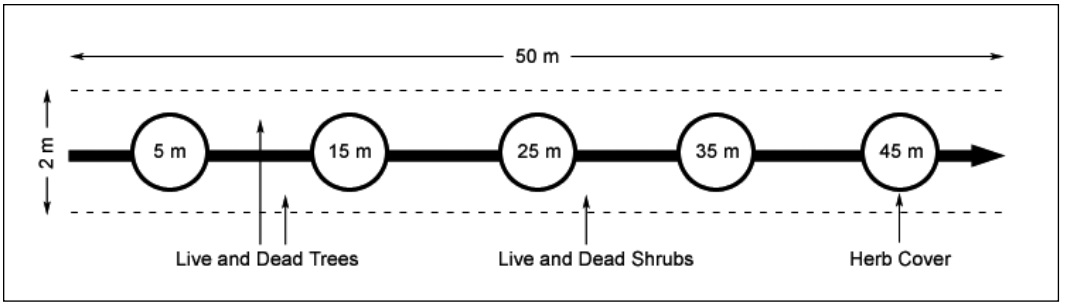

FIGURE 3. Vegetation was sampled using a 50 m transect. Tree and shrub density was estimated by recording the number and diameter of live and dead trees rooted within 1 m to either side of the transect and the number of live and dead shrub stems within 1 m to the right side of the transect. Herb cover was determined using a 1 m^2 circular plot centered at 5, 15, 25, 35, and 45 m along the transect.

within the 6.25 ha grid), territory cover (percent of grid covered), and existence energy (kcal day-1 required to maintain the observed density of birds). Existence energy was calculated using formulas that consider body mass and ambient temperatures (Kendeigh 1970, Apfelbaum and Haney 1986). Relative values for these three related variables were then combined to create an importance value index (IVI; Curtis 1959) for each species and guild. IVIs reflect relative percentages of bird number, area occupied, and required energy by species or guild and provide an abstract value ranging from 0 – 300 that indicates one species' or guild's use of resources relative to another (Apfelbaum and Haney 1981). Species were assigned to guilds following the five Bock and Lynch (1970) designations that indicate foraging behavior (e.g. timber-driller, tree foliage-searcher). An additional guild was added for raptors. To address known issues of spatial scale in regard to bird sampling (Wiens 1981, Wiens et al. 1987) and to identify trends most likely related to the disturbance, bird data for seven common species were further examined by plotting Breeding Bird Survey (BBS) trend data from Strata 28: Northern Spruce - Hardwoods (Bystrak 1981) alongside observed densities on the study site (Fig. 4).

Vegetation data were examined for normality (Q-Q plot and Shapiro-Wilk tests). When data did not meet assumptions, homogeneity of variances (Levene's test), with transformations according to Box-Cox plots (Box and Cox 1964), were tested. Rank transformation was used as a last resort when Box-Cox recommendations failed to yield a normal distribution (Conover and Iman 1981, Blake et al. 1994). For each vegetation characteristic, a one-way ANOVA was used to test for significance. Where appropriate, a comparison of means was made using Dunnett's C (does not assume equal variance) procedure.

All scientific names of bird species are included in Table 2.

RESULTS

Among the habitat variables tested, 72% (13 of 18) were found to change significantly with time (Table 1). Eleven of these 13 variables were significantly different between at least one year before and after the blowdown. Evergreen shrub cover increased 866% and the number of live shrub stems increased 981% in the first year following the storm. Notably, both decreased significantly in 2001 and again in 2003.

Despite the loss of over 60% of the tree canopy (from 64.2% in 1997 to 23.8% in 2000), the overall richness of territorial and visiting birds changed very little (Table 2). On average, 13 species in four guilds held territories in the study area before the disturbance, compared to 11 species in the same number of guilds that held territories afterwards. Before and after the storm, 20 and 24 species, respectively, were recorded only as visitors. Of the 24 species that were exclusively seen as visitors throughout the study, 13 were recorded as visitors during both periods. The Magnolia Warbler, White-throated Sparrow, and Winter Wren each averaged at least two territories more after the storm while

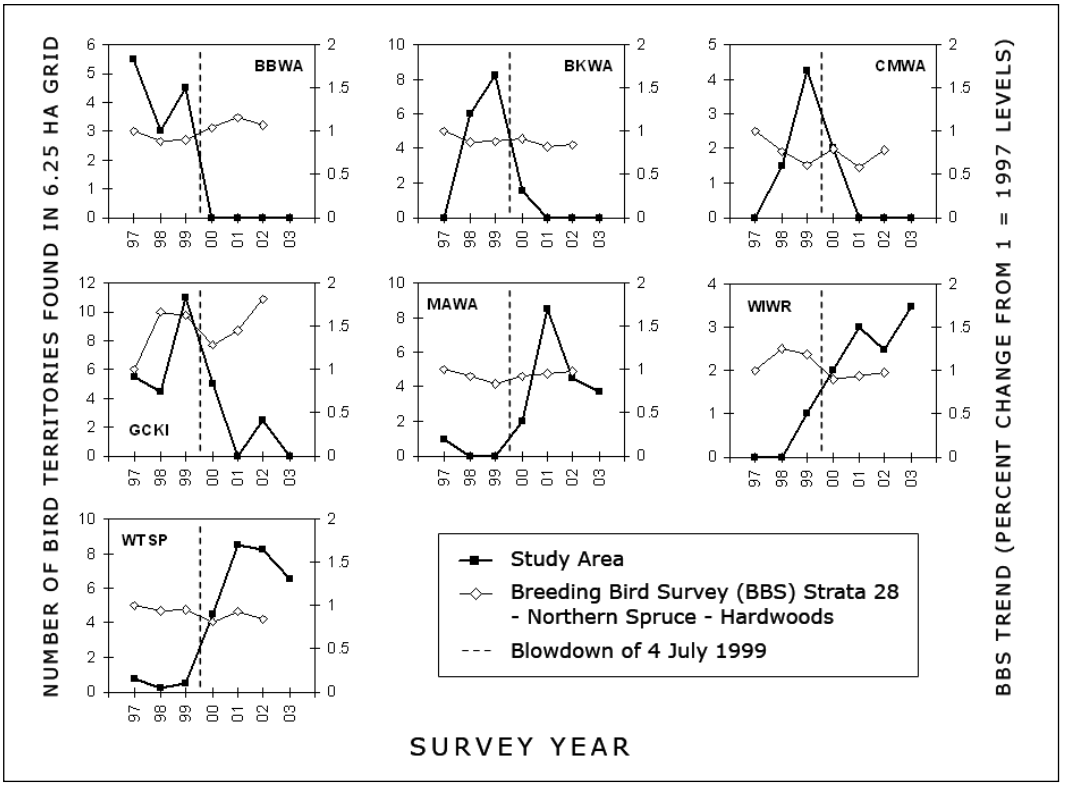

FIGURE 4. Population clines of seven common migratory birds before (1997 - 1999) and after (2000 - 2003) a major blowdown in a mature jack pine – black spruce forest, Superior National Forest, MN. BBS trend data are provided to reflect changes in bird populations occurring on a larger scale. BBWA = Bay-breasted Warbler; BKWA = Blackburnian Warbler; CMWA = Cape May Warbler; GCKI = Golden-crowned Kinglet; MAWA = Magnolia Warbler; WIWR = Winter Wren; WTSP = White-throated Sparrow.

the Blackburnian Warbler, Cape May Warbler, and Golden-crowned Kinglet each averaged at least two less. Although variability was evident in several species, it was most notable in Blackburnian Warbler and Cape May Warbler with both being conspicuously absent in 1997. The Bay-breasted Warbler, which increased slightly in the region from 1997 - 2002 (BBS data), was the only species holding territories in all three years leading up to the storm that was not recorded as either a visitor or a peripheral afterwards (Fig. 4).

By guild, tree-foliage searchers, which had the highest IVI values before the blowdown, decreased and ground-brush foragers increased in every year following the storm (Table 2). The Magnolia Warbler was the only tree-foliage searcher that notably increased following the storm. No species of ground-brush forager decreased after the storm. Changes to other guilds were minor.

DISCUSSION

The most significant effect of the storm on vegetation was a >60% decrease in canopy cover and the number of live trees and a concomitant increase in shrub cover of >500%. Jack pine and black spruce, the main overstory trees before the blowdown, were reduced from a combined 47% canopy cover in 1997 to <10% in 2000. About half of the trees that were destroyed by the wind were tipped over exposing pockets of mineral soil and reducing bryophyte cover by almost 50% between 1997 and 2000.

As with observations following fire (Emlen 1970, Apfelbaum and Haney 1981), and similar effects documented following hurricanes (Waide

TABLE 1. Mean vegetation characteristics and outcomes of one-way ANOVA on 40 (10 each year) 50 m transects surveyed before (1997) and after (2000, 2001, 2003) a blowdown in a mature jack pine – black spruce forest, Superior National Forest, MN. When ANOVA yielded a significant result, pairwise comparisons were conducted using Dunnett's C procedure; common superscripts indicate no significant difference ($P > 0.05$) between paired means.

		$\bar{X}$					
	Tr.[a]	1997	2000	2001	2003	*F*	*P*
% tree cover	ln	64.2	23.8^{b}	5.0^{b}	8.2^{b}	11.7	< 0.01
% tree cover (evergreen)	ln	52.9^{b}	21.9^{bc}	2.8^{c}	5.9^{c}	12.12	< 0.01
% tree cover (deciduous)	root	21.7	3.4^{b}	3.1^{b}	4.0^{b}	8.46	< 0.01
Live trees ha^{-1}	ln	2510	810^{a}	160^{a}	280^{a}	13.20	< 0.01
Dead trees ha^{-1}	rank	210^{ab}	40^{a}	90^{ab}	360^{b}	3.86	0.02
Live tree diameter (cm)		12.2	10.8	8.6	11.1	2.63	0.07
Dead tree diameter (cm)		8.6^{a}	17.3^{ab}	12.5^{ab}	13.5^{b}	5.43	0.01
% shrub cover	root	11.3^{a}	71.7	29.5	12.0^{a}	36.81	< 0.01
% shrub cover (evergreen)	rank	6.7^{a}	64.7	17.9	2.8^{a}	37.49	< 0.01
% shrub cover (deciduous)		4.8	13.3	12.4	9.6	1.59	0.21
Live shrub stems ha^{-1}		1080^{a}	11,680	$3{,}740^{a}$	$2{,}220^{a}$	34.88	< 0.01
Dead shrub stems ha^{-1}	rank	280^{a}	500^{a}	0^{a}	0^{a}	5.10	0.01
% shrub or tree cover		69.2^{a}	80.6^{a}	32.6	18.4	65.87	< 0.01
% herb cover		15.5	7.7	29.4	25.3	5.72	0.32
% fine litter cover		49.2	47.6	41.1	49.6	0.49	0.70
% coarse litter cover	root	18.4^{ab}	8.8^{a}	15.9^{a}	31.7^{b}	10.71	< 0.01
% mineral cover	rank	3.9	6.1	12.8	7.5	2.45	0.08
% bryophyte cover		78.3	42.3^{a}	41.0^{a}	32.5^{a}	21.1	< 0.01

[a] Transformations used include square root (root), natural log (ln), and rank (rank).

1991, Wunderle 1995), some territorial species that were negatively impacted by the storm in 1999 returned in 2000 before disappearing the following year. The typically higher-nesting (Cruickshank 1956, Morse 1994) Blackburnian Warbler, for example, which we observed nesting uncharacteristically very near the ground in 2000, held 8.25 territories in 1999, 1.5 in 2000, but no territories from 2001 – 2003. Territory numbers of the Cape May Warbler and Golden-crowned Kinglet displayed a similar trend (Fig. 4). Notably this did not hold true for the Bay-breasted Warbler, which was not even recorded as a visitor immediately after the storm despite holding multiple territories in every year leading up to it. Despite nesting in the lower one third of trees and occasionally even in shrubs (Peck and James 1987, Williams 1996), the Bay-breasted Warbler has been identified as a species sensitive to canopy loss (Morton 1992, Drolet et al. 1999).

Many species that increased as a result of the change in habitat also did not respond much the first year after the blowdown. The Magnolia Warbler, relatively uncommon before the blowdown, held two territories in 2000 then averaged nearly six from 2001 - 2003. Similarly, the White-throated Sparrow averaged 0.5 territories from 1997 - 1999, 4.5 in 2000, and then >8 from 2001 – 2003. The Yellow-bellied Flycatcher, which was not recorded before the blowdown but may have found an increase in suitable habitat in the form of roots of upturned stumps (Bent 1942, Erlich et al. 1988), established territories in 2001 and afterwards in all of the blowdown areas we studied (Haney and Thomton 2001).

Based on similar studies conducted in the wake of hurricanes (Greenberg and Lanham 2001, Tejeda-Cruz and Sutherland 2005), it was not surprising that the loss of over half the tree cover and corresponding increase in shrub cover resulted in a shift from tree-foliage-searching species to ground-brush-foraging species. Before the blowdown, tree-foliage searchers averaged

TABLE 2. Breeding bird importance values (IVI) by foraging guild before (1997 - 1999) and after (2000 - 2003) a major blowdown in a mature jack pine – black spruce forest,Superior National Forest, MN. IVI is based on relative frequency, relative territory area, and relative existence energy. Visitor (V) and peripheral (P) species are noted but not included in calculations.

Guild and Species	1997	1998	1999	2000	2001	2002	2003
FLYCATCHERS	19.1	11.4	19	25.4	14	18.1	18.5
Alder Flycatcher (*Empidonax alnorum*)	P	P	P	1.1	P	P	2.3
Common Nighthawk (*Chordeiles minor*)		P					
Least Flycatcher (*Empidonax minimus*)	19.1	11.4	19	24.3		V	12.4
Olive-sided Flycatcher (*Contopus cooperi*)					V	P	
Yellow-bellied Flycatcher (*Empidonax flaviventris*)					14	18.1	3.8
GROUND-BRUSH FORAGERS	80.2	72.3	63	168	188.2	196.4	223
American Crow (*Corvus brachyrhynchos*)		V					
American Robin (*Turdus migratorius*)			V	P	V	V	V
Blue Jay (*Cyanocitta cristata*)	V	V		V	V	V	V
Dark-eyed Junco (*Junco hyemalis*)	V			V	V	V	V
Chestnut-sided Warbler (*Dendroica pensylvanica*)	V	V			V	V	P
Chipping Sparrow (*Spizella passerina*)	19.1	14.6	7.5	31.8	28	22.8	31.4
Common Raven (*Corvus corax*)		V			V		P
Evening Grosbeak (*Coccothraustes vespertinus*)		V	V			V	
Gray Jay (*Perisoreus canadensis*)	V	P		P		V	V
Hermit Thrush (*Catharus guttatus*)	P	P	P	P	V	P	V
Lincoln's Sparrow (*Melospiza lincolnii*)	V		P				P
Mourning Warbler (*Oporornis philadelphia*)					V	V	24.6
Nashville Warbler (*Vermivora ruficapilla*)	36	36	42.3	62.6	28.9	17.1	44.2
Ovenbird (*Seiurus aurocapillus*)	V		V				P
Purple Finch (*Carpodacus purpureus*)	V		V				
Swainson's Thrush (*Catharus ustulatus*)	14.8	V			19.9	7.4	13.7
Swamp Sparrow (*Melospiza georgiana*)		15.9		P	P	P	P
White-throated Sparrow (*Zonotrichia albicollis*)	10.3	5.8	6.5	49.6	80.8	111.1	74.2
Winter Wren (*Troglodytes troglodytes*)			6.7	24	30.6	38	29.2
Veery (*Catharus fuscescens*)				P			5.7
RAPTORS							
Broad-winged Hawk (*Buteo platypterus*)			V		V		
Merlin (*Falco columbarius*)					V		
Sharp-shinned Hawk (*Accipiter striatus*)					V	V	
TIMBER-DRILLERS							
Black-backed Woodpecker (*Picoides arcticus*)				V	V	V	V
Hairy Woodpecker (*Picoides villosus*)				P			V
Northern Flicker (*Colaptes auratus*)	V	V		P		V	
TIMBER-GLEANERS		17	22.1				10.1
Black-and-white Warbler (*Mniotilta varia*)	V				P	V	10.1
Brown Creeper (*Certhia americana*)	V					V	
Red-breasted Nuthatch (*Sitta canadensis*)	V	17	22.1		V		V
TREE FOLIAGE-SEARCHERS	200.7	199.3	195.8	106.6	97.7	85.4	48.1
Bay-breasted Warbler (*Dendroica castanea*)	54.4	31.9	29.3				
Black-capped Chickadee (*Poecile atricapilla*)	6.7			V	9.2	V	V
Black-throated Green Warbler (*Dendroica virens*)			V		V		
Blackburnian Warbler (*Dendroica fusca*)	V	70.3	47.8	12.1	V		
Blue-headed Vireo (*Vireo solitarius*)	P	V				P	
Boreal Chickadee (*Poecile hudsonica*)	V	3.6			V		
Canada Warbler (*Wilsonia canadensis*)				7.1	V		
Cape May Warbler (*Dendroica tigrina*)		23.9	24.8	13.3			
Cedar Waxwing (*Bombycilla cedrorum*)		V			V		
Common Yellowthroat (*Geothlypis trichas*)		V	V	2	P	11.6	3.8

TABLE 2. Continued.

Guild and Species	1997	1998	1999	2000	2001	2002	2003
Golden-crowned Kinglet (*Regulus satrapa*)	46.7	45.6	61.2	29.4	V	25.5	
Magnolia Warbler (*Dendroica magnolia*)	10.7	P	V	23.2	60.5	48.3	30.1
Pine Siskin (*Carduelis pinus*)	16.2				V		
Red-eyed Vireo (*Vireo olivaceus*)	V	V	V	P	V	V	P
Ruby-crowned Kinglet (*Regulus calendula*)	23.8	6.4	23.2	10.5	5.9	V	P
Tennessee Warbler (*Vermivora peregrina*)	8.8	V	1.9		P		
Yellow-rumped Warbler (*Dendroica coronata*)	33.4	17.6	7.6	9	22.1	V	14.2
Total (all guilds)	300	300	299.9	300	299.9	299.9	299.7

nearly 36 more birds than ground-brush foragers with an IVI of nearly three times as much. Discounting the transition year of 2000, this proportion reversed after the blowdown with an average of 24 more ground-brush foragers than tree-foliage searchers. The Magnolia Warbler, which is associated with low conifers and mixed deciduous woods (Bent 1953, Ehrlich et al. 1988), markedly increased following the storm suggesting that it may simply prefer large amounts of structure at or near the ground. This response also suggests that, although treated as a member of the tree-foliage-searcher guild based on known foraging habits, the Magnolia Warbler could just as accurately be considered a member of the ground-brush-forager guild.

As expected, given the increase in coarse woody debris (Lohr et al. 2002) and dead and dying trees (Schreiber and DeCalesta 1992, Schulte and Niemi 1998), the number of woodpeckers using the area increased following the disturbance. However, because of the larger size of their territories, we could not estimate the actual increase in density. Black-backed and Hairy woodpeckers, which had not been recorded previously, were both recorded with Black-backed being present in all years. In 2003, a Hairy Woodpecker nest cavity was found in a snapped off hollow aspen located in the center of the study area.

The opportunity to study a large-scale wind disturbance using baseline data collected before the event provided us with a rare opportunity to examine specific changes in the structure of the vegetation and the corresponding bird community. In spite of dramatic changes in forest structure, the diversity and density of birds using the area were not greatly altered.

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LITERATURE CITED

APFELBAUM, S., AND A. HANEY. 1981. Bird populations before and after wildfire in a Great Lakes pine forest. Condor 83:347-354.

APFELBAUM, S. I., AND A. HANEY. 1986. Changes in bird populations during succession following fire in the Northern Great Lakes Wilderness. Pages 10-16 *in* USDA Forest Service General Technical Report INT-212.

BENT, A. C. 1942. Life histories of North American flycatchers, larks, swallows, and their allies. U.S. National Museum Bulletin 179.

BENT, A. C. 1953. Life histories of North American Wood Warblers. U.S. National Museum Bulletin 203.

BERGERON, Y. 1991. The influence of island and mainland lakeshore landscapes on boreal forest fire regimes. Ecology 72:1980-1992.

BLAKE, J. G., J. M. HANOWSKI, G. J. NIEMI, AND P. T. COLLINS. 1994. Annual variation in bird popula-

tions of mixed conifer - northern hardwood forests. Condor 96:381-399.

BOCK, C. E., AND J. F. LYNCH. 1970. Breeding bird populations of burned and unburned forest in the Sierra Nevada. Condor 72:182-189.

BONAN, G. B., AND H. H. SHUGART. 1989. Environmental factors and ecological processes controlling vegetation patterns in boreal forests. Landscape Ecology 3:111-130.

BOX, G. E. P., AND D. R. COX. 1964. An analysis of transformations. Journal of the Royal Statistical Society B 26:211-252.

BYSTRAK, D. 1981. The North American Breeding Bird Survey. Pages 34-41 *in* Estimating Numbers of Terrestrial Birds (C. J. Ralph and J. M. Scott, editors). Studies in Avian Biology No. 6.

CONOVER, W. J., AND R. L. IMAN. 1981. Rank transformations as a bridge between parametric and nonparametric statistics. American Statistician 35:124-133.

CRUICKSHANK, A. D. 1956. Nesting heights of some woodland warblers in Maine. Wilson Bulletin 68: 157.

CURTIS, J. T. 1959. The vegetation of Wisconsin. University of Wisconsin Press, Madison.

DRAPEAU, P., A. LEDUC, J. F. GIROUX, J. P. SAVARD, Y. BERGERON, AND W. L. VICKERY. 2000. Landscape-scale disturbances and changes in bird communities of boreal mixed wood forests. Ecological Monographs 70:423-444.

DROLET, B., A. DESROCHERS, AND M. J. FORTIN. 1999. Effects of landscape structure on nesting songbird distribution in a harvested boreal forest. Condor 101:699-704.

DYER, J. M., AND R. BAIRD-PHILIP. 1997. Wind disturbance in remnant forest stands along the prairie-forest ecotone, Minnesota, USA. Plant Ecology 129:121-134.

EHRLICH, P. R., D. S. DOBKIN, AND D. WHEYE. 1988. The Birder's Handbook: A Field Guide to the Natural History of North American Birds. Simon and Schuster, Inc., NY.

EMLEN, J. T. 1970. Habitat selection by birds following a forest fire. Ecology 51:343-345.

FRELICH, L.E. 2002. Forest dynamics and disturbance regimes. Cambridge University Press, Cambridge, UK.

FRELICH, L. E., AND P. B. REICH. 1996. Old growth in the Great Lakes region. Pages 144-160 *in* Eastern Old Growth Forests (M. B. Davis, ed.). Island Press, Washington, D.C.

GREENBERG, C. H., AND J. D. LANHAM. 2001. Breeding bird assemblages of hurricane-created gaps and adjacent closed canopy forest in the southern Appalachians. Forest Ecology and Management 154:251-260.

HANEY, A., AND J. THOMTON. 2001. Yellow-bellied Flycatcher response to blowdown. The Loon 73:7-10.

KENDEIGH, S. C. 1944. Measurement of bird populations. Ecological Monographs 14:69-106.

KENDEIGH, S. C. 1970. Energy requirements for existence in relation to size of bird. Condor 72:60-65.

LARSON, B. M.H., AND G. E. WALDRON. 2000. Catastrophic windthrow in Rondeau Provincial Park, Ontario. Canadian Field Naturalist 114:78-82.

LOHR, S. M., S. A. GAUTHREAUX AND J. C. KILGO. 2002. Importance of coarse woody debris to avian communities in loblolly pine forests. Conservation Biology 16:767-778.

MORSE, D. H. 1994. Blackburnian Warbler (*Dendroica fusca*). *In* The Birds of North America, No. 102 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

MORTON, E. S. 1992. What do we know about the future of migrant landbirds? Pages 579-589 *in* Ecology and Conservation of Neotropical Migrant Landbirds (J. M. Hagen III and D. W. Johnston, eds.). Smithsonian Institution Press, Washington, D.C.

PECK, G. K., AND R. D. JAMES. 1987. Breeding Birds of Ontario. Nidology and Distribution. Vol. 2. Passerines. Royal Ontario Museum. Toronto, Ontario.

SCHREIBER, B., AND D. S. DECALESTA. 1992. The relationship between cavity-nesting birds and snags on clearcuts in western Oregon. Forest Ecology and Management 50:299-316.

SCHULTE, L. A., AND G. J. NIEMI. 1998. Bird communities of early successional burned and logged forest. Journal of Wildlife Management 62:1418-1429.

SMITH, R., AND M. DALLMAN. 1996. Forest gap use by breeding Black-throated Green Warblers. Wilson Bulletin 108:588-591.

TEJEDA-CRUZ, C., AND W. J. SUTHERLAND. 2005. Cloud forest bird responses to unusually severe storm damage. Biotropica 37:88-95.

USDA FOREST SERVICE. 2002. After the storm – a progress report from the Superior National Forest. Superior National Forest, U.S. Department of Agriculture, Forest Service, Eastern Region, Minnesota.

VAN WAGNER, C. E., AND I. R. METHVEN. 1978. Prescribed fire for site preparation in white and red pine. Pages 95-101 *in* White and Red Pine Symposium (D. A. Cameron, compiler). Symposium Proceedings O-P-6. Department of the Environment, Canadian Forestry Service, Great Lakes Forest Research Centre, Sault Ste. Marie, ON.

WAIDE, R. B. 1991. The effect of Hurricane Hugo on bird populations in the Luquillo Experimental

Forest, Puerto Rico. Biotropica 23:475-480.

WIENS, J. A. 1981. Scale problems in avian censusing. Studies in Avian Biology 6:513-521.

WIENS, J. A., J. T. ROTENBERRY, AND B. VAN HORNE. 1987. Habitat occupancy patterns of North American shrubsteppe birds: the effects of spatial scale. Oikos 48:132-147.

WILLIAMS, J. M. 1996. Bay-breasted Warbler (*Dendroica castanea*). *In* The Birds of North America, No. 206 (A. Poole and F. Gill, eds.). Philadelphia: The Academy of Natural Sciences; Washington, DC: The American Ornithologists' Union.

WUNDERLE JR., J. M. 1995. Responses of bird populations in a Puerto Rican forest to Hurricane Hugo: the first 18 months. Condor 97:879-896.

BIRD POPULATIONS

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REPORTS OF AVIAN MONITORING PROGRAMS

INTRODUCTION TO THE REPORTS

After what, to many of us, seems an inexcusably long time, the reality of climate change appears finally to have penetrated the consciousness of most organizations and governments worldwide. The physical effects of climate change that have come to light recently, including widespread recession of ice in the Arctic Ocean, accelerated melting of the Greenland and Antarctic icecaps, disappearing glaciers worldwide, and the submergence of previously inhabited islands in the Pacific Ocean and Bay of Bengal, have simply been too dramatic to ignore. And while the urgency of the situation may not yet be fully grasped by public leaders, at least a vague notion has taken hold that fundamental changes in energy policies and practices are required to avert sociopolitical upheaval.

Despite this welcome awakening from apathy and denial, the reality is that major changes in climate, and in populations of plants and animals worldwide, are inevitable, no matter how quickly energy-use practices are redesigned. The more slowly we implement changes in energy use, the greater will be the extent of the ecological damage to the Earth's biodiversity. The more dire but scientifically sound predictions suggest that, if climate change continues unabated, nearly a quarter of all species on Earth could be threatened with extinction by 2050 and half could be extinct or threatened with extinction by the end of the century. Thus, we also face the dual challenges of determining the ways that plant and animal populations will likely be affected by climate change and of formulating management strategies to maintain their populations under those circumstances, that is, as the "baseline" conservation targets shift.

The science of predicting effects of climate change on bird populations is in its infancy. One line of investigation attempts to predict the range changes and local extinctions of bird species that will result from geographic displacement of the climatic conditions that exist in their current ranges. This approach assumes that species are mobile enough to track rapidly changing environments, an assumption widely thought to be true for birds, but not for less mobile species, such as many plants and sessile animals. However, because bird populations depend on habitat conditions, including plant and animal species compositions, as well as weather conditions, such assumptions may not be true for birds either.

Moreover, most bird species in the temperate portions of North America and Eurasia are migratory and occupy two — often very different — breeding and wintering habitats that can be separated by thousands of miles, as well as a number of other habitat types along their migration routes. These different habitats play critical roles in the overall life history of these species, and are each likely to be affected differently by climate change. Thus, the ways in which each of these habitats is likely to change, and the ecological responses of each bird species to such changes, must be factored into avian conservation plans if they are to succeed.

Because changes in avian vital rates (i.e., productivity, recruitment, and survival) drive changes in bird populations, one important way

of addressing these issues is by modeling vital rates as functions of both habitat and weather conditions, and then examining the results of these models as climate and habitats are allowed to change according to predictions of climate models. Such an approach necessitates the existence and integration of long-term, large-scale monitoring data on avian demographic rates, data that have only recently begun to be collected over substantial areas of temperate North America and Europe.

The British Trust for Ornithology spearheaded the integration of avian population and vital rate data in the early 1990s. Annual reports for 2001 and 2002 for key program components of their integrated avian population and demographic monitoring scheme are reprinted on pages 136-215 of this volume of *Bird Populations*. Examples presented throughout these reports illustrate the value of integrating population and demographic data: proximate demographic causes of population change can be determined, management and conservation strategies for declining species can be formulated, and the effectiveness of such strategies can be evaluated through continued monitoring.

Avian monitoring efforts in North America benefited from the establishment of major conservation initiatives that also began in the early 1990s. These include the Neotropical Migratory Bird Conservation Initiative – Partners In Flight (PIF) and the North American Bird Conservation Initiative (NABCI), which have aided the growth of the North American Breeding Bird Survey (BBS) and the establishment and growth of the Monitoring Avian Productivity and Survivorship (MAPS) Program. Reports of the BBS have been published in past volumes (and will be published in future volumes) of *Bird Populations*, while the 1999 - 2001 report of the MAPS Program is published on pages 23-89 of this volume. Efforts are currently underway in North America to coordinate the establishment of demographic monitoring (MAPS) efforts based to some extent on trend information from population monitoring programs (BBS), and to integrate data from each of these two continent-wide programs to provide spatially explicit information on the demographic causes of population changes.

Evidence for the expansion of avian demographic monitoring in Europe is provided by the rapid growth of the European Constant Effort Sites (CES) Network. Patterned after the British CES Program, which was created in 1981, and stimulated by the success of the North American MAPS program (which was also patterned on the British CES program), the European effort now includes stations in at least 14 countries.

It is our hope that, beginning with this volume of *Bird Populations*, the onset of entirely electronic publication will increase the ease, timeliness, and cost-efficiency of reporting results of avian monitoring programs. Indeed, publication of the longest-running landbird monitoring program in North America, the Breeding Bird Census – which was initiated in 1937 and utilizes a spot-mapping protocol – was revived, after a 9-year hiatus, with publication of the 2001 and 2002 censuses on pages 90-135 of this volume. We hope that the benefits accruing electronic publication will provide encouragement for other programs, such as the North American Breeding Bird Research and Monitoring Database (BBIRD), the Landbird Migration Monitoring Network of the Americas (LaMMNA), and many of the participants in the European CES Network, to also publish their reports in this journal.

The ability of meteorologists and climatologists to model and understand recent changes in weather and climate has depended upon the existence of monitoring data extending back into the mid 1800s. We take the existence of such weather monitoring data completely for granted today, but it was not always so. Early proponents of weather monitoring had to fight for funding and rely on volunteers, much the same as do today's proponents of avian population and demographic monitoring. We can only dream that, likewise, 150 years from now, the avian population ecologists charged with maintaining the health of bird populations will take for granted the high-quality global avian population and demographic monitoring data they will have at their disposal. It is our hope that the reports of avian monitoring programs published in *Bird Populations* will contribute to the realization of that dream. – David F. DeSante.

Bird Populations 7:23-89

THE MONITORING AVIAN PRODUCTIVITY AND SURVIVORSHIP (MAPS) PROGRAM 1999, 2000, AND 2001 REPORT[1]

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Abstract. Herein we summarize results of the Monitoring Avian Productivity and Survivorship (MAPS) Program during 1999-2001, a period in which MAPS grew from 475 stations in 1998 to 498 stations in 2001. We found alternating increases and decreases in regional annual indices of adult population size, with significant decreases in the Northwest and South-central regions and non-significant increases in the remaining five regions in 1999; a significant increase in the South-central region and decreases of varying significance in the other six regions in 2000; and significant decreases in the Southwest and South-central regions and increases in four of the five remaining regions in 2001. Productivity (i.e., reproductive index, defined as young/adult) tended to follow the opposite pattern, with significant decreases in five of the seven regions and non-significant increases in the South-central and Southeast regions in 1999; and increases in five of the seven regions and non-significant decreases in the North-central and South-central regions in 2000. Productivity, however, increased further in 2001, with increases in five regions (significant in the South-central and Alaska/Boreal Canada regions) and non-significant decreases in the Northwest and Northeast regions. These generally alternating, out-of-phase patterns in productivity and population size suggest that (a) increased productivity leads to increased population sizes the following year through increased recruitment, and (b) increased population sizes, coupled with a higher proportion of younger, inexperienced breeders, may suppress productivity through increased competition for resources. That these patterns were not consistent in all regions in all years suggests that density-independent factors may also drive productivity and that other factors besides productivity (e.g., survival of young and adults) may also drive year-to-year changes in population size. We estimated regional annual adult survival (φ) and recapture probabilities and proportions of residents among newly captured adults using 1992-2001 data pooled from all stations operated for at least four consecutive years and modified Cormack-Jolly-Seber capture-mark-recapture analyses, which included both between- and within-year transient models. The mean number of stations per region contributing data for a species (68) and mean number of species per region for which survival rates could be estimated (59) were 39% and 34% greater, respectively, in the 10-yr (1992-2001), than in the 7-yr (1992-1998), data set. The increased number of years and stations in the data continued to increase precision: the mean number of species with CV(φ) <30%, <20%, and <10% increased by 35%, 57%, and 100%, respectively, using the 10- rather than the 7-yr data set. As in previous years, mean regional annual survival probabilities decreased with increasing latitude. For six of the seven regions, both the number and proportion of species for which time-dependence in survival was detected in the 10-yr data set was less than in the 7-yr data set, suggesting that survival varied less during the last three years (1999-2001) than during the previous seven (1992-1998). Finally, in each region, mean survival for species for which it was adequately estimated tended to be highest over the five

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years 1992-1996, lower over the seven years 1992-1998, and lowest over the 10 years 1992-2001, suggesting that a negative trend in survival among North American landbirds may have occurred over those ten years. We will test this hypothesis in future analyses by modeling survival as a linear function of year.

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

INFORME ANUAL DE 1999, 2000 Y 2001 DEL PROGRAMA MAPS (MAPEO DE PRODUCTIVIDAD Y SOBREVIVENCIA DE AVES)

Resumen. Presentamos un sumario de los resultados del programa MAPS durante los años 1999 y 2000, periodo en el que MAPS creció de 475 estaciones en 1998 a 498 en 2001. Encontramos aumentos y declives alternados en los índices anuales de tamaño poblacional adulto, con declives significativos en las regiones noroeste y centro-sur, y aumentos no significativos en las cinco regiones restantes en 1999; un aumento significativo en la región centro-sur y declives de significatividad variable en el suroeste y centro-sur y aumentos en cuatro de las cinco regiones restantes en 2001. La productividad (el índice reproductivo definido como la proporción de juveniles a adultos) tendió a mostrar el patrón opuesto, con declives significativos en cinco de las seis regiones y aumentos no significativos en el centro-sur y el sureste en 1999; y aumentos en cinco de las siete regiones y declives no significativos en el centro-norte y centro-sur en 2000. Sin embargo, la productividad siguió aumentando en 2001, con aumentos en cinco regiones (significativos en las regiones centro-sur y la de Alaska/Canadá Boreal) y declives no significativos en el noroeste y noreste. Estos patrones generalmente alternantes y desfasados en productividad y tamaño poblacional sugieren que (a) el aumento de productividad conlleva un aumento en tamaño poblacional el siguiente año mediante un aumento del reclutamiento, y (b) aumentos en el tamaño poblacional, junto una mayor proporción de reproductores jóvenes sin experiencia, puede reducir la productividad mediante una mayor competición por recursos. Que estos patrones no sean similares en todas las regiones en todos los años sugiere que factores denso-independientes pueden también afectar la productividad, y que otros factores además de la productividad (por ejemplo sobrevivencia de juveniles y adultos) pueden generar cambios anuales en tamaño poblacional. Estimamos la tasa anual de sobrevivencia (φ) y la probabilidad de recaptura en adultos, y la proporción de residentes en las capturas de adultos nuevos utilizando datos de 1992 a 2001 de todas las estaciones operadas al menos por cuatro años consecutivos y análisis de captura-marcaje-recaptura de Cormack-Jolly-Seber que incluyen modelos de transehuntes intra e interanuales. El número promedio de estaciones por región que contribuyó datos para una especie (68) y el promedio de especies para las que se pudo estimar tasas de sobrevivencia (59) fueron 39% y 34% mayores, respectivamente, al utilizar 10 años de datos (1992-2001) que al utilizar 7 años (1992-1998). El aumento en el número de años y estaciones continuó aumentando la precisión: el número promedio de especies con CV (φ) <30%, <20%, y <10% aumentó en un 35%, 57%, y 100%, respectivamente, utilizando 10 años en lugar de 7. Como en años anteriores, las probabilidades de sobrevivencia regionales promedio declinaron al aumentar la latitud. En seis de las siete regiones, tanto el número como la proporción de especies en las que se detectó dependencia temporal en su sobrevivencia usando 10 años fue menor que usando 7 años, lo que sugiere que la sobrevivencia varió menos en los últimos tres años (1999-2001) que en los siete anteriores (1992-1998). Por último, en cada región, la sobrevivencia promedio en especies para las que se estimó adecuadamente tendió a ser más alta de 1992 a 1996, más baja entre 1992 y 1998, y más baja aun entre 1992 y 2001, lo que sugiere una tendencia negativa en sobrevivencia en aves de bosque en Norte América en esta década. Probaremos esta hipótesis en el futuro modelando sobrevivencia como función lineal con año.

Palabras clave: programa MAPS, anillamiento y redeo de esfuerzo constante, demografía de aves terrestres, Norte América, 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 O'Grady 2000). MAPS, which was patterned to a large extent after the British Constant Effort Sites scheme (Baillie et al. 1986; Peach et al. 1996, 1998), was established by The Institute for Bird Populations (IBP) in 1989 to provide for the large-scale, long-term collection of demographic data on North American landbirds at multiple spatial scales. MAPS now provides indices and estimates of vital rates for over 130 species.

MAPS is organized to fulfill monitoring, research, and management goals. Monitoring goals are to provide, for over 130 target species:

- indices of adult population size and post-fledging productivity from the numbers of young and adult birds captured; and
- estimates of adult population size, adult survival rate, proportion of residents among newly captured adults, recruitment rate into the adult population, and population growth rate from Cormack-Jolly-Seber (CJS) analyses of capture-mark-recapture (CMR) data on adult birds.

Research goals are to describe:

- temporal and spatial patterns in these demographic indices and estimates at multiple spatial scales; and
- relationships between these patterns and ecological characteristics of the target species, population trends of the target species, station-specific and landscape-scale habitat characteristics, and spatially-explicit weather variables.

Management goals are to use these patterns and relationships, at the appropriate spatial scales, to:

- determine the proximate demographic cause(s) of population change;
- formulate management actions and conservation strategies to reverse population declines and maintain stable or increasing populations; and
- evaluate the effectiveness of the management actions and conservation strategies implemented.

Baillie (1990) was among the first to argue that monitoring vital rates (primary demographic parameters such as productivity and survivorship) must be a component of any successful integrated avian monitoring scheme. DeSante (1995), DeSante and Rosenberg (1998), and DeSante et al. (2005a) extended these ideas by arguing that effective avian management must be based on vital rates as well as population sizes and trends. They reasoned that, because of source-sink dynamics (Pulliam 1988, Donovan et al. 1995) and evolutionary and ecological traps (Schlaepfer et al. 2002), abundance metrics and the trends derived from them may not always accurately reflect habitat quality (Van Horne 1983). Furthermore, 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). Indeed, a recent survey of studies that compared both avian population density and reproductive success between two or more plots, habitats, or landscapes, found that, although density and per capita reproduction were often positively correlated, about 30% of studies showed exceptions in which higher density plots had lower per capita reproduction (Bock and Jones 2004).

Other advantages for basing management on vital rates accrue from the fact that 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). Moreover, 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 that winter in tropical latitudes, because it can determine whether management actions should be directed toward a species' temperate breeding grounds, tropical wintering grounds, or both. 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 provides more timely and insightful information for management and conservation applications.

In this report we present MAPS results from

1999, 2000, and 2001 using data from 467, 474, and 484 stations, respectively. For all species with adequate data (and for all species pooled), we compare, in a constant-effort manner, the regional indices of adult population size and post-fledging productivity obtained each year with the analogous indices obtained during the immediately preceding year. We then present 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, from a total of 479 stations operated for four or more consecutive years during the 10-yr (1992-2001) period.

METHODS

The overall design of MAPS and the general field methods are described in DeSante et al. (1996, 1998) and discussed in some detail in DeSante et al. (2004a). Detailed, standardized methods and instructions for the establishment and operation of MAPS stations are provided by DeSante et al. (2004b). 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. 2004b), but some aspects of site selection were dictated by logistical concerns.

DATA COLLECTION

Normally, 10 permanent net sites (sometimes more, rarely fewer) were distributed uniformly throughout the central eight hectares 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 in length, with 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 (both within and between years). Typically, nets were operated for 6 hr d^{-1} (sometimes less, rarely more), beginning at local sunrise, for one day per 10-d period (rarely more), and for 6 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 (in Canada, the Canadian Wildlife Service). Band number, capture status, species, age, sex, ageing and sexing criteria, date, time, station, and net number were recorded for all birds captured, including recaptures. The times of opening and closing the nets and the beginning of 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 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 proofing, 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 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. 2004).

DATA ANALYSES

Methods of data analysis, as described in

DeSante and Burton (1994), DeSante et al. (1998), and DeSante and O'Grady (2000), were further discussed in DeSante et al. (2004a), and are briefly summarized here. We divided North America (north of Mexico) into eight major regions based on biogeographical and meteorological considerations: Northwest, Southwest, North-central, South-central, Northeast, Southeast, Alaska, and Boreal Canada (see maps in DeSante et al. 1993a, DeSante and Burton 1994). These regions were delineated along lines consistent with the physiographic strata established in conjunction with the North American Breeding Bird Survey (Robbins et al. 1986). Because few stations were established in the Boreal Canada region, we pooled data from that region and the Alaska region into a single Alaska/Boreal Canada region.

Throughout the text, we use an alpha level of $P < 0.05$ to indicate statistical significance. We use $P < 0.01$ to indicate highly significant differences or relationships. In Tables 1-3, we also identify species for which between-year differences were nearly significant at $0.05 \leq P < 0.10$. In expressing variation around the mean, we use ± the standard deviation (Std. Dev.). Finally, for a number of analyses we compare results between two time periods. When we refer to the 10-yr period, this is 1992-2001; the 7-yr period referred to includes 1992-1998.

Population size and productivity indices — The numbers of individual adult birds of each species captured each year, pooled over all stations within each region that were located within the breeding range of the species, were used as annual indices of adult population size for the species in the region. Similarly, for each species in each region, the pooled numbers of individual young birds divided by the pooled numbers of individual adult birds ("reproductive index") were used as annual regional indices of post-fledging productivity. The use of reproductive index (young/adult), rather than "productivity index," defined as the proportion of young in the catch (young/[young+adult]), represents a departure from previous usage and provides an index more in line with other commonly-used measures of reproductive success. Data from a given station in a given year were included in population size and productivity analyses if the station was operated in at least five 10-d periods that year; at least three of these periods had to occur during the earlier part of the season (the adult superperiod, when adult birds predominate in the catch) and at least two had to occur during the later part of the season (the young superperiod, when young birds predominate in the catch). Definitions of the adult and young superperiods for each starting period are presented in DeSante et al. (2004b).

Year-to-year changes in the number 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. We inferred the statistical significance of annual changes in the regional indices of adult population size and productivity 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 are 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 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.

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 (CMR) analyses (Clobert et al. 1987,

Pollock et al. 1990, Lebreton et al. 1992) that incorporated a between-year transient model (Pradel et al. 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 et al. 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 regular or 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 10-yr period, 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 the 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 10 years (at least 25 year-unique individuals) from all stations pooled, and for which there were at least two returns (between-year recaptures) from all stations pooled. This is a substantially more relaxed criterion than was used in the previous annual report (an average of at least seven individual adult birds during each of the seven years for a total of at least 49 year-unique individuals; DeSante and O'Grady 2000). We considered survival probability to be "adequately 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 the 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 over-dispersion 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 among newly captured adults was assessed by summing the wi 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.

RESULTS

NUMBER AND DISTRIBUTION OF STATIONS

A total of 481 MAPS stations was operated during 1999, a 1.3% increase over the 475 in operation during 1998. Of these, 49 (10.2%) were new while 432 were in operation during a previous year. A total of 90.1% of the stations in operation in 1998 continued to be operated in 1999. We received data useable for productivity and/or survivorship analyses in time to be included in this report from 467 of the 481 stations that were operated during 1999. A total of 483 MAPS stations was operated during 2000. Of these, 37 (7.7%) were new while 446 were in operation during a previous year. A total of

92.5% of the stations in operation during 1999 continued to be operated during 2000. We received data useable for productivity and/or survivorship analysis in time to be included in this report from 474 of the 483 stations that were operated during 2000. A total of 498 MAPS stations was operated during 2001, a 3.1% increase over 2000. Of these, 49 (9.8%) were new while 449 were in operation during a previous year. A total of 92.1% of the stations in operation during 2000 continued to be operated during 2001. We received data useable for productivity and/or survivorship analyses in time to be included in this report from 484 of the 498 stations that were operated during 2001. The principal operator, sponsoring organization, location, elevation, and habitat(s) for each station newly established in 1999, 2000, or 2001 (or that was established prior to 1999 but not previously reported) are presented in the Appendix. See previous annual reports (DeSante et al. 1993b, 1996, 1998, DeSante and Burton 1994, and DeSante and O'Grady 2000) for these data for stations established prior to 1999.

The proportions of stations located in each of the eight MAPS regions were very similar during 1999, 2000, and 2001 (Fig. 1), and were similar to analogous proportions in previous years. During each year, about 30% of stations were operated in the Northwest region, nearly twice as many as in any other region. As expected, the fewest stations were operated in the Alaska and, especially, Boreal Canada regions. The proportions of total stations operated in the remaining five regions were similar, ranging from 7-10% in the North-central and South-central to 15-17% in the other three regions. The largest increase in stations during 1999-2001 occurred in the Northeast Region while the largest decrease occurred in the Alaska Region. The locations of all 748 stations that were operated for one or more years between 1992 and 2001 are mapped by 10-minute block in Figure 2.

ADULT POPULATION SIZE AND PRODUCTIVITY

Changes between 1998 and 1999 — Constant-effort data on the numbers of adult and young birds captured and the proportion of young in the catchwere obtained for 1998 and 1999 from 384 MAPS stations that were operated comparably during both years (Table 1). Included were 62 species in the Northwest, 38 in the Southwest, 19 in the North-central, 25 in the South-central, 35 in the Northeast, 25 in the Southeast, and 18 in the Alaska/Boreal Canada regions, comprising a total of 112 species overall (plus 19 additional species that met productivity criteria when data were pooled from all seven regions).

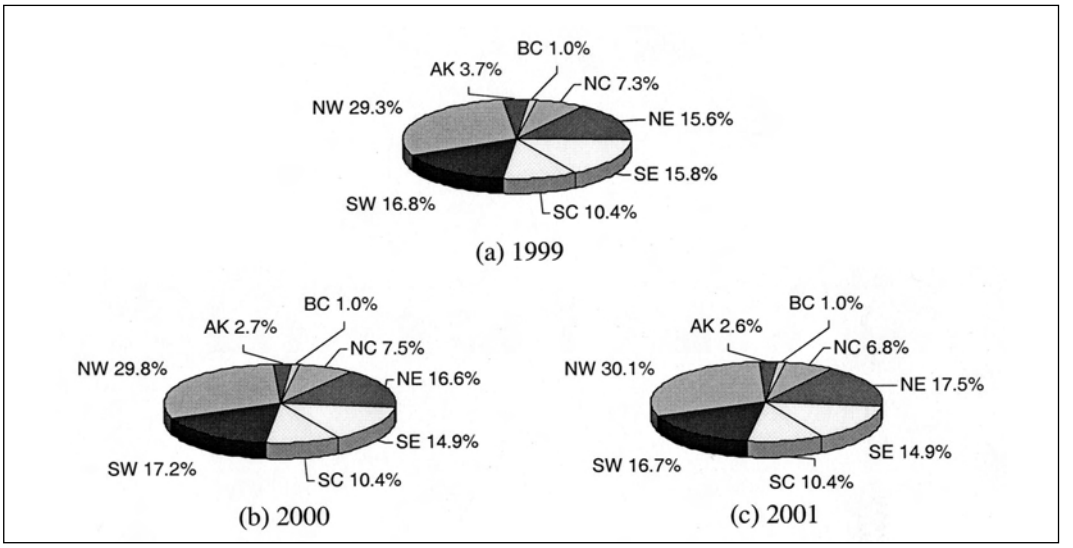

FIGURE 1. Proportion of MAPS stations in each of the seven major geographical regions (NW - Northwest; SW - Southwest; NC - North-central; SC - South-central; NE - Northeast; SE - Southeast; AK/BC - Alaska/Boreal Canada) during (a) 1999, (b) 2000, and (c) 2001.

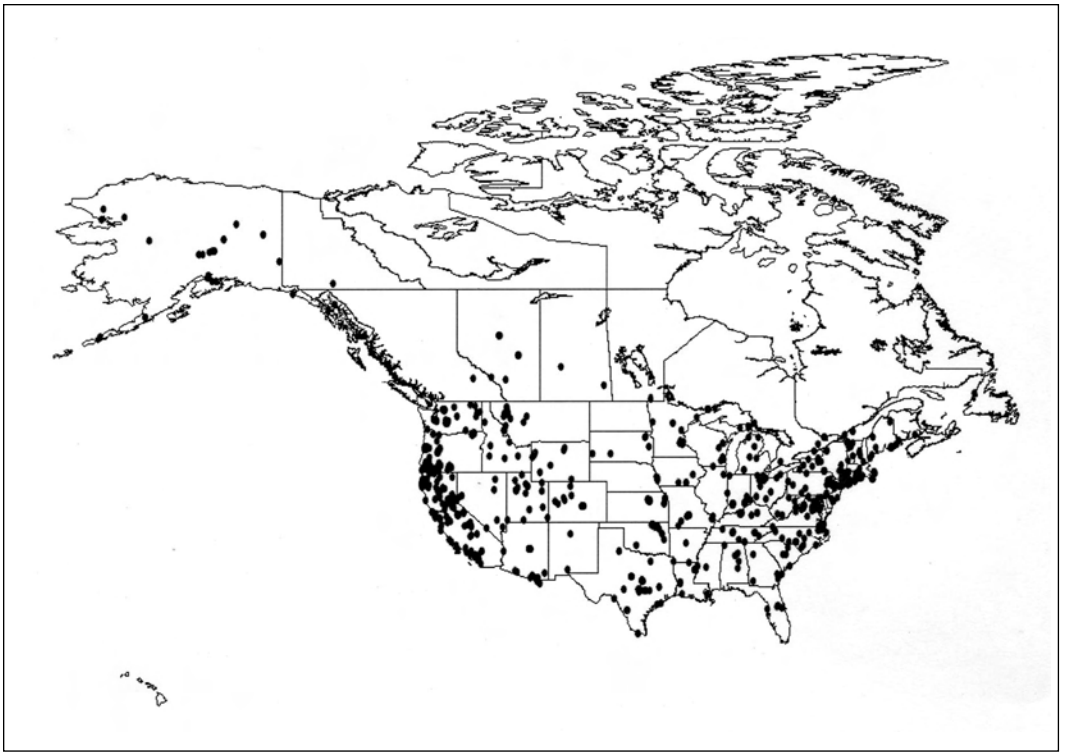

FIGURE 2. Locations (mapped by 10-minute block) of the 757 MAPS stations in operation during one or more years between 1992 and 2001. Some of the larger "individual" circles can represent as many as 11 stations.

Adult populations. — Indices of adult population size for all species pooled (numbers of adults captured) decreased significantly between 1998 and 1999 in the Northwest (by -6.9%) and South-central (by -18.1%) regions and showed slight, non-significant increases (ranging from +0.1% to +2.1%) in the remaining five regions. The proportions of decreasing species in the Northwest (63%) and South-central (80.0%) regions were also significantly >50%. Summing over these two regions, 10 species had significant decreases in numbers of adults and another nine species had nearly significant decreases, while only two species showed significant or nearly significant increases. The proportion of increasing species in the Northeast (66%) was significantly >50%, although the 2.1% increase in adults of all species pooled in the Northeast was not significant. The proportions of increasing species in the remaining four regions (ranging from 40-56%) were not significantly >50%. Summing over these five regions, 11 species had significant or nearly significant increases in numbers of adults, while 12 species showed significant or nearly significant decreases in numbers of adults.

On a continent-wide basis (all regions pooled), the number of adults captured of all species pooled decreased between 1998 and 1999 by a significant -3.7%, while a highly significant 64% of 131 species showed decreases.

Productivity. — Overall, productivity decreased between 1998 and 1999 in five of the seven regions. In the Northwest Region, numbers of young birds of all species pooled showed a highly significant decrease of -16.7%, substantially greater than the highly significant decrease in adults of -6.9%, so that the reproductive index showed a non-significant decrease of -10.5%. However, the proportion of decreasing species in the Northwest, for both number of young captured (66%) and reproductive index (65%), was significantly

TABLE 1. Regional changes between 1998 and 1999 in the numbers of adult and young individuals captured and in the reproductive index (number of young/number of adults) for 131 species and all species pooled (excluding gallinaceous birds and hummingbirds) at the 384 stations run comparably in 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[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
NORTHWEST MAPS REGION																
Red-naped Sapsucker	28	49	28	-42.9	11.5***	23	31	16	-48.4	16.8**	33	0.633	0.571	-0.061	0.199	-9.7
Red-breasted Sapsucker	47	82	82	0.0	17.0	27	34	49	44.1	36.2	50	0.415	0.598	0.183	0.158	44.1
Downy Woodpecker	49	56	49	-12.5	14.1	33	41	32	-22.0	23.0	56	0.732	0.653	-0.079	0.237	-10.8
Western Wood-Pewee	59	166	167	0.6	12.7	21	27	11	-59.3	17.5**	60	0.163	0.066	-0.097	0.044**	-59.5
Willow Flycatcher	61	207	205	-1.0	13.0	10	15	13	-13.3	34.0	62	0.073	0.063	-0.009	0.042	-12.5
Hammond's Flycatcher	66	132	151	14.4	15.2	32	51	28	-45.1	27.7	72	0.386	0.185	-0.201	0.175	-52.0
Dusky Flycatcher	64	235	189	-19.6	10.7	18	17	31	82.4	68.1	65	0.072	0.164	0.092	0.059	126.7
"Western" Flycatcher	84	248	267	7.7	33.5	45	66	45	-31.8	19.5	89	0.266	0.169	-0.098	0.080	-36.7
Cassin's Vireo	29	65	50	-23.1	14.4	18	17	18	5.9	41.7	36	0.262	0.360	0.099	0.182	37.6
Warbling Vireo	98	540	478	-11.5	6.1*	24	36	46	27.8	42.1	99	0.067	0.096	0.030	0.041	44.4
Steller's Jay	36	30	30	0.0	25.7	12	5	20	300.0	259.2*	40	0.167	0.667	0.500	0.259*	300.0
Tree Swallow	13	59	39	-33.9	9.8*	2	9	3	-66.7	14.8	13	0.153	0.077	-0.076	0.050	-49.6
Black-capped Chickadee	45	142	124	-12.7	14.8	41	201	153	-23.9	13.6	51	1.416	1.234	-0.182	0.363	-12.8
Mountain Chickadee	38	91	109	19.8	15.2	28	98	71	-27.6	24.5	40	1.077	0.651	-0.426	0.302	-39.5
Chestnut-backed Chick.	45	82	81	-1.2	25.4	40	84	87	3.6	24.4	57	1.024	1.074	0.050	0.313	4.9
Bushtit	17	35	17	-51.4	18.9*	14	47	59	25.5	57.2	18	1.343	3.471	2.128	1.323	158.4
Red-breasted Nuthatch	38	33	43	30.3	37.6	27	47	34	-27.7	31.0	45	1.424	0.791	-0.634	0.550	-44.5
Brown Creeper	53	77	49	-36.4	12.2**	45	56	29	-48.2	13.0***	70	0.727	0.592	-0.135	0.234	-18.6
Bewick's Wren	11	25	29	16.0	17.1	13	31	50	61.3	49.6	14	1.240	1.724	0.484	0.430	39.0
House Wren	26	41	52	26.8	22.8	32	58	56	-3.4	24.6	40	1.415	1.077	-0.338	0.535	-23.9
Winter Wren	40	137	115	-16.1	8.7*	42	103	102	-1.0	18.2	52	0.752	0.887	0.135	0.235	18.0
Golden-crowned Kinglet	43	103	59	-42.7	9.0***	48	226	116	-48.7	23.9*	59	2.194	1.966	-0.228	0.915	-10.4
Ruby-crowned Kinglet	17	50	51	2.0	39.4	5	55	20	-63.6	20.0**	18	1.100	0.392	-0.708	0.793	-64.3
Swainson's Thrush	96	1238	1163	-6.1	4.5	58	163	169	3.7	16.7	96	0.132	0.145	0.014	0.030	10.4
Hermit Thrush	43	108	119	10.2	15.7	31	46	29	-37.0	12.2**	53	0.426	0.244	-0.182	0.090**	-42.8
American Robin	115	607	559	-7.9	6.5	72	165	109	-33.9	10.2***	116	0.272	0.195	-0.077	0.050	-28.3
Varied Thrush	27	51	44	-13.7	21.0	19	40	12	-70.0	8.1***	32	0.784	0.273	-0.512	0.199**	-65.2
Wrentit	23	82	52	-36.6	10.7***	21	46	74	60.9	46.3	25	0.561	1.423	0.862	0.306***	153.7
Gray Catbird	14	83	105	26.5	21.8	9	19	17	-10.5	37.8	14	0.229	0.162	-0.067	0.071	-29.3
Cedar Waxwing	42	218	169	-22.5	11.7	14	19	10	-47.4	26.1	44	0.087	0.059	-0.028	0.044	-32.1

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
Orange-crowned Warbler†	70	325	247	-24.0	7.6***	68	469	474	1.1	30.2	82	1.443	1.919	0.476	0.700	33.0
Nashville Warbler†	49	84	99	17.9	22.3	41	176	169	-4.0	30.3	56	2.095	1.707	-0.388	0.807	-18.5
Yellow Warbler	69	719	744	3.5	7.6	50	247	288	16.6	15.7	72	0.344	0.387	0.044	0.086	12.7
Yellow-rumped Warbler	71	386	342	-11.4	7.5	46	190	150	-21.1	22.4	76	0.492	0.439	-0.054	0.157	-10.9
Townsend's Warbler	33	80	101	26.3	20.7	20	54	66	22.2	71.6	35	0.675	0.653	-0.022	0.470	-3.2
Hermit Warbler	31	94	110	17.0	25.0	24	80	89	11.3	63.4	35	0.851	0.809	-0.042	0.496	-4.9
American Redstart	12	49	41	-16.3	16.6	8	19	17	-10.5	26.9	13	0.388	0.415	0.027	0.218	6.9
MacGillivray's Warbler	105	909	841	-7.5	4.2*	69	325	247	-24.0	12.0*	107	0.358	0.294	-0.064	0.071	-17.9
Common Yellowthroat	36	238	234	-1.7	9.8	21	71	49	-31.0	20.9	38	0.298	0.209	-0.089	0.076	-29.8
Wilson's Warbler	100	790	683	-13.5	7.5	57	230	142	-38.3	12.4**	105	0.291	0.208	-0.083	0.072	-28.6
Yellow-breasted Chat	20	112	111	-0.9	8.8	11	28	25	-10.7	38.7	20	0.250	0.225	-0.025	0.090	-9.9
Western Tanager	78	175	172	-1.7	15.3	26	40	42	5.0	33.2	80	0.229	0.244	0.016	0.091	6.8
Green-tailed Towhee	10	47	40	-14.9	16.9	9	17	11	-35.3	26.0	12	0.362	0.275	-0.087	0.125	-24.0
Spotted Towhee	36	135	128	-5.2	9.2	32	69	65	-5.8	24.7	41	0.511	0.508	-0.003	0.176	-0.6
Chipping Sparrow	37	75	67	-10.7	18.8	13	12	11	-8.3	51.9	40	0.160	0.164	0.004	0.089	2.6
Savannah Sparrow	5	64	86	34.4	9.2**	3	2	1	-50.0	75.0	7	0.031	0.012	-0.020	0.029	-62.8
Fox Sparrow	28	96	84	-12.5	9.5	15	15	12	-20.0	34.5	33	0.156	0.143	-0.013	0.076	-8.6
Song Sparrow	98	1112	960	-13.7	4.6***	95	1097	786	-28.4	5.7***	103	0.986	0.819	-0.168	0.155	-17.0
Lincoln's Sparrow	47	335	237	-29.3	6.1***	34	140	106	-24.3	16.3	48	0.418	0.447	0.029	0.114	7.0
White-crowned Sparrow	20	73	57	-21.9	13.7	11	24	12	-50.0	22.1	21	0.329	0.211	-0.118	0.132	-36.0
Dark-eyed Junco	83	660	705	6.8	6.5	69	461	403	-12.6	10.5	85	0.698	0.572	-0.127	0.135	-18.2
Black-headed Grosbeak	76	325	270	-16.9	7.6**	36	56	64	14.3	29.7	80	0.172	0.237	0.065	0.067	37.6
Lazuli Bunting	43	141	139	-1.4	17.3	13	29	22	-24.1	23.4	46	0.206	0.158	-0.047	0.089	-23.0
Red-winged Blackbird	17	117	152	29.9	22.6	7	8	15	87.5	118.7	17	0.068	0.099	0.030	0.070	44.3
Brown-headed Cowbird	48	139	137	-1.4	13.8	21	23	14	-39.1	24.7	52	0.166	0.102	-0.063	0.058	-38.2
Bullock's Oriole	22	91	75	-17.6	17.9	13	29	12	-58.6	28.8*	24	0.319	0.160	-0.159	0.249	-49.8
Purple Finch	42	324	248	-23.5	8.1*	27	55	72	30.9	50.9	46	0.170	0.290	0.121	0.101	71.0
Cassin's Finch	27	35	77	120.0	64.6**	8	4	10	150.0	171.1	30	0.114	0.130	0.016	0.084	13.6
House Finch	7	24	56	133.3	123.3	7	12	31	158.3	203.9	9	0.500	0.554	0.054	0.166	10.7
Pine Siskin	56	183	185	1.1	31.2	27	68	36	-47.1	32.4	58	0.372	0.195	-0.177	0.122	-47.6
Lesser Goldfinch	18	55	62	12.7	29.9	11	20	21	5.0	72.7	20	0.364	0.339	-0.025	0.184	-6.9
American Goldfinch	27	148	137	-7.4	15.4	4	4	2	-50.0	45.6	27	0.027	0.015	-0.012	0.019	-46.0
All species pooled	**127**	**13637**	**12692**	**-6.9**	**2.3*** **	**127**	**6140**	**5113**	**-16.7**	**5.7*** **	**127**	**0.450**	**0.403**	**-0.047**	**0.044**	**-10.5**
	Number decreasing: 39/62 (63%)**					Number decreasing: 41/62 (66%)***					Number decreasing: 40/62 (65%)**					

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
SOUTHWEST MAPS REGION																
Nuttall's Woodpecker	13	36	26	-27.8	16.8	14	29	19	-34.5	26.5	19	0.806	0.731	-0.075	0.533	-9.3
Western Wood-Pewee	31	65	85	30.8	33.6	4	3	1	-66.7	44.4	32	0.046	0.012	-0.034	0.030	-74.5
Dusky Flycatcher	13	36	63	75.0	29.7***	3	2	2	0.0	86.6	13	0.056	0.032	-0.024	0.043	-42.9
"Western" Flycatcher	30	90	131	45.6	33.7*	14	22	22	0.0	45.2	30	0.244	0.168	-0.077	0.129	-31.3
Black Phoebe	10	14	19	35.7	42.4	16	53	26	-50.9	16.1***	17	3.786	1.368	-2.417	1.733	-63.9
Ash-throated Flycatcher	29	118	89	-24.6	12.9	7	15	5	-66.7	24.9	29	0.127	0.056	-0.071	0.062	-55.8
Warbling Vireo	28	125	103	-17.6	21.3	5	5	3	-40.0	67.5	28	0.040	0.029	-0.011	0.025	-27.2
Bushtit	33	129	185	43.4	36.0	26	140	109	-22.1	19.4	36	1.085	0.589	-0.496	0.324	-45.7
Bewick's Wren	39	208	195	-6.3	8.9	38	269	148	-45.0	8.9***	40	1.293	0.759	-0.534	0.281*	-41.3
House Wren	24	147	138	-6.1	12.4	22	114	70	-38.6	12.6**	26	0.775	0.507	-0.268	0.270	-34.6
Swainson's Thrush	15	208	171	-17.8	15.2	6	26	14	-46.2	10.7**	15	0.125	0.082	-0.043	0.058	-34.5
American Robin	24	88	87	-1.1	17.6	11	26	17	-34.6	16.3	25	0.296	0.195	-0.100	0.131	-33.9
Wrentit	17	124	141	13.7	13.4	15	124	66	-46.8	21.2	18	1.000	0.468	-0.532	0.404	-53.2
Orange-crowned Warbler	22	89	148	66.3	40.8	13	42	49	16.7	40.5	23	0.472	0.331	-0.141	0.132	-29.8
Virginia's Warbler	9	52	31	-40.4	9.3*	4	18	4	-77.8	16.4**	9	0.346	0.129	-0.217	0.234	-62.7
Lucy's Warbler	5	42	36	-14.3	15.9	4	22	6	-72.7	23.9*	6	0.524	0.167	-0.357	0.316	-68.2
Yellow Warbler	31	308	308	0.0	14.8	14	55	45	-18.2	28.0	32	0.179	0.146	-0.033	0.070	-18.2
MacGillivray's Warbler	15	55	59	7.3	19.7	5	3	3	0.0	105.4	18	0.055	0.051	-0.004	0.053	-6.8
Common Yellowthroat	26	348	419	20.4	12.7	18	341	143	-58.1	7.8***	27	0.980	0.341	-0.639	0.148***	-65.2
Wilson's Warbler	14	227	126	-44.5	11.2***	6	112	102	-8.9	11.3	14	0.493	0.810	0.316	0.347	64.1
Yellow-breasted Chat	21	154	183	18.8	13.8	10	9	8	-11.1	57.7	22	0.058	0.044	-0.015	0.038	-25.2
Western Tanager	26	56	58	3.6	22.9	4	2	3	50.0	178.0	26	0.036	0.052	0.016	0.047	44.8
Spotted Towhee	37	208	240	15.4	13.7	33	134	57	-57.5	14.6**	38	0.644	0.238	-0.407	0.181**	-63.1
California Towhee	16	55	71	29.1	25.0	9	60	8	-86.7	9.9***	16	1.091	0.113	-0.978	0.331***	-89.7
Brewer's Sparrow	6	17	8	-52.9	40.5	6	129	3	-97.7	3.1**	7	7.588	0.375	-7.213	7.863	-95.1
Lark Sparrow	11	43	31	-27.9	10.8**	3	70	28	-60.0	13.8**	11	1.628	0.903	-0.725	0.440	-44.5
Sage Sparrow	7	51	17	-66.7	27.0	7	254	0	-100.0	0.0	8	4.980	0.000	-4.980	4.479	-100.0
Song Sparrow	26	378	407	7.7	10.1	25	667	275	-58.8	5.3***	28	1.765	0.676	-1.089	0.417***	-61.7
Dark-eyed Junco	7	31	29	-6.5	11.0	4	25	5	-80.0	18.4**	8	0.807	0.172	-0.634	0.276*	-78.6
Black-headed Grosbeak	41	276	203	-26.4	7.8**	19	42	23	-45.2	16.0*	41	0.152	0.113	-0.039	0.060	-25.5
Blue Grosbeak	14	44	36	-18.2	14.3	6	13	1	-92.3	9.3***	15	0.296	0.028	-0.268	0.114**	-90.6
Lazuli Bunting	25	60	73	21.7	58.1	8	8	5	-37.5	46.3	26	0.133	0.068	-0.065	0.056	-48.6
Red-winged Blackbird	9	64	65	1.6	33.1	3	3	4	33.3	134.7	10	0.047	0.062	0.015	0.071	31.3

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
Brown-headed Cowbird	26	59	47	-20.3	17.6	10	9	2	-77.8	18.7**	27	0.153	0.043	-0.110	0.066*	-72.1
Bullock's Oriole	24	95	78	-17.9	16.8	9	32	44	37.5	120.4	24	0.337	0.564	0.227	0.400	67.5
House Finch	26	47	56	19.1	36.6	12	168	27	-83.9	16.3**	26	3.575	0.482	-3.092	2.714	-86.5
Lesser Goldfinch	23	117	133	13.7	25.7	13	100	25	-75.0	24.5**	23	0.855	0.188	-0.667	0.604	-78.0
American Goldfinch	12	45	56	24.4	41.6	5	9	9	0.0	60.9	12	0.200	0.161	-0.039	0.117	-19.6
All species pooled	**48**	**4955**	**5060**	**2.1**	**6.1**	**48**	**3466**	**1590**	**-54.1**	**9.4*** **	**48**	**0.699**	**0.314**	**-0.385**	**0.145*** **	**-55.1**
	Number increasing: 19/38 (50%)					Number decreasing: 30/38 (79%)***					Number decreasing: 34/38 (89%)***					
NORTH-CENTRAL MAPS REGION																
Downy Woodpecker	18	28	22	-21.4	31.9	16	39	36	-7.7	27.1	19	1.393	1.636	0.244	0.690	17.5
"Traill's" Flycatcher	11	70	68	-2.9	16.8	5	6	15	150.0	166.7	11	0.086	0.221	0.135	0.147	157.4
Red-eyed Vireo	15	40	48	20.0	22.4	3	3	2	-33.3	100.0	15	0.075	0.042	-0.033	0.077	-44.4
Black-capped Chickadee	18	49	64	30.6	24.3	16	62	62	0.0	23.0	18	1.265	0.969	-0.297	0.495	-23.4
Tufted Titmouse	8	23	19	-17.4	35.4	8	31	19	-38.7	31.9	9	1.348	1.000	-0.348	0.720	-25.8
House Wren	13	90	100	11.1	19.5	14	36	83	130.6	66.5**	15	0.400	0.830	0.430	0.173**	107.5
Wood Thrush	11	33	42	27.3	41.1	8	15	10	-33.3	25.1	13	0.455	0.238	-0.217	0.278	-47.6
American Robin	14	65	57	-12.3	17.8	13	41	29	-29.3	31.1	15	0.631	0.509	-0.122	0.393	-19.3
Gray Catbird	18	182	193	6.0	12.9	13	76	68	-10.5	14.9	18	0.418	0.352	-0.065	0.145	-15.6
Cedar Waxwing	7	48	26	-45.8	32.0	4	4	0	-100.0	0.0	7	0.083	0.000	-0.083	0.055	-100.0
Yellow Warbler	9	140	129	-7.9	25.2	8	76	126	65.8	17.7***	10	0.543	0.977	0.434	0.723	79.9
American Redstart	6	44	49	11.4	16.1	4	15	7	-53.3	31.6	6	0.341	0.143	-0.198	0.158	-58.1
Common Yellowthroat	17	142	157	10.6	9.2	10	69	49	-29.0	27.5	17	0.486	0.312	-0.174	0.148	-35.8
Field Sparrow	6	59	59	0.0	21.5	6	24	28	16.7	52.9	6	0.407	0.475	0.068	0.238	16.7
Song Sparrow	13	113	98	-13.3	20.2	12	78	35	-55.1	14.0**	13	0.690	0.357	-0.333	0.197	-48.3
Swamp Sparrow	5	51	35	-31.4	5.3***	3	30	19	-36.7	10.0*	7	0.588	0.543	-0.045	0.073	-7.7
Northern Cardinal	15	62	54	-12.9	9.9	12	13	17	30.8	33.0	15	0.210	0.315	0.105	0.106	50.1
Indigo Bunting	12	97	123	26.8	17.0	5	4	8	100.0	163.0	12	0.041	0.065	0.024	0.037	57.7
American Goldfinch	13	147	188	27.9	5.3*	0	0	0	-	-	13	0.000	0.000	0.000	0.000	-
All species pooled	**20**	**1995**	**2018**	**1.2**	**5.4**	**20**	**778**	**764**	**-1.8**	**14.5**	**20**	**0.390**	**0.379**	**-0.011**	**0.091**	**-2.9**
	Number increasing: 9/19 (47%)					Number decreasing: 11/19 (58%)					Number decreasing: 11/19 (58%)					
SOUTH-CENTRAL MAPS REGION																
Common Ground-Dove	5	64	52	-18.8	27.3	1	8	9	12.5		5	0.125	0.173	0.048	0.091	38.5
Yellow-billed Cuckoo	27	57	42	-26.3	15.9	2	1	1	0.0	200.0	27	0.018	0.024	0.006	0.029	35.7

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
Downy Woodpecker	18	42	26	-38.1	13.7**	15	32	27	-15.6	26.7	21	0.762	1.039	0.277	0.442	36.3
Acadian Flycatcher	10	56	41	-26.8	21.9	6	5	5	0.0	53.7	12	0.089	0.122	0.033	0.058	36.6
Brown-crested Flycatcher	4	59	35	-40.7	1.4*	2	6	0	-100.0	0.0	4	0.102	0.000	-0.102	0.005***	-100.0
White-eyed Vireo	27	216	199	-7.9	7.3	25	162	172	6.2	10.6	28	0.750	0.864	0.114	0.268	15.2
Bell's Vireo	9	51	35	-31.4	19.6	4	17	9	-47.1	14.7**	9	0.333	0.257	-0.076	0.226	-22.9
Carolina Chickadee	28	56	48	-14.3	20.2	24	70	33	-52.9	15.0	29	1.250	0.688	-0.563	0.407	-45.0
Tufted Titmouse	22	32	52	62.5	46.6	17	41	41	0.0	46.5	22	1.281	0.789	-0.493	0.427	-38.5
Black-crested Titmouse	17	36	39	8.3	24.6	19	59	26	-55.9	11.7**	19	1.639	0.667	-0.972	0.369**	-59.3
Carolina Wren	34	171	117	-31.6	8.6***	34	78	104	33.3	25.7	37	0.456	0.889	0.433	0.162***	94.9
Bewick's Wren	19	85	56	-34.1	14.8*	18	86	61	-29.1	17.6*	20	1.012	1.089	0.078	0.417	7.7
Blue-gray Gnatcatcher	16	22	31	40.9	41.6	12	19	26	36.8	68.4	17	0.864	0.839	-0.025	0.478	-2.9
Gray Catbird	10	76	101	32.9	32.0	6	45	40	-11.1	26.6	10	0.592	0.396	-0.196	0.077**	-33.1
Kentucky Warbler	15	68	63	-7.4	16.0	10	14	13	-7.1	39.4	16	0.206	0.206	0.001	0.096	0.2
Common Yellowthroat	16	52	43	-17.3	25.2	6	7	8	14.3	55.8	16	0.135	0.186	0.051	0.109	38.2
Yellow-breasted Chat	12	114	88	-22.8	11.7	7	11	12	9.1	54.4	13	0.097	0.136	0.040	0.051	41.3
Olive Sparrow	4	41	68	65.9	32.8	3	6	6	0.0	104.1	4	0.146	0.088	-0.058	0.099	-39.7
Field Sparrow	18	123	88	-28.5	10.0*	12	31	17	-45.2	17.2*	18	0.252	0.193	-0.059	0.084	-23.4
Grasshopper Sparrow	2	38	33	-13.2	5.1	2	5	29	480.0	408.0	2	0.132	0.879	0.747	0.115	567.9
Northern Cardinal	44	416	284	-31.7	4.7***	39	138	149	8.0	25.9	44	0.332	0.525	0.193	0.119	58.2
Indigo Bunting	22	184	161	-12.5	15.0	10	14	14	0.0	51.1	22	0.076	0.087	0.011	0.033	14.3
Painted Bunting	26	196	167	-14.8	15.1	18	46	150	226.1	277.7	26	0.235	0.898	0.664	0.561	282.7
Brown-headed Cowbird	28	48	38	-20.8	12.4	2	6	1	-83.3	5.6	28	0.125	0.026	-0.099	0.098	-78.9
American Goldfinch	9	71	51	-28.2	13.2	0	0	0	-	-	9	0.000	0.000	0.000	0.000	-
All species pooled	**46**	**3158**	**2586**	**-18.1**	**4.2*** **	**46**	**1172**	**1189**	**1.5**	**15.8**	**46**	**0.371**	**0.460**	**0.089**	**0.079**	**23.9**
	Number decreasing: 20/25 (80%)***					Number increasing: 9/25 (36%)					Number increasing: 14/25 (56%)					
NORTHEAST MAPS REGION																
Downy Woodpecker	36	44	68	54.5	37.0*	39	51	72	41.2	30.6*	45	1.159	1.059	-0.100	0.365	-8.7
"Traill's" Flycatcher	19	62	68	9.7	30.8	8	13	15	15.4	40.4	20	0.210	0.221	0.011	0.141	5.2
White-eyed Vireo	9	42	58	38.1	16.4**	7	13	12	-7.7	14.1	10	0.310	0.207	-0.103	0.101	-33.2
Red-eyed Vireo	45	190	160	-15.8	12.4	13	8	20	150.0	106.1	45	0.042	0.125	0.083	0.040**	196.9
Carolina Chickadee	14	17	36	111.8	108.1	13	18	17	-5.6	48.5	16	1.059	0.472	-0.587	0.535	-55.4
Black-capped Chickadee	39	111	118	6.3	13.5	31	148	111	-25.0	17.3	42	1.333	0.941	-0.393	0.485	-29.4
Tufted Titmouse	27	50	61	22.0	24.3	21	47	48	2.1	23.5	30	0.940	0.787	-0.153	0.282	-16.3

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
Carolina Wren	16	60	71	18.3	35.2	16	33	24	-27.3	21.8	21	0.550	0.338	-0.212	0.193	-38.5
House Wren	12	38	32	-15.8	27.6	10	15	15	0.0	31.4	14	0.395	0.469	0.074	0.333	18.8
Veery	35	262	248	-5.3	6.6	23	48	48	0.0	27.9	35	0.183	0.194	0.010	0.055	5.6
Hermit Thrush	20	76	77	1.3	16.6	12	44	19	-56.8	18.9*	21	0.579	0.247	-0.332	0.169**	-57.4
Wood Thrush	38	211	187	-11.4	10.0	24	45	46	2.2	29.3	41	0.213	0.246	0.033	0.091	15.3
American Robin	39	137	163	19.0	17.7	24	84	72	-14.3	15.4	43	0.613	0.442	-0.171	0.320	-28.0
Gray Catbird	45	600	569	-5.2	5.8	35	245	213	-13.1	15.5	46	0.408	0.374	-0.034	0.098	-8.3
Cedar Waxwing	19	70	56	-20.0	23.1	1	1	0	-100.0		19	0.014	0.000	-0.014	0.014	-100.0
Yellow Warbler	21	127	85	-33.1	10.3*	14	44	34	-22.7	38.3	23	0.347	0.400	0.054	0.176	15.5
Chestnut-sided Warbler	13	56	49	-12.5	23.4	11	29	19	-34.5	24.8	17	0.518	0.388	-0.130	0.182	-25.1
Magnolia Warbler	15	49	48	-2.0	27.0	9	29	19	-34.5	21.0	16	0.592	0.396	-0.196	0.218	-33.1
Yellow-rumped Warbler	10	48	39	-18.8	19.5	5	21	4	-81.0	5.5***	10	0.438	0.103	-0.335	0.157*	-76.6
Blk.-throated Grn. Warb.	17	52	60	15.4	20.0	11	14	15	7.1	73.4	20	0.269	0.250	-0.019	0.153	-7.1
Black-and-white Warbler	40	67	73	9.0	19.7	20	47	33	-29.8	11.6*	41	0.701	0.452	-0.249	0.228	-35.6
American Redstart	27	256	233	-9.0	12.7	25	186	123	-33.9	12.6	30	0.727	0.528	-0.199	0.210	-27.3
Worm-eating Warbler	19	41	54	31.7	37.5	10	35	13	-62.9	6.8***	20	0.854	0.241	-0.613	0.307*	-71.8
Ovenbird	45	215	257	19.5	10.3*	33	101	91	-9.9	22.7	45	0.470	0.354	-0.116	0.118	-24.6
Common Yellowthroat	33	266	288	8.3	11.9	28	77	95	23.4	29.2	33	0.290	0.330	0.040	0.090	14.0
Hooded Warbler	16	61	98	60.7	12.5***	10	18	10	-44.4	20.5	18	0.295	0.102	-0.193	0.127	-65.4
Eastern Towhee	23	59	69	16.9	20.4	20	30	23	-23.3	24.0	24	0.509	0.333	-0.175	0.154	-34.4
Song Sparrow	22	137	142	3.7	10.2	26	101	107	5.9	26.7	29	0.737	0.754	0.016	0.219	2.2
White-throated Sparrow	10	33	45	36.4	27.0	8	16	21	31.3	57.8	10	0.485	0.467	-0.018	0.217	-3.8
Dark-eyed Junco	13	41	47	14.6	23.4	13	108	63	-41.7	18.3	16	2.634	1.340	-1.294	1.135	-49.1
Northern Cardinal	30	102	142	39.2	19.1**	22	34	45	32.4	33.8	30	0.333	0.317	-0.016	0.097	-4.9
Rose-breasted Grosbeak	17	38	41	7.9	22.9	10	10	10	0.0	81.6	19	0.263	0.244	-0.019	0.230	-7.3
Indigo Bunting	23	67	75	11.9	18.1	7	10	13	30.0	63.4	23	0.149	0.173	0.024	0.117	16.1
Red-winged Blackbird	13	51	45	-11.8	15.2	2	3	6	100.0	66.7	13	0.059	0.133	0.074	0.062	126.7
American Goldfinch	30	141	174	23.4	19.9	0	0	0	-	-	30	0.000	0.000	0.000	0.000	-
All species pooled	**55**	**4603**	**4699**	**2.1**	**3.5**	**55**	**2025**	**1768**	**-12.7**	**6.3***	**55**	**0.440**	**0.376**	**-0.064**	**0.047**	**-14.5**
	Number increasing: 23/35 (66%)**					Number decreasing: 19/35 (54%)					Number decreasing: 24/35 (69%)**					
SOUTHEAST MAPS REGION																
Downy Woodpecker	34	44	35	-20.5	18.0	32	34	42	23.5	35.1	46	0.773	1.200	0.427	0.349	55.3
Acadian Flycatcher	51	218	229	5.0	9.4	24	20	20	0.0	37.5	53	0.092	0.087	-0.004	0.033	-4.8

TABLE 1. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1998	1999	%change[2]	SE[3]	n[4]	1998	1999	%change[5]	SE[6]	n[7]	1998	1999	change[8]	SE[9]	% change[10]
White-eyed Vireo	39	140	131	-6.4	9.2	24	26	46	76.9	56.7*	39	0.186	0.351	0.165	0.075**	89.1
Red-eyed Vireo	54	277	261	-5.8	12.1	14	10	13	30.0	69.6	55	0.036	0.050	0.014	0.024	38.0
Blue Jay	35	53	48	-9.4	23.6	11	12	4	-66.7	18.4**	38	0.226	0.083	-0.143	0.096	-63.2
Carolina Chickadee	43	69	69	0.0	15.2	34	89	71	-20.2	16.3	52	1.290	1.029	-0.261	0.396	-20.2
Tufted Titmouse	59	141	103	-27.0	10.4**	45	141	86	-39.0	11.6**	60	1.000	0.835	-0.165	0.212	-16.5
Carolina Wren	59	220	218	-0.9	10.1	52	182	162	-11.0	14.2	61	0.827	0.743	-0.084	0.177	-10.2
Wood Thrush	60	351	360	2.6	9.0	37	70	91	30.0	27.4	60	0.199	0.253	0.053	0.065	26.8
American Robin	17	39	48	23.1	74.3	17	48	35	-27.1	34.5	20	1.231	0.729	-0.502	0.590	-40.8
Gray Catbird	31	95	107	12.6	26.1	17	46	64	39.1	22.1*	33	0.484	0.598	0.114	0.323	23.5
Blue-winged Warbler	10	44	30	-31.8	13.5*	6	5	23	360.0	170.7*	10	0.114	0.767	0.653	0.157***	574.7
Prairie Warbler	17	55	38	-30.9	21.3	10	23	18	-21.7	32.6	18	0.418	0.474	0.056	0.227	13.3
Prothonotary Warbler	13	41	59	43.9	27.4*	7	15	21	40.0	40.2	14	0.366	0.356	-0.010	0.188	-2.7
Worm-eating Warbler	25	49	50	2.0	15.2	15	10	19	90.0	86.5	27	0.204	0.380	0.176	0.136	86.2
Ovenbird	49	217	253	16.6	11.6	36	115	108	-6.1	19.3	51	0.530	0.427	-0.103	0.122	-19.5
Louisiana Waterthrush	25	58	50	-13.8	16.5	21	27	34	25.9	48.9	29	0.466	0.680	0.215	0.229	46.1
Kentucky Warbler	30	169	163	-3.6	11.6	27	42	96	128.6	42.5***	35	0.249	0.589	0.340	0.115***	137.0
Common Yellowthroat	42	157	202	28.7	17.6*	26	48	75	56.3	31.8*	45	0.306	0.371	0.066	0.116	21.4
Hooded Warbler	28	69	77	11.6	18.3	15	6	15	150.0	151.4	32	0.087	0.195	0.108	0.081	124.0
Yellow-breasted Chat	18	59	53	-10.2	18.0	6	10	4	-60.0	23.8*	19	0.170	0.075	-0.094	0.067	-55.5
Northern Cardinal	61	275	268	-2.5	8.5	48	98	88	-10.2	13.3	62	0.356	0.328	-0.028	0.113	-7.9
Indigo Bunting	41	165	162	-1.8	11.6	16	17	23	35.3	70.6	41	0.103	0.142	0.039	0.058	37.8
Common Grackle	19	56	43	-23.2	26.8	8	8	8	0.0	46.3	20	0.143	0.186	0.043	0.097	30.2
American Goldfinch	16	54	92	70.4	26.5*	1	2	0	-100.0		17	0.037	0.000	-0.037	0.043	-100.0
All species pooled	**66**	**3575**	**3578**	**0.1**	**3.6**	**66**	**1245**	**1299**	**4.3**	**9.1**	**66**	**0.348**	**0.363**	**0.015**	**0.046**	**4.3**
	Number increasing: 10/25 (40%)					Number increasing: 13/25 (52%)					Number increasing: 14/25 (56%)					
ALASKA AND BOREAL CANADA MAPS REGIONS																
Alder Flycatcher	14	74	68	-8.1	17.7	7	10	7	-30.0	38.5	15	0.135	0.103	-0.032	0.053	-23.8
Black-capped Chickadee	12	36	34	-5.6	42.5	12	87	36	-58.6	25.4	15	2.417	1.059	-1.358	0.691*	-56.2
Ruby-crowned Kinglet	9	29	15	-48.3	10.4**	8	28	29	3.6	22.6	10	0.966	1.933	0.968	0.567	100.2
Swainson's Thrush	15	93	102	9.7	15.8	14	41	39	-4.9	23.9	16	0.441	0.382	-0.059	0.136	-13.3
Hermit Thrush	13	137	104	-24.1	12.8*	11	111	32	-71.2	5.4***	13	0.810	0.308	-0.503	0.248*	-62.0
American Robin	14	39	61	56.4	61.7	11	22	9	-59.1	12.1**	18	0.564	0.148	-0.417	0.162**	-73.8
Orange-crowned Warbler	16	210	212	1.0	12.0	14	340	52	-84.7	4.0***	16	1.619	0.245	-1.374	0.365***	-84.9

TABLE 1. Continued.

Species	ADULTS n[1]	1998	1999	%change[2]	SE[3]	YOUNG n[4]	1998	1999	%change[5]	SE[6]	REPRODUCTIVE INDEX n[7]	1998	1999	change[8]	SE[9]	% change[10]
Yellow Warbler	9	149	175	17.5	19.7	9	78	67	-14.1	27.8	11	0.523	0.383	-0.141	0.227	-26.9
Yellow-rumped Warbler	15	105	78	-25.7	9.4**	13	69	48	-30.4	28.0	15	0.657	0.615	-0.042	0.331	-6.4
Wilson's Warbler	16	396	509	28.5	20.7	15	645	143	-77.8	8.2***	16	1.629	0.281	-1.348	0.423***	-82.8
American Tree Sparrow	8	25	21	-16.0	16.9	7	54	47	-13.0	26.7	9	2.160	2.238	0.078	0.937	3.6
Savannah Sparrow	7	12	19	58.3	98.2	7	30	33	10.0	33.1	10	2.500	1.737	-0.763	1.882	-30.5
Fox Sparrow	11	58	59	1.7	12.7	15	60	37	-38.3	21.1	15	1.035	0.627	-0.407	0.492	-39.4
Lincoln's Sparrow	5	27	38	40.7	49.2	7	59	19	-67.8	4.8**	8	2.185	0.500	-1.685	1.018	-77.1
White-crowned Sparrow	11	100	58	-42.0	13.0**	9	85	63	-25.9	26.0	11	0.850	1.086	0.236	0.399	27.8
Golden-crowned Sparrow	8	41	51	24.4	22.1	3	22	2	-90.9	8.7***	8	0.537	0.039	-0.497	0.277	-92.7
Dark-eyed Junco	11	101	83	-17.8	17.7	12	123	60	-51.2	15.3*	13	1.218	0.723	-0.495	0.341	-40.6
Common Redpoll	15	150	156	4.0	25.0	13	42	61	45.2	56.2	15	0.280	0.391	0.111	0.148	39.7
All species pooled	**22**	**2170**	**2185**	**0.7**	**9.4**	**22**	**2099**	**898**	**-57.2**	**10.1*** **	**22**	**0.967**	**0.411**	**-0.556**	**0.166*** **	**-57.5**
	Number increasing: 10/18 (56%)					Number decreasing: 15/18 (83%)***					Number decreasing: 14/18 (78%)**					
ALL REGIONS POOLED																
All species pooled	**384**	**34093**	**32818**	**-3.7**	**1.6****	**384**	**16925**	**12621**	**-25.4**	**4.5*** **	**384**	**0.496**	**0.385**	**-0.111**	**0.033*** **	**-22.5**
	Number decreasing: 84/131 (64%)***					Number decreasing: 84/131 (64%)***					Number decreasing: 79/131 (60%)***					

[1] Number of stations at which at least one individual adult bird of the species was captured in either year.
[2] Percent change between the two years in the number of adult individuals captured.
[3] Standard error and statistical significance of the percent change in the number of adult individuals captured.
[4] Number of stations at which at least one individual young bird of the species was captured in either year.
[5] Percent change between the two years in the number of adult individuals captured.
[6] Standard error and statistical significance of the percent change in the number of adult individuals captured.
[7] Number of stations at which at least one individual young bird of the species was captured in either year.
[8] Change between the two years in the reproductive index (number of young/number of adults).
[9] Standard error and statistical significance of the change in the reproductive index.
[10] Percent change between the two years in the reproductive index.
†Reproductive indices for this species should be interpreted with caution because it likely includes data from stations where the species occurs only as an altitudinal disperser (a situation in which large numbers of adults and, especially, young, disperse up-mountain after the breeding season) and, therefore, may be biased high.
* $0.05 \leq P < 0.10$; ** $0.01 \leq P < 0.05$; *** $P < 0.01$

>50%. Similar declines in the number of young captured (-12.7%, nearly significant) and in reproductive index (-14.5%, not significant) were also found for the Northeast Region, where the proportion of decreasing species (66%) was significantly >50% for reproductive index but not for number of young. Very large, highly significant declines in number of young captured (-54.1% and -57.2%) and reproductive index (-55.1% and -57.5%) were documented for both the Southwest and Alaska/Boreal Canada regions, respectively. Moreover, the proportions of decreasing species were significantly >50% for both parameters in both regions. Decreases in number of young and reproductive index were also found in the North-central Region, but the decreases were small (-1.8% and -2.9%, respectively) and non-significant. The proportion of decreasing species for each of these parameters (58%) likewise was not significantly >50%. Summing over all five of these regions, 43 species had significant or nearly significant decreases, while only five species showed significant or nearly significant increases in number of young captured. Similarly, 19 species had significant or nearly significant decreases, while only four species showed significant or nearly significant increases in reproductive index.

In sharp contrast to all of the western and northern regions, both numbers of young and reproductive index increased slightly between 1998 and 1999 for both the South-central and Southeast regions, although none was significant (number of young in Southeast nearly significant, +12.7%) and none of the proportions of increasing species was significant. Even in these two regions, however, the seven species with significant or nearly significant decreases in number of young outnumbered the five species with such increases. Furthermore, the three species with significant or nearly significant decreases in reproductive index nearly equaled the four species with such increases in these two regions.

On a continent-wide basis, both the number of young captured and the reproductive index (young/adult) for all species pooled showed highly significant decreases of -25.4% and -22.5%, respectively, between 1998 and 1999, while the percentages of decreasing species for these two parameters were 64% and 60%, respectively, both significantly >50%.

Changes between 1999 and 2000 — Constant-effort data on the number of adult and young birds captured and the proportion of young in the catch were obtained for 1999 and 2000 from 407 MAPS stations operated comparably in both years (Table 2). Included were 62 species in the Northwest, 42 in the Southwest, 20 in the North-central, 24 in the South-central, 39 in the Northeast, 28 in the Southeast, and 16 in the Alaska/Boreal Canada regions, comprising a total of 114 species overall (plus 21 additional species that met productivity criteria when data were pooled from all seven regions).

Adult populations. — Numbers of adults for all species pooled decreased between 1999 and 2000 in six of the seven regions (all except the South-central Region) by amounts that ranged from highly significant decreases of -19.4% in the Southwest, -18.0% in Alaska/Boreal Canada, and -11.2% in the Northeast regions to non-significant decreases of -4.2% in the North-central, -3.8% in the Southeast, and -0.0% in the Northwest regions. The proportion of decreasing species was significantly >50% for the Southwest (83%) and Northeast (69%) regions, but not for the other four regions that showed decreases in adults for all species pooled. Summing over the three regions that showed significant decreases in adults of all species pooled, 28 species had significant or nearly significant decreases in adults, while only five species showed significant or nearly significant increases. Summing over the three regions that showed non-significant decreases in adults of all species pooled, 11 species had significant or nearly significant decreases in adults, while eight species showed significant or nearly significant increases.

In contrast to all of the other six regions, the South-central Region showed a significant 15.2% increase between 1999 and 2000 in numbers of adults for all species pooled and a proportion of increasing species (67%) that was nearly significantly >50%. Three species in the South-central Region had significant or nearly significant increases in adults between 1999 and 2000, while no species showed a significant or even nearly significant decrease in numbers of adults.

On a continent-wide basis, numbers of adults of all species pooled decreased between 1999

TABLE 2. Regional changes between 1999 and 2000 in the numbers of adult and young individuals captured and in the reproductive index (number of young/number of adults) for 135 species and all species pooled (excluding gallinaceous birds and hummingbirds) at the 407 stations run comparably in 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[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
NORTHWEST MAPS REGION																
Red-breasted Sapsucker	49	83	116	39.8	21.5**	32	51	52	2.0	27.0	51	0.614	0.448	-0.166	0.154	-27.0
Downy Woodpecker	50	46	64	39.1	27.0	30	30	31	3.3	31.6	55	0.652	0.484	-0.168	0.202	-25.7
Western Wood-Pewee	55	167	150	-10.2	11.4	18	10	27	170.0	130.7	58	0.060	0.180	0.120	0.057**	200.6
Willow Flycatcher	65	202	210	4.0	14.7	17	13	29	123.1	156.4	67	0.064	0.138	0.074	0.053	114.6
Hammond's Flycatcher	64	160	158	-1.3	11.8	36	29	70	141.4	56.1***	70	0.181	0.443	0.262	0.129**	144.4
Dusky Flycatcher	59	205	195	-4.9	12.4	28	30	51	70.0	61.9*	65	0.146	0.262	0.115	0.068*	78.7
"Western" Flycatcher	80	275	188	-31.6	21.7	41	57	59	3.5	24.7	86	0.207	0.314	0.107	0.110	51.4
Cassin's Vireo	32	45	71	57.8	30.3**	18	20	25	25.0	35.2	42	0.444	0.352	-0.092	0.216	-20.8
Warbling Vireo	96	485	466	-3.9	8.1	25	40	59	47.5	38.5**	96	0.083	0.127	0.044	0.046	53.5
Steller's Jay	35	28	32	14.3	27.6	16	18	19	5.6	55.5	39	0.643	0.594	-0.049	0.326	-7.6
Tree Swallow	14	39	48	23.1	19.3*	3	3	4	33.3	100.0	15	0.077	0.083	0.006	0.047	8.3
Black-capped Chickadee	44	131	138	5.3	15.1	44	160	178	11.3	21.8	51	1.221	1.290	0.068	0.410	5.6
Mountain Chickadee	40	118	139	17.8	18.8	37	70	174	148.6	56.6***	45	0.593	1.252	0.659	0.261**	111.0
Chestnut-backed Chick.	48	81	90	11.1	27.0	38	72	130	80.6	45.9**	54	0.889	1.444	0.556	0.370	62.5
Bushtit	16	21	22	4.8	42.4	19	54	51	-5.6	49.1	21	2.571	2.318	-0.253	1.384	-9.8
Red-breasted Nuthatch	49	43	76	76.7	36.8***	34	33	110	233.3	126.8***	60	0.767	1.447	0.680	0.477	88.6
Brown Creeper	49	52	66	26.9	23.1	47	28	111	296.4	113.1***	61	0.539	1.682	1.143	0.362***	212.3
Bewick's Wren	14	27	34	25.9	28.4	15	41	53	29.3	34.0	18	1.519	1.559	0.040	0.464	2.7
House Wren	29	57	59	3.5	22.1	40	56	60	7.1	22.1	46	0.982	1.017	0.035	0.405	-3.5
Winter Wren	33	113	101	-10.6	11.9	40	104	100	-3.8	17.3	47	0.920	0.990	0.070	0.328	7.6
Golden-crowned Kinglet	37	60	94	56.7	30.2**	42	114	398	249.1	73.3*	53	1.900	4.234	2.334	1.790	122.8
Ruby-crowned Kinglet	19	64	59	-7.8	28.5	13	23	43	87.0	82.3	23	0.359	0.729	0.369	0.274	102.8
Swainson's Thrush	88	1154	1169	1.3	4.9	59	168	279	66.1	28.4**	89	0.146	0.239	0.093	0.053*	63.9
Hermit Thrush	41	131	78	-40.5	12.5**	27	37	53	43.2	54.0	50	0.282	0.680	0.397	0.209*	140.6
American Robin	113	599	560	-6.5	6.0	73	118	198	67.8	31.9**	116	0.197	0.354	0.157	0.070**	79.5
Varied Thrush	25	39	51	30.8	23.5	13	11	35	218.2	118.9*	29	0.282	0.686	0.404	0.281	143.3
Wrentit	21	51	86	68.6	27.0***	22	84	93	10.7	20.1	25	1.647	1.081	-0.566	0.416	-34.3

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Gray Catbird	14	114	127	11.4	10.7	8	17	40	135.3	80.3	14	0.149	0.315	0.166	0.101	111.2
Cedar Waxwing	40	170	245	44.1	18.4**	11	10	21	110.0	181.6	41	0.059	0.086	0.027	0.059	45.7
Orange-crowned Warbler†	79	287	314	9.4	13.4	68	538	660	22.7	34.7	86	1.875	2.102	0.227	0.678	12.1
Nashville Warbler†	45	106	92	-13.2	11.3	41	195	152	-22.1	21.0	53	1.840	1.652	-0.188	0.612	-10.2
Virginia's Warbler	4	14	29	107.1	47.6	4	16	24	50.0	93.1	5	1.143	0.828	-0.315	0.502	-27.6
Yellow Warbler	69	791	800	1.1	6.7	50	296	481	62.5	34.3	73	0.374	0.601	0.227	0.162	60.7
Yellow-rumped Warbler	79	373	394	5.6	8.5	50	157	288	83.4	56.1*	82	0.421	0.731	0.310	0.173*	73.7
Townsend's Warbler	31	94	76	-19.1	9.7*	22	68	110	61.8	96.3	34	0.723	1.447	0.724	0.527	100.1
Hermit Warbler	35	104	142	36.5	18.2**	22	90	91	1.1	50.6	38	0.865	0.641	-0.225	0.447	-25.9
American Redstart	12	48	26	-45.8	9.2***	7	16	17	6.3	30.2	13	0.333	0.654	0.321	0.247	96.2
MacGillivray's Warbler	103	846	781	-7.7	4.6	79	253	358	41.5	21.6**	106	0.299	0.458	0.159	0.076**	53.3
Common Yellowthroat	41	228	184	-19.3	7.0**	23	38	91	139.5	50.1**	43	0.167	0.495	0.328	0.181*	196.7
Wilson's Warbler	99	711	543	-23.6	6.0***	49	118	193	63.6	25.8***	102	0.166	0.355	0.190	0.069***	114.2
Yellow-breasted Chat	19	106	90	-15.1	15.0	11	26	37	42.3	29.8	20	0.245	0.411	0.166	0.126	67.6
Western Tanager	74	181	213	17.7	14.9	39	43	94	118.6	61.3**	77	0.238	0.441	0.204	0.149	85.8
Green-tailed Towhee	14	43	36	-16.3	15.6	9	11	16	45.5	59.6	18	0.256	0.444	0.189	0.173	73.7
Spotted Towhee	43	125	138	10.4	10.5	39	68	142	108.8	38.6***	50	0.544	1.029	0.485	0.214**	89.2
Chipping Sparrow	44	75	85	13.3	25.5	26	11	38	245.5	169.0**	48	0.147	0.447	0.300	0.120**	204.8
Savannah Sparrow	5	87	48	-44.8	4.3*	5	4	6	50.0	106.4	8	0.046	0.125	0.079	0.115	171.9
Fox Sparrow	31	88	84	-4.5	14.0	15	12	20	66.7	56.5	34	0.136	0.238	0.102	0.095	74.6
Song Sparrow	100	975	969	-0.6	4.9	99	746	1244	66.8	15.1***	104	0.765	1.284	0.519	0.142***	67.8
Lincoln's Sparrow	47	262	257	-1.9	7.1	42	112	194	73.2	27.7***	53	0.428	0.755	0.327	0.172*	76.6
White-crowned Sparrow	21	96	81	-15.6	13.5	14	23	45	95.7	48.5*	24	0.240	0.556	0.316	0.122***	131.9
Dark-eyed Junco	82	730	669	-8.4	5.6	78	423	737	74.2	26.7***	90	0.580	1.102	0.522	0.175***	90.1
Black-headed Grosbeak	76	255	262	2.7	10.6	35	54	88	63.0	30.5**	79	0.212	0.336	0.124	0.104	58.6
Lazuli Bunting	46	136	163	19.9	26.7	27	23	40	73.9	48.1**	49	0.169	0.245	0.076	0.053	45.1
Red-winged Blackbird	16	159	208	30.8	30.9	8	18	29	61.1	82.8	17	0.113	0.139	0.026	0.056	23.2
Brown-headed Cowbird	47	122	135	10.7	14.0	18	17	16	-5.9	41.0	47	0.139	0.119	-0.021	0.063	-14.9
Bullock's Oriole	23	68	73	7.4	21.1	17	10	50	400.0	224.4*	28	0.147	0.685	0.538	0.364	365.8
Purple Finch	40	247	314	27.1	16.2	26	76	76	0.0	31.8	42	0.308	0.242	-0.066	0.108	-21.3
Cassin's Finch	29	84	49	-41.7	14.0*	10	10	7	-30.0	53.5	32	0.119	0.143	0.024	0.095	20.0

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
House Finch	9	49	38	-22.4	17.8	5	25	13	-48.0	24.1	10	0.510	0.342	-0.168	0.130	-32.9
Pine Siskin	62	202	190	-5.9	18.8	32	38	79	107.9	73.5*	66	0.188	0.416	0.228	0.157	121.0
Lesser Goldfinch	16	42	38	-9.5	17.7	9	15	67	346.7	417.2	16	0.357	1.763	1.406	1.342	393.7
American Goldfinch	23	156	217	39.1	26.5	8	3	10	233.3	253.7	23	0.019	0.046	0.027	0.021	139.6
All species pooled	**126**	**13100**	**13095**	**0.0**	**2.0**	**126**	**5194**	**8284**	**59.5**	**12.4*****	**126**	**0.397**	**0.633**	**0.236**	**0.053*****	**59.6**
	Number decreasing: 27/62 (44%)					Number increasing: 55/62 (89%)***					Number increasing: 50/62 (81%)***					
SOUTHWEST MAPS REGION																
Nuttall's Woodpecker	19	37	57	54.1	32.4*	14	26	38	46.2	25.6*	21	0.703	0.667	-0.036	0.430	-5.1
Downy Woodpecker	20	42	40	-4.8	21.2	15	16	22	37.5	60.4	22	0.381	0.550	0.169	0.197	44.4
Western Wood-Pewee	27	88	40	-54.5	11.4**	5	2	10	400.0	370.8	27	0.023	0.250	0.227	0.117*	1000.0
Dusky Flycatcher	13	64	41	-35.9	11.3**	2	2	0	-100.0	0.0	13	0.031	0.000	-0.031	0.022	-100.0
"Western" Flycatcher	38	159	106	-33.3	13.2*	20	32	35	9.4	31.6	39	0.201	0.330	0.129	0.139	64.1
Black Phoebe	13	20	18	-10.0	30.0	21	35	56	60.0	42.7**	24	1.750	3.111	1.361	1.557	77.8
Ash-throated Flycatcher	41	131	106	-19.1	13.2	12	13	14	7.7	86.8	41	0.099	0.132	0.033	0.082	33.1
Loggerhead Shrike	10	32	29	-9.4	25.2	7	24	20	-16.7	23.0	11	0.750	0.690	-0.060	0.439	-8.0
Bell's Vireo	6	35	36	2.9	15.0	6	6	17	183.3	60.7*	7	0.171	0.472	0.301	0.100**	175.5
Warbling Vireo	34	131	95	-27.5	20.1	9	3	14	366.7	361.7	35	0.023	0.147	0.125	0.080	543.5
Cliff Swallow	7	44	24	-45.5	23.9	2	8	2	-75.0	50.0	8	0.182	0.083	-0.099	0.137	-54.2
Chestnut-backed Chick.	7	12	17	41.7	34.7	8	46	100	117.4	68.7	8	3.833	5.882	2.049	1.996	53.5
Oak Titmouse	13	35	30	-14.3	19.5	12	35	44	25.7	37.4	14	1.000	1.467	0.467	0.530	46.7
Bushtit	42	290	207	-28.6	13.7	34	175	203	16.0	20.0	44	0.603	0.981	0.377	0.255	62.5
Bewick's Wren	47	253	236	-6.7	8.4	45	192	323	68.2	23.3***	50	0.759	1.369	0.610	0.293**	80.3
House Wren	25	185	161	-13.0	18.5	20	128	167	30.5	20.0	26	0.692	1.037	0.345	0.457	49.9
Swainson's Thrush	18	222	131	-41.0	9.7**	8	16	29	81.3	65.1	18	0.072	0.221	0.149	0.062**	207.2
American Robin	21	110	62	-43.6	11.0***	12	16	16	0.0	43.3	22	0.146	0.258	0.113	0.119	77.4
Wrentit	21	223	134	-39.9	8.8**	19	107	166	55.1	46.8*	21	0.480	1.239	0.759	0.250***	158.2
Orange-crowned Warbler	25	200	89	-55.5	6.3***	17	82	54	-34.1	23.3	26	0.410	0.607	0.197	0.223	48.0
Lucy's Warbler	7	91	57	-37.4	13.8**	7	55	39	-29.1	34.7	7	0.604	0.684	0.080	0.268	13.2
Yellow Warbler	38	403	330	-18.1	21.2	12	55	85	54.5	52.3	39	0.137	0.258	0.121	0.112	88.7
MacGillivray's Warbler	21	58	49	-15.5	17.8	6	3	5	66.7	126.5	23	0.052	0.102	0.050	0.058	97.3

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Common Yellowthroat	36	608	417	-31.4	5.1***	24	265	438	65.3	17.1***	38	0.436	1.050	0.614	0.182***	141.0
Wilson's Warbler	14	140	110	-21.4	15.2	7	95	72	-24.2	23.8	14	0.679	0.654	-0.024	0.319	-3.5
Yellow-breasted Chat	23	228	193	-15.4	10.5	10	19	33	73.7	47.8	23	0.083	0.171	0.088	0.059	105.2
Western Tanager	23	59	38	-35.6	20.5	7	4	10	150.0	180.1	23	0.068	0.263	0.195	0.153	288.2
Spotted Towhee	43	326	292	-10.4	8.6	32	77	173	124.7	45.8***	43	0.236	0.593	0.356	0.129***	150.8
California Towhee	20	125	75	-40.0	6.7**	14	10	50	400.0	321.5	20	0.080	0.667	0.587	0.146***	733.3
Brewer's Sparrow	7	18	29	61.1	60.2	7	5	25	400.0	278.3	9	0.278	0.862	0.584	0.215**	210.3
Lark Sparrow	15	51	43	-15.7	31.8	7	48	11	-77.1	14.5***	16	0.941	0.256	-0.685	0.246**	-72.8
Sage Sparrow	7	26	45	73.1	55.7	4	0	13	++++[11]		9	0.000	0.289	0.289	0.099**	++++[11]
Song Sparrow	35	627	468	-25.4	6.0***	31	388	647	66.8	45.9*	36	0.619	1.383	0.764	0.270***	123.4
Black-headed Grosbeak	40	235	224	-4.7	16.4	18	24	23	-4.2	42.7	41	0.102	0.103	0.001	0.050	0.5
Blue Grosbeak	22	56	38	-32.1	11.3***	5	3	2	-33.3	68.0	23	0.054	0.053	0.001	0.044	-1.8
Lazuli Bunting	34	98	67	-31.6	16.8	8	3	15	400.0	478.1	35	0.031	0.224	0.193	0.104*	631.3
Red-winged Blackbird	13	110	65	-40.9	10.8**	6	5	15	200.0	259.2	13	0.046	0.231	0.185	0.107	407.7
Brown-headed Cowbird	28	76	75	-1.3	14.7	7	5	4	-20.0	56.7	28	0.066	0.053	-0.013	0.042	-18.9
Bullock's Oriole	36	111	152	36.9	12.6**	13	56	23	-58.9	26.0**	39	0.505	0.151	-0.353	0.241	-70.0
House Finch	31	98	145	48.0	37.4	22	78	218	179.5	66.7**	33	0.796	1.503	0.708	0.487	88.9
Lesser Goldfinch	24	142	114	-19.7	25.1	16	19	31	63.2	57.3	26	0.134	0.272	0.138	0.076*	103.2
American Goldfinch	17	108	102	-5.6	30.4	6	29	20	-31.0	25.4	17	0.269	0.196	-0.072	0.186	-27.0
All species pooled	**58**	**6843**	**5518**	**-19.4**	**4.2*** **	**57**	**2425**	**3638**	**50.0**	**13.3*** **	**58**	**0.354**	**0.659**	**0.305**	**0.076*** **	**86.0**
	Number decreasing: 35/42 (83%)***					Number increasing: 29/42 (69%)***					Number increasing: 32/42 (76%)***					
NORTH-CENTRAL MAPS REGION																
Downy Woodpecker	22	30	35	16.7	29.0	22	62	60	-3.2	16.8	24	2.067	1.714	-0.352	0.608	-17.1
"Traill's" Flycatcher	17	71	60	-15.5	23.5	7	15	12	-20.0	25.3	17	0.211	0.200	-0.011	0.192	-5.3
Black-capped Chickadee	21	72	80	11.1	20.1	22	127	123	-3.2	27.7	22	1.764	1.538	-0.226	0.606	-12.8
House Wren	16	126	101	-19.8	16.8	17	150	91	-39.3	15.7	19	1.191	0.901	-0.290	0.346	-24.3
Wood Thrush	12	53	44	-17.0	14.9	9	13	14	7.7	63.6	13	0.245	0.318	0.073	0.181	29.7
American Robin	21	77	78	1.3	21.4	18	42	47	11.9	29.0	21	0.546	0.603	0.057	0.279	10.5
Gray Catbird	23	277	301	8.7	11.1	17	136	155	14.0	11.2	23	0.491	0.515	0.024	0.155	4.9
Cedar Waxwing	15	23	49	113.0	79.6	1	0	1	++++[11]		15	0.000	0.020	0.020	0.020	++++[11]

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Yellow Warbler	10	170	174	2.4	14.2	9	148	46	-68.9	13.1***	11	0.871	0.264	-0.606	0.493	-69.6
American Redstart	7	46	39	-15.2	8.7	4	6	4	-33.3	54.4	7	0.130	0.103	-0.028	0.075	-21.4
Ovenbird	12	31	41	32.3	33.8	8	9	9	0.0	47.5	14	0.290	0.220	-0.071	0.092	-24.4
Common Yellowthroat	23	156	181	16.0	19.3	17	99	78	-21.2	10.7	24	0.635	0.431	-0.204	0.205	-32.1
Field Sparrow	11	96	75	-21.9	21.4	11	36	20	-44.4	15.1***	12	0.375	0.267	-0.108	0.179	-28.9
Song Sparrow	19	118	105	-11.0	15.2	17	69	101	46.4	30.7*	19	0.585	0.962	0.377	0.222	64.5
Northern Cardinal	20	62	75	21.0	16.4	14	22	24	9.1	28.2	21	0.355	0.320	-0.035	0.116	-9.8
Rose-breasted Grosbeak	15	35	34	-2.9	29.5	8	15	4	-73.3	20.5*	16	0.429	0.118	-0.311	0.249	-72.5
Indigo Bunting	20	154	119	-22.7	9.4*	7	9	6	-33.3	38.8	20	0.058	0.050	-0.008	0.034	-13.7
Red-winged Blackbird	8	75	61	-18.7	22.3	2	6	3	-50.0	83.3	8	0.080	0.049	-0.031	0.075	-38.5
Baltimore Oriole	15	44	41	-6.8	34.2	6	22	10	-54.5	6.3***	15	0.500	0.244	-0.256	0.320	-51.2
American Goldfinch	19	265	219	-17.4	10.0*	1	0	1	++++[11]		19	0.000	0.005	0.005	0.003	++++[11]
All species pooled	**26**	**2565**	**2457**	**-4.2**	**3.2**	**26**	**1198**	**1051**	**-12.3**	**10.3**	**26**	**0.467**	**0.428**	**-0.039**	**0.088**	**-8.4**
	Number decreasing: 11/20 (55%)					Number decreasing: 12/20 (60%)					Number decreasing: 14/20 (70%)*					
SOUTH-CENTRAL MAPS REGION																
Common Ground-Dove	5	49	64	30.6	25.4	2	10	14	40.0	72.0	5	0.204	0.219	0.015	0.091	7.2
Downy Woodpecker	15	31	29	-6.5	24.3	13	28	26	-7.1	34.6	15	0.903	0.897	-0.007	0.398	-0.7
Acadian Flycatcher	9	61	65	6.6	12.4	6	9	4	-55.6	18.2**	11	0.148	0.062	-0.086	0.043*	-58.3
White-eyed Vireo	28	202	274	35.6	13.7***	24	167	176	5.4	7.4	28	0.827	0.642	-0.184	0.268	-22.3
Bell's Vireo	7	45	48	6.7	37.1	2	11	8	-27.3	66.1	7	0.244	0.167	-0.078	0.154	-31.8
Red-eyed Vireo	19	21	40	90.5	56.1	4	3	11	266.7	365.1	19	0.143	0.275	0.132	0.203	92.5
Carolina Chickadee	31	53	60	13.2	26.0	25	37	45	21.6	43.0	33	0.698	0.750	0.052	0.313	7.4
Tufted Titmouse	23	55	39	-29.1	16.5	18	42	71	69.0	51.1	25	0.764	1.821	1.057	0.430**	138.4
Black-crested Titmouse	15	26	42	61.5	50.4	16	26	34	30.8	39.8	18	1.000	0.810	-0.191	0.377	-19.0
Carolina Wren	34	120	147	22.5	14.8*	35	114	121	6.1	15.2	38	0.950	0.823	-0.127	0.202	-13.4
Bewick's Wren	17	67	73	9.0	20.3	16	71	74	4.2	11.5	17	1.060	1.014	-0.046	0.372	-4.3
House Wren	5	23	41	78.3	16.9**	4	12	15	25.0	49.9	5	0.522	0.366	-0.156	0.165	-29.9
Blue-gray Gnatcatcher	19	32	30	-6.3	33.7	17	26	19	-26.9	20.9	21	0.813	0.633	-0.179	0.332	-22.1
Gray Catbird	7	112	110	-1.8	9.0	8	51	37	-27.5	12.3*	9	0.455	0.336	-0.119	0.061*	-26.1
Kentucky Warbler	16	63	85	34.9	25.6	9	13	21	61.5	70.6	17	0.206	0.247	0.041	0.108	19.7

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Common Yellowthroat	15	44	53	20.5	41.4	5	10	5	-50.0	13.7**	15	0.227	0.094	-0.133	0.122	-58.5
Yellow-breasted Chat	13	118	132	11.9	15.9	6	17	16	-5.9	29.4	14	0.144	0.121	-0.023	0.053	-15.9
Field Sparrow	18	88	86	-2.3	18.1	10	17	20	17.6	45.3	18	0.193	0.233	0.039	0.085	20.4
Grasshopper Sparrow	2	32	25	-21.9	68.4	2	29	8	-72.4	22.8	2	0.906	0.320	-0.586	0.043	-64.7
Northern Cardinal	41	280	303	8.2	8.5	37	157	121	-22.9	19.7	41	0.561	0.399	-0.161	0.133	-28.8
Indigo Bunting	24	176	141	-19.9	10.0	12	16	14	-12.5	46.3	24	0.091	0.099	0.008	0.052	9.2
Painted Bunting	26	165	320	93.9	59.2	18	155	34	-78.1	15.9***	27	0.939	0.106	-0.833	0.549	-88.7
Brown-headed Cowbird	28	44	54	22.7	26.2	4	2	4	100.0	230.9	28	0.046	0.074	0.029	0.059	63.0
American Goldfinch	10	50	40	-20.0	24.6	0	0	0	-	-	10	0.000	0.000	0.000	0.000	-
All species pooled	**45**	**2539**	**2938**	**15.7**	**7.2****	**45**	**1264**	**1072**	**-15.2**	**12.4**	**45**	**0.498**	**0.365**	**-0.133**	**0.076***	**-26.7**
	Number increasing: 16/24 (67%)*					Number decreasing: 11/24 (46%)					Number decreasing: 15/24 (63%)					
NORTHEAST MAPS REGION																
Downy Woodpecker	40	78	47	-39.7	10.5***	47	77	64	-16.9	17.8	54	0.987	1.362	0.375	0.371	37.9
"Traill's" Flycatcher	24	82	73	-11.0	15.2	7	16	7	-56.3	20.8**	24	0.195	0.096	-0.099	0.069	-50.9
Eastern Phoebe	18	16	24	50.0	50.0	17	23	37	60.9	72.1	22	1.438	1.542	0.104	0.646	7.2
White-eyed Vireo	10	60	55	-8.3	12.7	7	13	14	7.7	38.4	11	0.217	0.255	0.038	0.094	17.5
Red-eyed Vireo	45	164	189	15.2	12.6	16	18	34	88.9	99.7	45	0.110	0.180	0.070	0.078	63.9
Carolina Chickadee	14	36	22	-38.9	23.2	12	20	24	20.0	35.0	16	0.556	1.091	0.535	0.506	96.4
Black-capped Chickadee	47	174	148	-14.9	10.7	35	133	107	-19.5	18.5	49	0.764	0.723	-0.041	0.263	-5.4
Tufted Titmouse	35	78	51	-34.6	16.1*	30	65	40	-38.5	17.8*	37	0.833	0.784	-0.049	0.254	-5.9
Carolina Wren	21	81	70	-13.6	22.2	16	25	35	40.0	50.4	23	0.309	0.500	0.191	0.190	62.0
House Wren	12	32	39	21.9	57.3	9	22	11	-50.0	20.5	14	0.688	0.282	-0.405	0.293	-59.0
Veery	36	246	207	-15.9	7.6*	23	45	55	22.2	18.7	36	0.183	0.266	0.083	0.070	45.3
Hermit Thrush	24	104	81	-22.1	10.8*	17	25	45	80.0	58.3	25	0.240	0.556	0.315	0.154**	131.1
Wood Thrush	41	194	171	-11.9	12.8	27	48	48	0.0	30.2	43	0.247	0.281	0.033	0.098	13.5
American Robin	46	211	197	-6.6	14.0	27	95	79	-16.8	17.2	47	0.450	0.401	-0.049	0.197	-10.9
Gray Catbird	51	704	701	-0.4	5.2	38	295	290	-1.7	13.9	52	0.419	0.414	-0.005	0.098	-1.3
European Starling	6	12	5	-58.3	16.6**	4	52	16	-69.2	5.8**	7	4.333	3.200	-1.133	1.715	-26.2
Cedar Waxwing	24	74	142	91.9	41.6**	4	3	4	33.3	180.5	24	0.041	0.028	-0.012	0.039	-30.5
Yellow Warbler	20	172	196	14.0	11.7*	13	82	107	30.5	31.0	20	0.477	0.546	0.069	0.117	14.5

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Chestnut-sided Warbler	12	43	43	0.0	27.3	8	12	21	75.0	83.6	14	0.279	0.488	0.209	0.130	75.0
Magnolia Warbler	13	54	55	1.9	16.8	11	21	23	9.5	61.2	14	0.389	0.418	0.029	0.296	7.5
Yellow-rumped Warbler	12	41	49	19.5	23.4	4	4	7	75.0	75.7	12	0.098	0.143	0.045	0.063	46.4
Blk.-throated Grn. Warb.	20	69	68	-1.4	13.8	11	19	9	-52.6	16.8**	22	0.275	0.132	-0.143	0.101	-51.9
Black-and-white Warbler	37	73	74	1.4	19.8	23	35	39	11.4	28.5	38	0.480	0.527	0.048	0.137	9.9
American Redstart	32	230	217	-5.7	10.2	24	122	168	37.7	23.4	34	0.530	0.774	0.244	0.192	46.0
Worm-eating Warbler	14	55	55	0.0	22.0	11	12	32	166.7	102.5	18	0.218	0.582	0.364	0.187*	166.7
Ovenbird	50	288	227	-21.2	6.2***	36	98	127	29.6	24.5	52	0.340	0.560	0.219	0.110**	64.4
Common Yellowthroat	40	345	218	-36.8	5.8***	30	89	117	31.5	24.2	42	0.258	0.537	0.279	0.113**	108.0
Hooded Warbler	16	104	51	-51.0	6.2***	7	10	17	70.0	52.0	17	0.096	0.333	0.237	0.137	246.7
Yellow-breasted Chat	6	49	38	-22.4	12.8	2	4	3	-25.0	37.5	6	0.082	0.079	-0.003	0.089	-3.3
Eastern Towhee	31	78	78	0.0	13.8	22	26	42	61.5	48.1*	33	0.333	0.539	0.205	0.143	61.5
Song Sparrow	24	186	129	-30.6	6.6***	25	126	132	4.8	13.6	28	0.677	1.023	0.346	0.247	51.1
White-throated Sparrow	11	53	51	-3.8	13.1	6	21	19	-9.5	23.5	11	0.396	0.373	-0.024	0.155	-6.0
Dark-eyed Junco	12	45	35	-22.2	22.0	12	64	67	4.7	26.2	14	1.422	1.914	0.492	0.866	34.6
Northern Cardinal	37	158	113	-28.5	7.5***	25	52	51	-1.9	20.3	37	0.329	0.451	0.122	0.108	37.1
Rose-breasted Grosbeak	21	42	34	-19.0	28.2	13	10	20	100.0	97.6	25	0.238	0.588	0.350	0.269	147.1
Indigo Bunting	22	86	53	-38.4	9.8***	10	14	18	28.6	57.9	22	0.163	0.340	0.177	0.125	108.6
Red-winged Blackbird	15	54	47	-13.0	15.1	6	9	5	-44.4	50.9	15	0.167	0.106	-0.060	0.077	-36.2
Baltimore Oriole	11	27	45	66.7	29.6**	6	12	5	-58.3	26.4*	14	0.444	0.111	-0.333	0.275	-75.0
American Goldfinch	35	263	198	-24.7	8.9**	2	0	2	++++[11]		36	0.000	0.010	0.010	0.007	++++[11]
All species pooled	**65**	**5626**	**4998**	**-11.2**	**2.3*** **	**65**	**2067**	**2204**	**6.6**	**7.6**	**65**	**0.367**	**0.441**	**0.074**	**0.040***	**20.0**
	Number decreasing: 27/39 (69%)**					Number increasing: 24/39 (62%)*					Number increasing: 26/39 (67%)**					
SOUTHEAST MAPS REGION																
Downy Woodpecker	41	42	48	14.3	24.1	38	44	64	45.5	34.7	52	1.048	1.333	0.286	0.408	27.3
Acadian Flycatcher	52	260	233	-10.4	7.1	23	20	30	50.0	38.1	54	0.077	0.129	0.052	0.040	67.4
White-eyed Vireo	41	144	134	-6.9	11.3	28	53	54	1.9	22.4	44	0.368	0.403	0.035	0.102	9.5
Red-eyed Vireo	56	282	279	-1.1	12.4	23	13	36	176.9	133.7**	57	0.046	0.129	0.083	0.040**	179.9
Carolina Chickadee	51	90	90	0.0	16.8	40	85	108	27.1	23.5	56	0.944	1.200	0.256	0.278	27.1
Tufted Titmouse	59	123	142	15.4	15.1	51	113	158	39.8	24.8*	64	0.919	1.113	0.194	0.210	21.1

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Carolina Wren	63	244	185	-24.2	7.8***	55	193	190	-1.6	13.5	64	0.791	1.027	0.236	0.213	29.8
Blue-gray Gnatcatcher	20	24	33	37.5	52.5	14	9	17	88.9	81.9	29	0.375	0.515	0.140	0.271	37.4
Wood Thrush	55	373	324	-13.1	8.9	38	78	97	24.4	23.1	57	0.209	0.299	0.090	0.070	43.2
American Robin	13	45	37	-17.8	22.1	13	38	36	-5.3	24.5	18	0.844	0.973	0.129	0.281	15.2
Gray Catbird	35	145	152	4.8	17.8	16	79	67	-15.2	9.7	35	0.545	0.441	-0.104	0.247	-19.1
Brown Thrasher	29	27	36	33.3	38.3	16	13	20	53.8	58.7	34	0.482	0.556	0.074	0.243	15.4
Blue-winged Warbler	11	39	40	2.6	42.1	7	21	19	-9.5	45.5	12	0.539	0.475	-0.063	0.188	-11.8
Prairie Warbler	21	74	73	-1.4	28.1	17	30	31	3.3	39.7	24	0.405	0.425	0.019	0.157	4.7
Prothonotary Warbler	13	56	35	-37.5	21.1	9	21	25	19.0	18.1	17	0.375	0.714	0.339	0.380	90.5
Worm-eating Warbler	34	61	61	0.0	17.1	23	23	38	65.2	51.5	38	0.377	0.623	0.246	0.180	65.2
Ovenbird	52	271	271	0.0	9.4	37	106	114	7.5	30.4	56	0.391	0.421	0.030	0.098	7.5
Louisiana Waterthrush	29	59	66	11.9	16.3	22	29	38	31.0	39.9	34	0.492	0.576	0.084	0.196	17.1
Kentucky Warbler	35	172	179	4.1	11.4	26	94	63	-33.0	15.9	38	0.547	0.352	-0.195	0.113*	-35.6
Common Yellowthroat	47	216	165	-23.6	9.0**	33	82	87	6.1	24.8	49	0.380	0.527	0.148	0.135	38.9
Hooded Warbler	32	84	90	7.1	20.7	17	13	22	69.2	59.1	34	0.155	0.244	0.090	0.120	57.9
Yellow-breasted Chat	22	83	89	7.2	18.2	10	9	21	133.3	74.7	23	0.108	0.236	0.128	0.071*	117.6
Eastern Towhee	27	33	34	3.0	21.6	19	5	28	460.0	280.2	35	0.152	0.823	0.672	0.255***	443.5
Field Sparrow	18	49	36	-26.5	17.8	7	18	12	-33.3	24.2	18	0.367	0.333	-0.034	0.191	-9.3
Northern Cardinal	65	312	286	-8.3	9.0	54	95	158	66.3	28.8***	66	0.305	0.552	0.248	0.088***	81.4
Indigo Bunting	46	182	199	9.3	11.6	19	16	33	106.3	97.1	47	0.088	0.166	0.078	0.060	88.6
Common Grackle	19	41	61	48.8	65.1	8	8	13	62.5	90.1	19	0.195	0.213	0.018	0.110	9.2
American Goldfinch	25	92	80	-13.0	17.1	1	0	5	++++[11]		25	0.000	0.063	0.063	0.068	++++[11]
All species pooled	**70**	**4087**	**3930**	**-3.8**	**3.6**	**70**	**1455**	**1730**	**18.9**	**8.3****	**70**	**0.356**	**0.440**	**0.084**	**0.043***	**23.7**
	Number decreasing: 12/28 (43%)					Number increasing: 22/28 (79%)***					Number increasing: 24/28 (86%)***					
ALASKA AND BOREAL CANADA MAPS REGIONS																
Ruby-crowned Kinglet	6	19	26	36.8	53.9	4	16	45	181.3	87.2	7	0.842	1.731	0.889	0.719	105.5
Swainson's Thrush	11	54	51	-5.6	14.4	8	22	18	-18.2	20.7	12	0.407	0.353	-0.055	0.219	-13.4
Hermit Thrush	7	71	64	-9.9	8.1	5	34	54	58.8	49.6	7	0.479	0.844	0.365	0.234	76.2
American Robin	13	65	50	-23.1	17.8	6	10	20	100.0	83.4	13	0.154	0.400	0.246	0.112**	160.0
Orange-crowned Warbler	11	166	93	-44.0	4.6***	11	40	67	67.5	62.7	11	0.241	0.720	0.480	0.220*	199.0

TABLE 2. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	1999	2000	%change[2]	SE[3]	n[4]	1999	2000	%change[5]	SE[6]	n[7]	1999	2000	change[8]	SE[9]	% change[10]
Yellow Warbler	7	150	123	-18.0	18.7	6	62	92	48.4	26.7	7	0.413	0.748	0.335	0.340	81.0
Yellow-rumped Warbler	11	65	84	29.2	23.0	7	27	49	81.5	54.1	11	0.415	0.583	0.168	0.132	40.4
Wilson's Warbler	12	501	332	-33.7	4.9**	11	143	455	218.2	123.9*	12	0.285	1.371	1.085	0.294***	380.1
American Tree Sparrow	7	18	22	22.2	44.7	9	41	39	-4.9	51.6	9	2.278	1.773	-0.505	1.368	-22.2
Savannah Sparrow	8	20	12	-40.0	25.2	7	31	23	-25.8	32.4	9	1.550	1.917	0.367	1.459	23.7
Fox Sparrow	9	36	48	33.3	23.2	10	29	28	-3.4	24.7	11	0.806	0.583	-0.222	0.365	-27.6
White-crowned Sparrow	8	58	52	-10.3	15.9	8	56	50	-10.7	32.6	9	0.966	0.962	-0.004	0.427	-0.4
Golden-crowned Sparrow	5	40	39	-2.5	7.8	4	2	21	950.0	738.2	6	0.050	0.539	0.489	0.095***	976.9
Dark-eyed Junco	7	40	30	-25.0	15.8	7	25	69	176.0	116.8	8	0.625	2.300	1.675	1.204	268.0
Common Redpoll	11	154	203	31.8	27.2	11	55	65	18.2	71.1	11	0.357	0.320	-0.037	0.149	-10.3
Pine Siskin	3	66	3	-95.5	2.0***	1	7	0	-100.0		3	0.106	0.000	-0.106	0.136	-100.0
All species pooled	**17**	**1914**	**1569**	**-18.0**	**6.7****	**17**	**707**	**1211**	**71.3**	**41.3***	**17**	**0.369**	**0.772**	**0.402**	**0.145****	**109.0**
	Number decreasing: 11/16 (69%)					Number increasing: 10/16 (63%)					Number increasing: 10/16 (63%)					
ALL REGIONS POOLED																
All species pooled	**407**	**36674**	**34505**	**-5.9**	**1.6*****	**406**	**14310**	**19190**	**34.1**	**5.8*****	**407**	**0.390**	**0.556**	**0.166**	**0.028*****	**42.5**
	Number decreasing: 76/135 (56%)*					Number increasing: 101/135 (75%)***					Number increasing: 97/135 (72%)***					

[1] Number of stations at which at least one individual adult bird of the species was captured in either year.

[2] Percent change between the two years in the number of adult individuals captured.

[3] Standard error and statistical significance of the percent change in the number of adult individuals captured.

[4] Number of stations at which at least one individual young bird of the species was captured in either year.

[5] Percent change between the two years in the number of adult individuals captured.

[6] Standard error and statistical significance of the percent change in the number of adult individuals captured.

[7] Number of stations at which at least one individual aged bird of the species was captured in either year.

[8] Change between the two years in the reproductive index (number of young/number of adults).

[9] Standard error and statistical significance of the change in the reproductive index.

[10] Percent change between the two years in the reproductive index.

[11] Percent change undefined because no young were captured in the first year of the comparison.

†Reproductive indices for this species should be interpreted with caution because it likely includes data from stations where the species occurs only as an altitudinal disperser (a situation in which large numbers of adults and, especially, young, disperse up-mountain after the breeding season) and, therefore, may be biased high.

* $0.05 \leq P < 0.10$; ** $0.01 \leq P < 0.05$; *** $P < 0.01$

and 2000 by a highly significant -5.9%, while 56% of 135 species had decreasing numbers of adults, a proportion that was nearly significantly >50%.

Productivity. — Both the Northwest and Southwest regions showed highly-significant increases in numbers of young captured and in reproductive index between 1999 and 2000 for all species pooled, 59.5% and 59.6%, respectively, for the Northwest and 50.0% and 86.0%, respectively, for the Southwest. The proportions of increasing species for these two parameters for these two regions ranged from 69% to 89% and were highly significantly >50% for each parameter in each region. Summing over these two regions, fully 34 species had significant or nearly significant increases in number of young captured, while only two species showed significant or nearly significant decreases. Similarly, 31 species had significant or nearly significant increases in reproductive index, while only one species showed a significant or nearly significant decrease. The Alaska /Boreal Canada Region likewise showed large increases in both number of young (71.3%) and reproductive index (109.0%) for all species pooled, but the increase in number of young was only nearly significant while that for reproductive index was significant. The proportion of increasing species in the region for each parameter (63%), was not significantly >50%. Nevertheless, five species in the region showed significant or nearly significant increases in one or the other of these two parameters while no species showed significant or nearly significant decreases. Number of young and reproductive index for all species pooled also increased between 1999 and 2000 in both the Northeast (a non-significant 6.6% and nearly significant 20.0%, respectively) and Southeast (a significant 18.9% and nearly significant 23.7%, respectively) regions, but the magnitude and significance of the increases were less than in the western regions. Still, the proportions of increasing species for the two parameters in the Northeast (62% and 67%, respectively), were nearly significantly and significantly >50%, respectively, while the proportions of increasing species for the two parameters for the Southeast (79% and 86%, respectively), were both highly significantly >50%. Summing over the two eastern regions, the six species with significant or nearly significant increases in young was similar in number to the five species with significant or nearly significant decreases in young, but the eight species with significant or nearly significant increases in reproductive index was much greater in number than the one species with significant or nearly significant decreases in reproductive index.

Again, in contrast to the other five regions, modest decreases between 1999 and 2000 were recorded in the North-central (-12.3%) and South-central (-15.2%) regions in the number of young captured for all species pooled and in the reproductive index (-8.4% and -26.7%, respectively). Only the last difference, however, reached even the nearly significant level. The proportion of decreasing species for these two parameters in these two regions ranged from 46% to 70%, but only the proportion of decreasing species for reproductive index in the North-central region (70%) was even nearly significant. Summing for these two regions, eight species showed significant or nearly significant decreases in young (as opposed to one species showing a nearly significant increase), and two species showed nearly significant decreases in reproductive index (as opposed to one species showing a significant increase).

On a continent-wide basis, both the number of young captured and the reproductive index for all species pooled showed highly significant increases of 5.8% and 42.5%, respectively, between 1999 and 2000, while the proportions of increasing species for these two parameters (75% and 72%, respectively) were both highly significantly >50%.

Changes between 2000 and 2001 — Constant-effort data on the numbers of adult and young birds captured and the proportion of young in the catch were obtained for 2000 and 2001 from 415 MAPS stations operated comparably in both years (Table 3). Included were 66 species in the Northwest, 42 in the Southwest, 24 in the North-central, 24 in the South-central, 41 in the Northeast, 29 in the Southeast, and 17 in the Alaska/Boreal Canada regions, comprising a total of 123 species overall (plus 16 additional species that met productivity criteria when data were pooled from all seven regions).

Adult populations. — Increases in adult population size between 2000 and 2001 for all

TABLE 3. Regional changes between 2000 and 2001 in the numbers of adult and young individuals captured and in the reproductive index (number of young/number of adults) for 139 species and all species pooled (excluding gallinaceous birds and hummingbirds) at the 415 stations run comparably in 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[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
NORTHWEST MAPS REGION																
Red-naped Sapsucker	22	35	53	51.4	29.8**	16	12	22	83.3	71.9*	26	0.343	0.415	0.072	0.138	21.1
Red-breasted Sapsucker	51	112	127	13.4	14.5	32	53	89	67.9	29.1***	52	0.473	0.701	0.228	0.143	48.1
Downy Woodpecker	53	71	67	-5.6	14.7	38	36	29	-19.4	22.5	63	0.507	0.433	-0.074	0.140	-14.6
Hairy Woodpecker	50	39	48	23.1	26.7	31	15	28	86.7	68.6*	60	0.385	0.583	0.199	0.201	51.7
Western Wood-Pewee	59	170	182	7.1	11.3	29	31	36	16.1	40.6	60	0.182	0.198	0.015	0.066	8.5
Willow Flycatcher	78	239	313	31.0	15.2**	20	29	17	-41.4	27.1	82	0.121	0.054	-0.067	0.042	-55.2
Hammond's Flycatcher	62	169	134	-20.7	12.1	36	80	44	-45.0	8.9***	67	0.473	0.328	-0.145	0.149	-30.6
Dusky Flycatcher	62	274	250	-8.8	11.0	27	61	42	-31.1	21.5	68	0.223	0.168	-0.055	0.062	-24.5
"Western" Flycatcher	85	183	183	0.0	11.0	57	61	105	72.1	46.6**	98	0.333	0.574	0.240	0.153	72.1
Cassin's Vireo	40	65	67	3.1	16.9	24	31	26	-16.1	23.4	46	0.477	0.388	-0.089	0.194	-18.6
Warbling Vireo	98	477	506	6.1	7.8	39	66	95	43.9	34.0	99	0.138	0.188	0.049	0.063	35.7
Steller's Jay	40	37	22	-40.5	19.1	20	20	5	-75.0	13.0***	46	0.541	0.227	-0.313	0.179*	-58.0
Tree Swallow	16	51	87	70.6	27.2	4	4	8	100.0	91.3	18	0.078	0.092	0.014	0.040	17.2
Black-capped Chickadee	50	154	135	-12.3	14.6	51	198	169	-14.6	13.0	57	1.286	1.252	-0.034	0.332	-2.6
Mountain Chickadee	43	134	105	-21.6	15.0	40	176	109	-38.1	14.0*	48	1.313	1.038	-0.275	0.289	-21.0
Chestnut-backed Chick.	53	82	150	82.9	24.6***	37	120	95	-20.8	18.6	59	1.463	0.633	-0.830	0.365**	-56.7
Bushtit	28	25	54	116.0	75.1**	24	56	88	57.1	54.1	33	2.240	1.630	-0.610	0.905	-27.2
Red-breasted Nuthatch	53	73	72	-1.4	18.9	44	106	60	-43.4	16.3*	63	1.452	0.833	-0.619	0.419	-42.6
Brown Creeper	46	61	69	13.1	21.2	54	103	89	-13.6	20.1	66	1.689	1.290	-0.399	0.401	-23.6
Bewick's Wren	25	47	45	-4.3	23.5	23	71	71	0.0	20.5	27	1.511	1.578	0.067	0.529	4.4
House Wren	33	81	84	3.7	19.1	46	75	100	33.3	24.6	50	0.926	1.191	0.265	0.310	28.6
Winter Wren	31	101	128	26.7	23.6	38	99	84	-15.2	14.5	43	0.980	0.656	-0.324	0.340	-33.0
Golden-crowned Kinglet	47	101	147	45.5	23.9**	44	411	349	-15.1	27.1	61	4.069	2.374	-1.695	1.592	-41.7
Ruby-crowned Kinglet	22	64	101	57.8	18.9***	17	37	69	86.5	88.8	25	0.578	0.683	0.105	0.269	18.2
Veery	6	58	35	-39.7	9.3***	3	9	6	-33.3	19.2	6	0.155	0.171	0.016	0.091	10.5
Swainson's Thrush	100	1205	1321	9.6	5.9	60	273	259	-5.1	15.9	101	0.227	0.196	-0.031	0.056	-13.5
Hermit Thrush	36	78	97	24.4	19.5	24	48	47	-2.1	22.1	44	0.615	0.485	-0.131	0.220	-21.3
American Robin	120	605	670	10.7	7.4	76	215	170	-20.9	15.7	122	0.355	0.254	-0.102	0.071	-28.6

TABLE 3. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
Varied Thrush	27	48	52	8.3	23.2	18	35	35	0.0	24.6	31	0.729	0.673	-0.056	0.288	-7.7
Wrentit	22	79	82	3.8	18.7	21	94	144	53.2	31.3**	23	1.190	1.756	0.566	0.391	47.6
Gray Catbird	18	143	156	9.1	16.9	11	43	27	-37.2	32.9	18	0.301	0.173	-0.128	0.113	-42.4
Cedar Waxwing	42	254	219	-13.8	13.8	8	26	6	-76.9	19.5***	43	0.102	0.027	-0.075	0.060	-73.2
Orange-crowned Warbler†	81	335	350	4.5	10.2	77	669	508	-24.1	9.9*	93	1.997	1.451	-0.546	0.422	-27.3
Nashville Warbler†	45	96	132	37.5	21.9*	43	160	195	21.9	26.2	53	1.667	1.477	-0.190	0.577	-11.4
Virginia's Warbler	4	26	29	11.5	45.7	3	24	9	-62.5	26.6	4	0.923	0.310	-0.613	0.482	-66.4
Yellow Warbler	68	975	1003	2.9	5.8	56	500	415	-17.0	19.4	71	0.513	0.414	-0.099	0.125	-19.3
Yellow-rumped Warbler	79	409	394	-3.7	10.1	55	251	294	17.1	36.6	85	0.614	0.746	0.133	0.264	21.6
Townsend's Warbler	29	76	113	48.7	24.0**	21	78	60	-23.1	27.8	31	1.026	0.531	-0.495	0.320	-48.3
Hermit Warbler	33	138	146	5.8	14.9	28	99	77	-22.2	26.0	36	0.717	0.527	-0.190	0.236	-26.5
MacGillivray's Warbler	101	798	830	4.0	5.1	86	381	512	34.4	17.1**	109	0.477	0.617	0.139	0.103	29.2
Common Yellowthroat	46	205	183	-10.7	10.6	26	94	57	-39.4	11.2***	48	0.459	0.312	-0.147	0.183	-32.1
Wilson's Warbler	100	653	712	9.0	11.9	63	203	276	36.0	15.6***	106	0.311	0.388	0.077	0.099	24.7
Yellow-breasted Chat	15	91	130	42.9	25.1	9	40	42	5.0	29.0	15	0.440	0.323	-0.117	0.154	-26.5
Western Tanager	86	213	253	18.8	15.0	42	92	96	4.3	30.0	91	0.432	0.379	-0.053	0.172	-12.2
Green-tailed Towhee	15	57	61	7.0	22.2	16	22	45	104.5	43.8***	20	0.386	0.738	0.352	0.240	91.1
Spotted Towhee	52	180	218	21.1	11.6*	47	164	167	1.8	16.0	59	0.911	0.766	-0.145	0.208	-15.9
Chipping Sparrow	40	95	108	13.7	20.0	30	49	49	0.0	27.5	48	0.516	0.454	-0.062	0.173	-12.0
Brewer's Sparrow	19	53	33	-37.7	19.1	22	33	31	-6.1	37.2	25	0.623	0.939	0.317	0.372	50.9
Savannah Sparrow	6	53	75	41.5	12.8	6	7	14	100.0	66.4	9	0.132	0.187	0.055	0.163	41.3
Fox Sparrow	31	87	96	10.3	15.2	23	21	36	71.4	56.9	39	0.241	0.375	0.134	0.153	55.4
Song Sparrow	108	1040	1105	6.3	4.4	113	1317	897	-31.9	5.5***	118	1.266	0.812	-0.455	0.127***	-35.9
Lincoln's Sparrow	41	259	266	2.7	10.0	45	194	159	-18.0	12.5	49	0.749	0.598	-0.151	0.180	-20.2
White-crowned Sparrow	21	75	88	17.3	23.7	13	40	30	-25.0	20.5	22	0.533	0.341	-0.192	0.131	-36.1
Dark-eyed Junco	86	670	672	0.3	7.1	90	742	717	-3.4	14.1	97	1.108	1.067	-0.041	0.218	-3.7
Black-headed Grosbeak	83	282	299	6.0	12.0	49	90	145	61.1	27.3**	86	0.319	0.485	0.166	0.142	52.0
Lazuli Bunting	49	219	201	-8.2	14.5	29	45	75	66.7	29.8**	53	0.206	0.373	0.168	0.081**	81.6
Red-winged Blackbird	21	205	182	-11.2	21.9	7	28	4	-85.7	12.1***	23	0.137	0.022	-0.115	0.035***	-83.9
Brown-headed Cowbird	50	146	144	-1.4	14.1	22	19	20	5.3	33.0	52	0.130	0.139	0.009	0.051	6.7
Bullock's Oriole	29	84	117	39.3	30.6	19	57	36	-36.8	37.5	31	0.679	0.308	-0.371	0.331	-54.7
Purple Finch	38	313	325	3.8	14.4	28	90	162	80.0	33.1**	41	0.288	0.499	0.211	0.146	73.4
Cassin's Finch	30	64	42	-34.4	19.1	13	9	7	-22.2	49.2	34	0.141	0.167	0.026	0.100	18.5

TABLE 3. Continued.

Species	ADULTS n[1]	2000	2001	%change[2]	SE[3]	YOUNG n[4]	2000	2001	%change[5]	SE[6]	REPRODUCTIVE INDEX n[7]	2000	2001	change[8]	SE[9]	% change[10]
House Finch	11	41	38	-7.3	18.4	9	16	18	12.5	45.8	14	0.390	0.474	0.083	0.211	21.4
Pine Siskin	55	201	201	0.0	19.2	30	84	91	8.3	43.5	57	0.418	0.453	0.035	0.170	8.3
Lesser Goldfinch	21	43	70	62.8	54.1	10	85	44	-48.2	46.2	23	1.977	0.629	-1.348	1.146	-68.2
American Goldfinch	27	244	184	-24.6	11.3*	9	10	11	10.0	53.7	27	0.041	0.060	0.019	0.051	45.9
Evening Grosbeak	19	51	59	15.7	34.8	6	4	5	25.0	97.8	20	0.078	0.085	0.006	0.069	8.1
All species pooled	**133**	**14153**	**15033**	**6.2**	**2.8****	**133**	**8614**	**8033**	**-6.7**	**4.9**	**133**	**0.609**	**0.534**	**-0.075**	**0.051**	**-12.2**
	Number increasing: 45/66 (68%)***					Number decreasing: 34/66 (52%)					Number decreasing: 38/66 (58%)					
SOUTHWEST MAPS REGION																
Nuttall's Woodpecker	23	61	43	-29.5	15.0*	19	40	40	0.0	19.6	24	0.656	0.930	0.275	0.295	41.9
Downy Woodpecker	23	42	50	19.0	29.4	18	22	23	4.5	36.7	24	0.524	0.460	-0.064	0.217	-12.2
Western Wood-Pewee	25	41	30	-26.8	19.4	5	10	2	-80.0	25.9**	25	0.244	0.067	-0.177	0.134	-72.7
"Western" Flycatcher	33	103	53	-48.5	10.4***	17	31	44	41.9	44.1	35	0.301	0.830	0.529	0.329	175.8
Black Phoebe	20	24	30	25.0	29.2	26	54	63	16.7	25.9	31	2.250	2.100	-0.150	1.225	-6.7
Ash-throated Flycatcher	48	121	152	25.6	18.0	13	13	11	-15.4	51.4	48	0.107	0.072	-0.035	0.052	-32.6
Loggerhead Shrike	8	30	21	-30.0	13.6*	10	20	15	-25.0	43.7	12	0.667	0.714	0.048	0.432	7.1
Bell's Vireo	7	37	28	-24.3	16.1	5	16	10	-37.5	17.5*	7	0.432	0.357	-0.075	0.130	-17.4
Warbling Vireo	29	88	58	-34.1	19.7	8	12	21	75.0	99.2	29	0.136	0.362	0.226	0.163	165.5
Chestnut-backed Chick.	7	18	24	33.3	39.8	8	95	85	-10.5	20.1	8	5.278	3.542	-1.736	1.441	-32.9
Oak Titmouse	14	38	40	5.3	20.7	12	48	40	-16.7	14.7	15	1.263	1.000	-0.263	0.386	-20.8
Verdin	4	18	14	-22.2	30.5	5	39	32	-17.9	31.6	5	2.167	2.286	0.119	1.729	5.5
Bushtit	42	215	242	12.6	18.6	36	194	185	-4.6	17.7	43	0.902	0.765	-0.138	0.242	-15.3
Bewick's Wren	49	246	237	-3.7	11.1	46	314	360	14.7	15.3	50	1.276	1.519	0.243	0.277	19.0
House Wren	24	144	195	35.4	16.4***	26	155	153	-1.3	23.9	26	1.076	0.785	-0.292	0.235	-27.1
Swainson's Thrush	16	141	117	-17.0	17.5	9	30	47	56.7	66.6	16	0.213	0.402	0.189	0.133	88.8
American Robin	21	79	52	-34.2	14.7*	12	16	14	-12.5	56.9	22	0.203	0.269	0.067	0.165	32.9
Wrentit	22	188	240	27.7	15.8*	22	252	309	22.6	18.4	22	1.340	1.288	-0.053	0.242	-3.9
California Thrasher	11	22	15	-31.8	21.6	8	29	27	-6.9	20.5	11	1.318	1.800	0.482	0.620	36.6
Orange-crowned Warbler	16	94	99	5.3	16.1	15	62	129	108.1	79.7*	20	0.660	1.303	0.644	0.385	97.6
Lucy's Warbler	10	71	62	-12.7	26.4	11	47	43	-8.5	35.9	11	0.662	0.693	0.032	0.222	4.8
Yellow Warbler	35	324	205	-36.7	16.2	14	62	46	-25.8	23.9	35	0.191	0.224	0.033	0.089	17.3
Common Yellowthroat	37	446	455	2.0	8.6	29	350	432	23.4	18.4	41	0.785	0.949	0.165	0.210	21.0
Wilson's Warbler	13	132	92	-30.3	11.5**	10	70	95	35.7	33.8	13	0.530	1.033	0.502	0.491	94.7

TABLE 3. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
Yellow-breasted Chat	23	233	209	-10.3	7.5	13	33	36	9.1	39.1	23	0.142	0.172	0.031	0.049	21.6
Summer Tanager	8	48	47	-2.1	16.4	3	1	7	600.0	1053.6	8	0.021	0.149	0.128	0.079	614.9
Spotted Towhee	39	291	248	-14.8	7.2*	33	194	168	-13.4	12.8	39	0.667	0.677	0.011	0.156	1.6
California Towhee	24	87	88	1.1	12.3	18	69	78	13.0	24.3	26	0.793	0.886	0.093	0.278	11.8
Abert's Towhee	6	44	36	-18.2	7.9*	4	7	12	71.4	92.9	6	0.159	0.333	0.174	0.112	109.5
Rufous-crowned Sparrow	9	28	32	14.3	52.4	12	22	47	113.6	57.6*	13	0.786	1.469	0.683	0.656	86.9
Lark Sparrow	12	46	38	-17.4	21.4	7	11	6	-45.5	28.8	13	0.239	0.158	-0.081	0.095	-34.0
Sage Sparrow	3	26	22	-15.4	25.0	4	11	101	818.2	220.3**	5	0.423	4.591	4.168	1.374**	985.1
Song Sparrow	37	526	467	-11.2	7.4	37	608	514	-15.5	11.3	39	1.156	1.101	-0.055	0.205	-4.8
Black-headed Grosbeak	43	231	204	-11.7	14.0	19	26	29	11.5	39.2	44	0.113	0.142	0.030	0.053	26.3
Blue Grosbeak	23	59	49	-16.9	11.8	7	2	9	350.0	298.3	25	0.034	0.184	0.150	0.080*	441.8
Lazuli Bunting	25	71	61	-14.1	28.4	8	13	10	-23.1	61.7	27	0.183	0.164	-0.019	0.135	-10.5
Red-winged Blackbird	13	54	53	-1.9	18.1	3	5	3	-40.0	12.0*	13	0.093	0.057	-0.036	0.048	-38.9
Brown-headed Cowbird	31	90	82	-8.9	13.9	7	3	7	133.3	214.0	31	0.033	0.085	0.052	0.058	156.1
Bullock's Oriole	28	158	97	-38.6	9.9**	14	20	20	0.0	42.2	30	0.127	0.206	0.080	0.097	62.9
House Finch	33	226	131	-42.0	14.7*	29	241	168	-30.3	32.4	36	1.066	1.282	0.216	0.638	20.3
Lesser Goldfinch	29	157	164	4.5	17.3	16	49	37	-24.5	29.0	30	0.312	0.226	-0.087	0.098	-27.7
American Goldfinch	16	88	100	13.6	25.3	3	7	0	-100.0	0.0	16	0.079	0.000	-0.079	0.054	-100.0
All species pooled	**59**	**6088**	**5388**	**-11.5**	**3.2*** **	**58**	**3594**	**3812**	**6.1**	**7.5**	**59**	**0.590**	**0.708**	**0.117**	**0.077**	**19.8**
	Number decreasing: 28/42 (67%)**					Number increasing: 19/42 (45%)					Number increasing: 26/42 (62%)*					
NORTH-CENTRAL MAPS REGION																
Downy Woodpecker	19	38	33	-13.2	18.9	21	56	55	-1.8	17.7	22	1.474	1.667	0.193	0.518	13.1
"Traill's" Flycatcher	17	58	63	8.6	23.8	7	3	5	66.7	113.9	18	0.052	0.079	0.028	0.039	53.4
Red-eyed Vireo	16	53	50	-5.7	14.9	3	3	2	-33.3	50.9	16	0.057	0.040	-0.017	0.043	-29.3
Black-capped Chickadee	21	89	84	-5.6	19.0	23	121	124	2.5	25.7	24	1.360	1.476	0.117	0.470	8.6
Tufted Titmouse	12	25	26	4.0	54.1	10	27	27	0.0	48.4	12	1.080	1.039	-0.042	0.506	-3.8
House Wren	16	102	83	-18.6	11.4	16	92	88	-4.3	18.0	18	0.902	1.060	0.158	0.328	17.5
Wood Thrush	16	51	75	47.1	23.0**	10	11	21	90.9	90.4	16	0.216	0.280	0.064	0.133	29.8
American Robin	25	86	81	-5.8	13.1	17	47	49	4.3	25.1	25	0.547	0.605	0.058	0.189	10.7
Gray Catbird	21	307	381	24.1	9.3**	20	154	196	27.3	17.2*	22	0.502	0.514	0.013	0.164	2.6
Cedar Waxwing	13	58	36	-37.9	15.0***	4	3	2	-33.3	54.4	13	0.052	0.056	0.004	0.052	7.4
Yellow Warbler	10	196	182	-7.1	12.4	10	45	30	-33.3	25.6	11	0.230	0.165	-0.065	0.082	-28.2

TABLE 3. Continued.

Species	ADULTS n[1]	2000	2001	%change[2]	SE[3]	YOUNG n[4]	2000	2001	%change[5]	SE[6]	REPRODUCTIVE INDEX n[7]	2000	2001	change[8]	SE[9]	% change[10]
American Redstart	12	50	57	14.0	19.7	3	5	8	60.0	122.6	12	0.100	0.140	0.040	0.095	40.4
Ovenbird	15	49	51	4.1	24.1	8	9	13	44.4	59.0	16	0.184	0.255	0.071	0.105	38.8
Common Yellowthroat	19	219	214	-2.3	14.4	16	85	112	31.8	55.3	20	0.388	0.523	0.135	0.151	34.8
Clay-colored Sparrow	2	34	39	14.7	7.6	2	3	13	333.3	66.7	3	0.088	0.333	0.245	0.040**	277.8
Field Sparrow	12	71	72	1.4	23.3	10	19	46	142.1	60.5**	13	0.268	0.639	0.371	0.187*	138.7
Song Sparrow	16	122	120	-1.6	8.1	15	106	87	-17.9	19.9	17	0.869	0.725	-0.144	0.253	-16.6
Swamp Sparrow	3	10	20	100.0	17.3	4	8	42	425.0	375.5	6	0.800	2.100	1.300	0.557*	162.5
Northern Cardinal	20	70	70	0.0	14.5	16	16	33	106.3	45.3***	20	0.229	0.471	0.243	0.117*	106.3
Rose-breasted Grosbeak	17	38	58	52.6	31.2	7	6	8	33.3	109.3	17	0.158	0.138	-0.020	0.130	-12.6
Indigo Bunting	18	115	113	-1.7	12.5	9	7	15	114.3	132.9	18	0.061	0.133	0.072	0.060	118.1
Red-winged Blackbird	6	40	46	15.0	74.3	3	0	4	++++[11]		6	0.000	0.087	0.087	0.029**	++++[11]
Baltimore Oriole	14	43	46	7.0	32.0	6	9	11	22.2	46.5	14	0.209	0.239	0.030	0.171	14.3
American Goldfinch	16	227	256	12.8	23.0	1	1	0	-100.0		16	0.004	0.000	-0.004	0.003	-100.0
All species pooled	**26**	**2631**	**2703**	**2.7**	**5.6**	**26**	**1010**	**1140**	**12.9**	**11.7**	**26**	**0.384**	**0.422**	**0.038**	**0.070**	**9.9**
	Number increasing: 13/24 (54%)					Number increasing: 16/24 (67%)**					Number increasing: 18/24 (75%)**					
SOUTH-CENTRAL MAPS REGION																
Common Ground-Dove	6	91	55	-39.6	10.2	3	15	34	126.7	69.3	6	0.165	0.618	0.453	0.153**	275.0
Downy Woodpecker	20	29	23	-20.7	29.9	20	25	44	76.0	63.0*	24	0.862	1.913	1.051	0.574*	121.9
Acadian Flycatcher	14	71	86	21.1	13.0	7	5	9	80.0	109.0	14	0.070	0.105	0.034	0.043	48.6
White-eyed Vireo	29	308	266	-13.6	7.2*	27	191	192	0.5	20.4	29	0.620	0.722	0.102	0.216	16.4
Bell's Vireo	7	50	47	-6.0	10.2	4	8	13	62.5	102.1	7	0.160	0.277	0.117	0.136	72.9
Red-eyed Vireo	23	40	65	62.5	33.7**	5	11	5	-54.5	12.5**	23	0.275	0.077	-0.198	0.141	-72.0
Carolina Chickadee	30	71	62	-12.7	27.1	27	44	66	50.0	47.7	32	0.620	1.065	0.445	0.387	71.8
Tufted Titmouse	26	52	69	32.7	20.5*	25	80	64	-20.0	19.9	26	1.539	0.928	-0.611	0.377	-39.7
Black-crested Titmouse	16	41	31	-24.4	17.3	13	28	46	64.3	43.2	16	0.683	1.484	0.801	0.397*	117.3
Carolina Wren	34	172	118	-31.4	13.6**	29	135	140	3.7	15.0	36	0.785	1.186	0.402	0.271	51.2
Bewick's Wren	15	63	49	-22.2	18.5	15	51	52	2.0	10.8	16	0.810	1.061	0.252	0.320	31.1
House Wren	6	43	24	-44.2	15.2	3	12	9	-25.0	9.5	6	0.279	0.375	0.096	0.250	34.4
Blue-gray Gnatcatcher	18	41	36	-12.2	33.1	16	19	20	5.3	45.6	22	0.463	0.556	0.092	0.203	19.9
Gray Catbird	9	106	86	-18.9	5.6***	6	37	43	16.2	29.3	10	0.349	0.500	0.151	0.104	43.2
Black-and-white Warbler	17	24	40	66.7	55.8	18	21	24	14.3	27.2	19	0.875	0.600	-0.275	0.372	-31.4
Prothonotary Warbler	8	20	40	100.0	49.0*	7	4	16	300.0	205.6	8	0.200	0.400	0.200	0.183	100.0

TABLE 3. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
Kentucky Warbler	16	95	76	-20.0	12.0	14	26	32	23.1	29.2	18	0.274	0.421	0.147	0.142	53.8
Common Yellowthroat	13	53	39	-26.4	12.4	6	6	12	100.0	63.2	13	0.113	0.308	0.195	0.188	171.8
Yellow-breasted Chat	10	121	127	5.0	8.4	6	16	34	112.5	73.2	11	0.132	0.268	0.136	0.076	102.5
Field Sparrow	17	82	65	-20.7	24.1	12	21	46	119.0	115.1	17	0.256	0.708	0.452	0.214*	176.3
Northern Cardinal	41	355	289	-18.6	6.4**	40	132	311	135.6	45.5***	42	0.372	1.076	0.704	0.150***	189.4
Indigo Bunting	27	144	182	26.4	13.0**	13	15	21	40.0	69.2	27	0.104	0.115	0.011	0.053	10.8
Painted Bunting	25	310	266	-14.2	13.6	21	26	92	253.8	80.4***	26	0.084	0.346	0.262	0.083***	312.4
Brown-headed Cowbird	30	54	39	-27.8	20.5	6	4	5	25.0	96.8	32	0.074	0.128	0.054	0.073	73.1
All species pooled	**45**	**3117**	**2862**	**-8.2**	**4.1***	**45**	**1093**	**1539**	**40.8**	**11.5*****	**45**	**0.351**	**0.538**	**0.187**	**0.061*****	**53.4**
	Number decreasing: 17/24 (71%)**					Number increasing: 21/24 (88%)***					Number increasing: 21/24 (88%)***					
NORTHEAST MAPS REGION																
Downy Woodpecker	44	50	64	28.0	24.2	42	65	67	3.1	17.9	55	1.300	1.047	-0.253	0.382	-19.5
"Traill's" Flycatcher	23	80	79	-1.3	15.3	8	9	14	55.6	96.7	24	0.113	0.177	0.065	0.099	57.5
Eastern Phoebe	21	29	27	-6.9	28.4	21	39	21	-46.2	13.5**	28	1.345	0.778	-0.567	0.418	-42.2
White-eyed Vireo	9	38	37	-2.6	25.5	7	5	20	300.0	341.6	10	0.132	0.541	0.409	0.194*	310.8
Red-eyed Vireo	51	169	164	-3.0	12.8	18	31	17	-45.2	21.1	52	0.183	0.104	-0.080	0.056	-43.5
Carolina Chickadee	16	25	38	52.0	58.1	14	25	23	-8.0	26.3	16	1.000	0.605	-0.395	0.410	-39.5
Black-capped Chickadee	43	141	180	27.7	17.5*	32	99	96	-3.0	17.4	44	0.702	0.533	-0.169	0.182	-24.0
Tufted Titmouse	39	58	71	22.4	25.4	29	52	100	92.3	43.8***	43	0.897	1.409	0.512	0.330	57.1
Carolina Wren	23	71	83	16.9	20.7	20	38	41	7.9	31.3	27	0.535	0.494	-0.041	0.228	-7.7
House Wren	13	46	38	-17.4	25.5	16	14	32	128.6	97.3*	19	0.304	0.842	0.538	0.331	176.7
Veery	37	215	206	-4.2	10.7	26	58	38	-34.5	17.4	38	0.270	0.185	-0.085	0.062	-31.6
Hermit Thrush	28	80	98	22.5	18.1	21	43	35	-18.6	20.2	30	0.537	0.357	-0.180	0.153	-33.6
Wood Thrush	44	175	185	5.7	15.1	28	47	55	17.0	28.6	45	0.269	0.297	0.029	0.081	10.7
American Robin	48	228	210	-7.9	7.8	28	95	97	2.1	36.1	50	0.417	0.462	0.045	0.263	10.9
Gray Catbird	48	718	658	-8.4	5.5	37	326	310	-4.9	12.1	49	0.454	0.471	0.017	0.097	3.8
Cedar Waxwing	28	165	146	-11.5	17.6	6	4	6	50.0	144.9	28	0.024	0.041	0.017	0.026	69.5
Yellow Warbler	20	240	197	-17.9	7.7**	14	109	53	-51.4	13.6***	20	0.454	0.269	-0.185	0.116	-40.8
Chestnut-sided Warbler	13	43	47	9.3	30.1	12	21	22	4.8	36.4	18	0.488	0.468	-0.020	0.142	-4.2
Magnolia Warbler	17	64	72	12.5	17.2	13	28	20	-28.6	35.4	19	0.438	0.278	-0.160	0.220	-36.5
Yellow-rumped Warbler	15	48	33	-31.3	16.9*	6	7	11	57.1	60.2	15	0.146	0.333	0.188	0.092*	128.6
Blk.-throated Grn. Warb.	22	69	68	-1.4	12.8	10	12	15	25.0	75.1	22	0.174	0.221	0.047	0.118	26.8

TABLE 3. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
Black-and-white Warbler	34	70	59	-15.7	12.0	21	38	47	23.7	31.0	38	0.543	0.797	0.254	0.187	46.7
American Redstart	32	245	229	-6.5	9.5	24	177	115	-35.0	11.5*	35	0.722	0.502	-0.220	0.207	-30.5
Worm-eating Warbler	17	50	56	12.0	41.5	12	32	53	65.6	49.7	19	0.640	0.946	0.306	0.351	47.9
Ovenbird	52	222	283	27.5	11.5***	38	132	98	-25.8	12.4*	55	0.595	0.346	-0.248	0.116**	-41.8
Louisiana Waterthrush	13	18	13	-27.8	21.7	9	36	25	-30.6	28.7	16	2.000	1.923	-0.077	1.649	-3.8
Common Yellowthroat	42	205	231	12.7	13.3	29	115	89	-22.6	15.4	43	0.561	0.385	-0.176	0.152	-31.3
Hooded Warbler	14	53	67	26.4	16.4*	11	19	33	73.7	72.0	15	0.359	0.493	0.134	0.171	37.4
Scarlet Tanager	24	30	38	26.7	33.5	8	13	22	69.2	67.5	24	0.433	0.579	0.146	0.275	33.6
Eastern Towhee	32	77	79	2.6	14.5	21	40	24	-40.0	21.2*	37	0.520	0.304	-0.216	0.129*	-41.5
Chipping Sparrow	15	32	43	34.4	38.8	10	9	19	111.1	79.5	17	0.281	0.442	0.161	0.149	57.1
Song Sparrow	27	144	165	14.6	15.0	28	138	143	3.6	12.9	32	0.958	0.867	-0.092	0.207	-9.6
White-throated Sparrow	12	51	52	2.0	31.8	10	22	16	-27.3	31.5	14	0.431	0.308	-0.124	0.182	-28.7
Dark-eyed Junco	16	36	62	72.2	31.4*	14	80	88	10.0	26.8	17	2.222	1.419	-0.803	0.909	-36.1
Northern Cardinal	35	119	134	12.6	12.1	28	55	63	14.5	23.7	37	0.462	0.470	0.008	0.113	1.7
Rose-breasted Grosbeak	19	35	44	25.7	36.4	11	19	12	-36.8	33.4	22	0.543	0.273	-0.270	0.267	-49.8
Indigo Bunting	22	56	65	16.1	26.7	10	16	17	6.3	84.7	24	0.286	0.262	-0.024	0.201	-8.5
Red-winged Blackbird	14	66	96	45.5	30.6	5	4	7	75.0	144.9	14	0.061	0.073	0.012	0.043	20.3
Common Grackle	19	43	48	11.6	27.9	7	6	4	-33.3	50.9	19	0.140	0.083	-0.056	0.091	-40.3
Baltimore Oriole	16	46	31	-32.6	16.6	5	5	4	-20.0	68.1	18	0.109	0.129	0.020	0.107	18.7
American Goldfinch	38	203	238	17.2	14.4	2	2	0	-100.0	0.0	39	0.010	0.000	-0.010	0.007	-100.0
All species pooled	**68**	**5176**	**5358**	**3.5**	**3.4**	**68**	**2334**	**2193**	**-6.0**	**7.3**	**68**	**0.451**	**0.409**	**-0.042**	**0.041**	**-9.2**
	Number increasing: 25/41 (61%)					Number decreasing: 19/41 (46%)					Number decreasing: 23/41 (56%)					
SOUTHEAST MAPS REGION																
Downy Woodpecker	40	45	57	26.7	24.2	41	55	80	45.5	30.2**	54	1.222	1.404	0.181	0.406	14.8
Acadian Flycatcher	52	233	297	27.5	11.9***	25	29	20	-31.0	24.1	52	0.125	0.067	-0.057	0.040	-45.9
White-eyed Vireo	36	124	132	6.5	10.4	26	55	43	-21.8	25.3	40	0.444	0.326	-0.118	0.148	-26.6
Red-eyed Vireo	49	283	245	-13.4	9.4	22	37	18	-51.4	19.8*	51	0.131	0.073	-0.057	0.045	-43.8
Blue Jay	41	43	52	20.9	25.5	9	8	11	37.5	86.0	42	0.186	0.212	0.026	0.112	13.7
Carolina Chickadee	55	85	87	2.4	17.8	44	100	110	10.0	20.0	58	1.177	1.264	0.088	0.345	7.5
Tufted Titmouse	61	138	155	12.3	15.1	60	147	186	26.5	17.5*	64	1.065	1.200	0.135	0.196	12.7
Carolina Wren	58	179	236	31.8	16.1**	56	203	248	22.2	17.2	61	1.134	1.051	-0.083	0.252	-7.3
Blue-gray Gnatcatcher	21	31	22	-29.0	20.6	14	19	22	15.8	43.8	22	0.613	1.000	0.387	0.385	63.2

TABLE 3. Continued.

	ADULTS					YOUNG					REPRODUCTIVE INDEX					
Species	n[1]	2000	2001	%change[2]	SE[3]	n[4]	2000	2001	%change[5]	SE[6]	n[7]	2000	2001	change[8]	SE[9]	% change[10]
Wood Thrush	53	334	395	18.3	9.7**	40	101	106	5.0	16.8	53	0.302	0.268	-0.034	0.069	-11.3
American Robin	14	36	52	44.4	64.4	14	34	46	35.3	44.3	19	0.944	0.885	-0.060	0.400	-6.3
Gray Catbird	30	164	156	-4.9	10.8	20	76	70	-7.9	16.1	33	0.463	0.449	-0.015	0.182	-3.2
Brown Thrasher	22	32	25	-21.9	24.9	16	20	19	-5.0	38.0	26	0.625	0.760	0.135	0.279	21.6
Blue-winged Warbler	12	37	32	-13.5	31.4	8	16	15	-6.3	78.1	13	0.432	0.469	0.036	0.273	8.4
Prairie Warbler	16	70	65	-7.1	29.2	14	33	30	-9.1	22.8	18	0.471	0.462	-0.010	0.157	-2.1
Prothonotary Warbler	14	23	33	43.5	37.5	11	7	17	142.9	108.5	17	0.304	0.515	0.211	0.232	69.3
Worm-eating Warbler	32	56	69	23.2	25.6	20	32	30	-6.3	17.3	35	0.571	0.435	-0.137	0.179	-23.9
Ovenbird	49	242	233	-3.7	8.6	38	107	156	45.8	33.4	51	0.442	0.670	0.227	0.145	51.4
Louisiana Waterthrush	31	64	54	-15.6	13.5	23	38	48	26.3	32.0	36	0.594	0.889	0.295	0.240	49.7
Kentucky Warbler	34	187	172	-8.0	10.7	28	62	89	43.5	29.7*	36	0.332	0.517	0.186	0.096*	56.1
Common Yellowthroat	44	167	194	16.2	15.6	30	73	66	-9.6	17.8	48	0.437	0.340	-0.097	0.108	-22.2
Hooded Warbler	34	96	92	-4.2	13.6	21	24	22	-8.3	40.7	38	0.250	0.239	-0.011	0.116	-4.3
Yellow-breasted Chat	21	95	88	-7.4	10.5	11	21	22	4.8	35.6	22	0.221	0.250	0.029	0.093	13.1
Eastern Towhee	27	37	32	-13.5	15.1	18	28	16	-42.9	18.7*	30	0.757	0.500	-0.257	0.279	-33.9
Field Sparrow	16	45	51	13.3	29.6	8	13	13	0.0	41.9	16	0.289	0.255	-0.034	0.116	-11.8
Northern Cardinal	62	277	339	22.4	8.7***	53	162	163	0.6	20.4	62	0.585	0.481	-0.104	0.125	-17.8
Indigo Bunting	44	203	199	-2.0	9.7	17	28	36	28.6	24.4	45	0.138	0.181	0.043	0.089	31.2
Common Grackle	17	58	32	-44.8	11.6*	7	13	17	30.8	77.2	18	0.224	0.531	0.307	0.321	137.0
American Goldfinch	23	85	150	76.5	79.9	1	5	2	-60.0		23	0.059	0.013	-0.046	0.065	-77.3
All species pooled	**66**	**3889**	**4185**	**7.6**	**3.7****	**66**	**1690**	**1899**	**12.4**	**7.9***	**66**	**0.435**	**0.454**	**0.019**	**0.046**	**4.4**
	Number increasing: 15/29 (52%)					Number increasing: 16/29 (55%)					Number increasing: 14/29 (48%)					
ALASKA AND BOREAL CANADA MAPS REGIONS																
Black-capped Chickadee	8	13	20	53.8	45.2	8	14	50	257.1	95.8**	11	1.077	2.500	1.423	0.881	132.1
Ruby-crowned Kinglet	6	25	33	32.0	38.6	7	40	24	-40.0	26.3	7	1.600	0.727	-0.873	0.590	-54.5
Swainson's Thrush	12	57	56	-1.8	17.1	10	14	20	42.9	60.3	13	0.246	0.357	0.112	0.131	45.4
Hermit Thrush	7	66	76	15.2	13.2	6	55	71	29.1	31.2	7	0.833	0.934	0.101	0.295	12.1
American Robin	12	51	43	-15.7	12.1	6	20	19	-5.0	31.3	13	0.392	0.442	0.050	0.185	12.7
Orange-crowned Warbler	11	89	111	24.7	22.3	11	64	116	81.3	66.1*	12	0.719	1.045	0.326	0.391	45.3
Yellow Warbler	9	126	128	1.6	27.4	7	86	68	-20.9	18.3	10	0.683	0.531	-0.151	0.283	-22.2
Yellow-rumped Warbler	12	92	60	-34.8	21.4	10	49	35	-28.6	37.9	13	0.533	0.583	0.051	0.151	9.5
American Redstart	5	30	47	56.7	42.9	4	5	19	280.0	271.5	5	0.167	0.404	0.238	0.305	142.6

TABLE 3. Continued.

Species	ADULTS n[1]	2000	2001	%change[2]	SE[3]	YOUNG n[4]	2000	2001	%change[5]	SE[6]	REPRODUCTIVE INDEX n[7]	2000	2001	change[8]	SE[9]	% change[10]
Wilson's Warbler	12	331	289	-12.7	10.3	12	453	600	32.5	26.7	12	1.369	2.076	0.708	0.436	51.7
American Tree Sparrow	6	20	17	-15.0	28.9	8	42	59	40.5	77.5	8	2.100	3.471	1.371	2.559	65.3
Savannah Sparrow	9	13	15	15.4	46.3	10	23	48	108.7	42.2	11	1.769	3.200	1.431	1.825	80.9
Fox Sparrow	9	45	47	4.4	31.6	11	29	51	75.9	67.1	11	0.644	1.085	0.441	0.572	68.4
White-crowned Sparrow	9	52	57	9.6	18.9	9	49	126	157.1	52.9**	10	0.942	2.211	1.268	0.615*	134.6
Golden-crowned Sparrow	5	40	46	15.0	12.0	5	21	13	-38.1	16.7*	7	0.525	0.283	-0.242	0.127	-46.2
Dark-eyed Junco	6	31	30	-3.2	26.1	8	68	102	50.0	25.3*	9	2.194	3.400	1.207	1.498	55.0
Common Redpoll	11	202	130	-35.6	12.1**	9	57	56	-1.8	81.1	11	0.282	0.431	0.149	0.312	52.7
All species pooled	**18**	**1636**	**1596**	**-2.4**	**7.3**	**18**	**1189**	**1652**	**38.9**	**22.1****	**18**	**0.727**	**1.035**	**0.308**	**0.184**	**42.4**
	Number decreasing: 7/17 (41%)					Number increasing: 11/17 (65%)					Number increasing: 14/17 (82%)***					
ALL REGIONS POOLED																
All species pooled	**415**	**36690**	**37125**	**1.2**	**1.5**	**414**	**19524**	**20268**	**3.8**	**3.3**	**415**	**0.532**	**0.546**	**0.014**	**0.029**	**2.6**
	Number increasing: 77/139 (55%)					Number increasing: 77/139 (55%)					Number increasing: 81/139 (58%)**					

[1] Number of stations at which at least one individual adult bird of the species was captured in either year.

[2] Percent change between the two years in the number of adult individuals captured.

[3] Standard error and statistical significance of the percent change in the number of adult individuals captured.

[4] Number of stations at which at least one individual young bird of the species was captured in either year.

[5] Percent change between the two years in the number of adult individuals captured.

[6] Standard error and statistical significance of the percent change in the number of adult individuals captured.

[7] Number of stations at which at least one individual aged bird of the species was captured in either year.

[8] Change between the two years in the reproductive index (number of young/number of adults).

[9] Standard error and statistical significance of the change in the reproductive index.

[10] Percent change between the two years in the reproductive index.

[11] Percent change undefined because no young were captured in the first year of the comparison.

† Reproductive indices for this species should be interpreted with caution because it likely includes data from stations where the species occurs only as an altitudinal disperser (a situation in which large numbers of adults and, especially, young, disperse up-mountain after the breeding season) and, therefore, may be biased high.

* $0.05 \leq P < 0.10$; ** $0.01 \leq P < 0.05$; *** $P < 0.01$

species pooled were recorded for four of the seven regions with significant increases in the Northwest (6.2%) and Southeast (7.6%). The proportion of increasing species in the Northwest (68%) was highly significantly >50%, but that for the Southeast (52%) was not. Summing over these two regions, 13 species showed significant or nearly significant increases compared to only three species that showed significant or nearly significant decreases. The Northeast and North-central regions had smaller and non-significant increases in the number of adults of all species pooled (3.5% and 2.7%, respectively) and had proportions of increasing species (61% and 54%, respectively) that were not significantly >50%. Summing over these two regions, six species showed significant or nearly significant increases compared to only three species that showed significant or nearly significant decreases.

In contrast, adult population size for all species pooled decreased in the remaining three regions by a highly significant -11.5% in the Southwest, a nearly significant -8.2% in the South-central, and a non-significant -2.4% in the Alaska/Boreal Canada regions. The proportions of declining species in the Southwest (67%) and South-central (71%) regions were significantly >50%. Summing over these two regions, 13 species showed significant or nearly significant decreases compared to only six species that showed significant or nearly significant increases. The proportion of decreasing species in the Alaska/Boreal Canada Region was not significantly >50% and only one species showed a significant or nearly significant decrease while no species showed a significant or nearly significant increase.

On a continent-wide basis, numbers of adults of all species pooled increased between 2000 and 2001 by a non-significant 1.2%, and a non-significant 55% of 139 species showed increases.

Productivity. — Over most regions, numbers of young captured and reproductive index for all species pooled were relatively similar between 2000 and 2001. Exceptions were in the South-central Region, where numbers of young and the reproductive index increased by 40.8% and 53.4% (both highly significant), respectively, and the proportions of increasing species for these two parameters were each 88% (again, both highly significant); and in the Alaska/Boreal Canada Region, where numbers of young and the reproductive index increased by 38.9% (significant) and 42.8% (highly significant), respectively, and the proportions of increasing species for these two parameters were 65% (non-significant) and 82% (highly significant), respectively. Summing over these two regions, seven species showed significant or nearly significant increases in young (as opposed to only two species showing significant or nearly significant decreases), and seven species showed significant or nearly significant increases in reproductive index (as opposed to no species showing even a nearly significant decrease). Numbers of young captured for all species pooled also increased in three other regions by amounts ranging from 6.1% (Southwest) to 12.9% (North-central), but only the 12.4% increase in the Southeast region was even nearly significant. The proportion of species with increasing numbers of young was significantly >50% only for the North-central Region (67%). Reproductive index showed similar, relatively small increases for these three regions, ranging from 4.4% (Southeast) to 19.9% (Southwest); none of these increases were even nearly significant. The proportion of species with increasing reproductive indices in these three regions ranged from a non-significant 48% (Southeast) to a significant 75% (North-central) with that for the Southwest (62%) being nearly significantly >50%. Summing over these three regions, nine species showed significant or nearly significant increases in young (as opposed to five species showing significant or nearly significant decreases), and eight species showed significant or nearly significant increases in reproductive index (as opposed to no species showing even a nearly significant decrease).

The number of young captured and the reproductive index decreased relatively slightly between 2000 and 2001 in the Northwest (-6.7% and -12.2%, respectively) and Northeast (-6.0% and -9.2%, respectively) regions; none of the four changes was even nearly significant. Similarly, the proportion of decreasing species for the two parameters in the two regions ranged from 46% to 58% and none of the four proportions was even nearly significantly >50%. Summing over these two regions, 14 species showed significant or nearly significant decreases in young, while 13 species showing significant or nearly significant

increases; and six species showed significant or nearly significant decreases in reproductive index, while three species showed significant or nearly significant decreases.

On a continent-wide basis, the number of young captured and the proportion of young in the catch showed non-significant increases of 3.8% and 2.6%, respectively, between 2000 and 2001, while the proportions of increasing species for these two parameters were 55% (non-significant) and 58% (significant), respectively.

SURVIVAL-RATES

Maximum-likelihood estimates of time-constant regional annual adult apparent survival rates, recapture probabilities, and proportions of residents among newly captured adults were derived from 10 years of capture-mark-recapture data pooled over all stations (in each region) that were operated for four or more consecutive years during the 1992-2001 period (Table 4). Data were thus pooled from 136 stations in the Northwest, 68 in the Southwest, 38 in the North-central, 62 in the South-central, 73 in the Northeast, 73 in the Southeast, and 29 in the Alaska/Boreal Canada region, for a total of 479 stations and an average of 68 stations per region (Table 5). The increases for the 10-yr period (1992-2001) over the 7-yr period (1992-1998) in the number of stations contributing data to survivorship analyses ranged from 11% in the South-central Region to 100% in the Southwest and averaged 44%.

Within the 10-yr data set, 77 species fulfilled the revised selection criteria for survivorship analyses in the Northwest Region, 72 in the Southwest, 54 in the North-central, 60 in the South-central, 71 in the Northeast, 41 in the Southeast, and 36 in the Alaska/Boreal Canada Region, for an average of 59 species per region (Tables 4 and 5). The increases, due primarily to the revised selection criteria, in the number of species per region for which survivorship estimates could be obtained ranged from 15% in the Northwest to 60% in the Southwest and averaged 34%.

Also included in Table 4 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 these individuals. The mean number of individual adult birds captured per station per species during the 10 years (1992-2001) was lowest for the Northeast (21.3) and Southeast (22.1) regions, higher for the South-central (29.1), Northwest (33.3), North-central (35.0), and Southwest (35.3) regions, and highest for the Alaska/Boreal Canada Region (51.2). Two of the Southwest stations operated more than 10 nets for up to eight days per period, which may have slightly inflated the average number of individuals per station per species there. No such large amounts of extra effort were characteristic of any Alaska/Boreal Canada station, so the high average number of individuals per station per species there appeared not to be a function of extra effort. Altogether, the 479 stations included in this survivorship analysis were operated for an average of 6.97 yr each (62 stations for four years, 105 for five, 45 for six, 55 for seven, 78 for eight, 53 for nine, and 81 for 10 years) and produced an average capture rate of 4.41 adult individuals per station per species per year. These captures, of course, were not distributed uniformly over all stations at which a species was captured; typically, fewer individuals than average were captured at most stations and many more individuals than average were captured at a few stations.

As in past years, the average total number of captures per individual per species (for species that met survivorship selection criteria) was remarkably constant over the seven regions, ranging from 1.34 ± 0.21 in the South-central region to 1.54 ± 0.25 in the Alaska/Boreal Canada Region, and averaging 1.41 ± 0.28 overall. Similarly, the average total number of returns per individual per species also remained remarkably constant over the seven regions, ranging from 0.129 ± 0.058 in the Southeast region to 0.158 ± 0.076 in the Alaska/Boreal Canada region, and averaging 0.140 ± 0.079 overall.

The precision of the estimates of annual adult survival rate using 10 years of data (1992-2001) from a total of 479 stations increased over that obtained during seven years (1992-1998) from a total of 346 stations (Table 5). The mean coefficient of variation in survival probability, CV(φ), for all species in each region ranged from 16.4% in the Northwest Region to 23.4% in the South-central Region and averaged 20.8 ± 2.7% over the seven regions. These figures compare to

TABLE 4. Regional time-constant estimates of annual adult survival probability, recapture probability, and proportion of residents from modified Cormack-Jolly-Seber capture-mark-recapture analyses[1] (using a transient model[2]) and the selected time-dependent models from ten years (1992-2001) of MAPS data for species with adequate data[3].

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8]				Recapture probability[9]				Proportion of residents[10]				Models selected[12]				
					φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	p	SE	CV(p)	$w(p_t)$[11]	τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	1	2	3	4	5
NORTHWEST MAPS REGION																					
Williamson's Sapsucker	8	81	112	9	0.324	0.132	40.7	0.010	0.341	0.212	62.3	0.119	0.734	0.485	66.0	0.019	...				
Red-naped Sapsucker	28	370	608	62	0.366	0.049	13.3	0.002	0.544	0.091	16.6	0.004	0.544	0.125	23.0	0.002	...				
R.-naped x R.-breasted Hybrid	8	46	110	19	0.628	0.094	14.9	0.009	0.556	0.131	23.5	0.046	0.452	0.188	41.6	0.145	...				
Red-breasted Sapsucker	47	671	1061	107	0.449	0.040	9.0	0.008	0.371	0.055	14.9	0.056	0.624	0.110	17.6	0.022	...				
Downy Woodpecker	45	355	433	27	0.319	0.083	26.0	0.014	0.213	0.102	47.8	0.143	0.952	0.450	47.3	0.001	...				
Hairy Woodpecker	56	249	311	43	0.550	0.068	12.3	0.205	0.286	0.076	26.6	0.125	0.643	0.199	30.9	0.025	...				
Northern Flicker	46	171	189	6	0.436	0.183	42.0	0.159	0.096	0.104	108.3	0.039	0.592	0.628	106.1	0.009	...				
Western Wood-Pewee	54	1015	1348	146	0.513	0.037	7.2	0.159	0.336	0.044	13.2	0.383	0.503	0.077	15.4	0.350	.t.	..t	...	t..	
"Traill's" Flycatcher	32	1115	1644	166	0.524	0.033	6.4	0.160	0.460	0.046	10.0	0.052	0.329	0.046	13.8	0.915	..t				
Hammond's Flycatcher	53	1142	1650	185	0.453	0.031	6.9	0.222	0.404	0.044	10.9	0.109	0.530	0.071	13.4	0.003	...				
Dusky Flycatcher	47	1903	2895	276	0.488	0.024	4.9	0.992	0.421	0.034	8.1	0.019	0.324	0.035	10.9	0.013	t..				
"Western" Flycatcher	54	1681	2232	190	0.481	0.030	6.3	0.135	0.314	0.037	11.9	0.024	0.407	0.056	13.7	0.127	...				
Cassin's Vireo	29	459	548	32	0.544	0.076	13.9	0.034	0.162	0.059	36.6	0.056	0.426	0.163	38.2	0.014	...				
Hutton's Vireo	11	54	70	6	0.585	0.169	28.8	0.000	0.337	0.196	58.1	0.002	0.224	0.165	73.7	0.001	...				
Warbling Vireo	86	3560	5306	604	0.479	0.017	3.6	0.180	0.422	0.024	5.7	0.017	0.465	0.034	7.3	0.070	...				
Red-eyed Vireo	7	126	187	14	0.664	0.116	17.5	0.168	0.198	0.086	43.1	0.045	0.309	0.152	49.4	0.002	...				
Gray Jay	12	55	76	18	0.754	0.088	11.7	0.007	0.232	0.082	35.5	0.014	0.677	0.266	39.2	0.004	...				
Steller's Jay	50	203	222	14	0.659	0.121	18.4	0.001	0.094	0.065	69.5	0.004	0.529	0.376	71.1	0.004	...				
Western Scrub-Jay	9	38	46	6	0.624	0.153	24.6	0.001	0.207	0.147	71.1	0.002	0.487	0.375	77.0	0.000	...				
Tree Swallow	15	386	538	45	0.447	0.066	14.8	0.005	0.272	0.075	27.7	0.005	0.682	0.206	30.2	0.003	...				
Barn Swallow	4	298	376	34	0.524	0.070	13.4	0.473	0.185	0.062	33.3	0.334	0.573	0.199	34.8	0.014	t..	.t.	...		
Black-capped Chickadee	43	831	1179	136	0.466	0.038	8.2	0.624	0.443	0.054	12.3	0.899	0.489	0.075	15.4	0.091	tt.	.t.			
Mountain Chickadee	41	891	1133	109	0.471	0.042	8.9	0.015	0.414	0.058	14.0	0.030	0.376	0.067	17.7	0.006	...				
Chestnut-backed Chickadee	45	784	902	53	0.325	0.059	18.1	0.007	0.180	0.068	38.0	0.094	0.999	0.390	39.0	0.003	...				
Bushtit*†	13	142	164	4	0.256	0.206	80.3	0.025	0.102	0.165	162.1	0.006	1.000	1.488	148.8	0.019	...				
Red-breasted Nuthatch	64	510	574	22	0.336	0.091	27.2	0.004	0.170	0.099	58.3	0.022	0.594	0.356	60.0	0.028	...				
Brown Creeper	48	492	615	41	0.328	0.067	20.3	0.005	0.252	0.090	35.5	0.018	0.836	0.312	37.3	0.001	...				
Bewick's Wren	13	168	298	40	0.452	0.065	14.4	0.002	0.461	0.099	21.5	0.016	0.803	0.221	27.6	0.001	...				
House Wren	27	597	831	53	0.278	0.051	18.3	0.002	0.373	0.098	26.2	0.001	0.660	0.186	28.2	0.002	...				
Winter Wren	37	926	1489	117	0.375	0.035	9.4	0.855	0.521	0.064	12.4	0.078	0.354	0.061	17.3	0.089	t..				
Golden-crowned Kinglet*	54	859	1056	13	0.128	0.078	60.9	0.004	0.358	0.256	71.4	0.003	0.232	0.127	54.7	0.026	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8]				Recapture probability[9]				Proportion of residents[10]				Models selected[12]				
					φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	p	SE	CV(p)	$w(p_t)$[11]	τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	1	2	3	4	5
Ruby-crowned Kinglet	14	628	793	30	0.255	0.069	26.8	0.366	0.275	0.112	40.7	0.737	0.564	0.224	39.8	0.031	.t.	t..			
Veery	4	92	183	36	0.714	0.073	10.3	0.001	0.386	0.080	20.8	0.001	0.587	0.159	27.1	0.015	...				
Swainson's Thrush	78	7394	16732	2809	0.586	0.008	1.3	0.014	0.629	0.011	1.7	0.002	0.438	0.015	3.4	0.098	...				
Hermit Thrush	35	808	1251	148	0.461	0.033	7.3	0.003	0.537	0.053	9.8	0.070	0.383	0.056	14.7	0.003	...				
American Robin	116	3947	5322	595	0.575	0.019	3.3	0.418	0.258	0.018	7.0	0.005	0.582	0.045	7.7	0.398	t..	..t	...		
Varied Thrush	30	388	526	51	0.494	0.059	11.9	0.050	0.407	0.080	19.6	0.083	0.343	0.087	25.2	0.002	...				
Wrentit	21	487	1143	174	0.527	0.029	5.6	0.677	0.637	0.045	7.1	0.164	0.424	0.063	14.9	0.818	t.t	..t			
Gray Catbird	12	584	885	106	0.561	0.048	8.6	0.021	0.450	0.059	13.2	0.004	0.450	0.076	16.9	0.442	...	..t			
Cedar Waxwing	24	1456	1656	11	0.639	0.152	23.8	0.006	0.022	0.016	71.5	0.001	0.246	0.165	67.0	0.038	...				
Orange-crowned Warbler	40	1468	2024	183	0.481	0.032	6.6	0.035	0.418	0.044	10.5	0.015	0.329	0.044	13.4	0.006	...				
Nashville Warbler	21	685	825	35	0.334	0.066	19.9	0.015	0.371	0.111	29.8	0.026	0.297	0.099	33.4	0.076	...				
Virginia's Warbler	3	180	203	12	0.443	0.141	31.8	0.007	0.171	0.124	72.2	0.863	0.668	0.489	73.2	0.006	.t.				
Yellow Warbler	49	4086	6770	906	0.571	0.015	2.7	0.166	0.493	0.020	4.0	0.005	0.410	0.024	5.8	0.059	...				
Yellow-rumped Warbler	60	2906	3482	234	0.486	0.030	6.1	0.076	0.208	0.028	13.4	0.644	0.504	0.071	14.1	0.010	.t.	...			
Black-throated Gray Warbler	17	121	139	5	0.487	0.196	40.2	0.022	0.092	0.100	108.5	0.005	0.582	0.627	107.7	0.005	...				
Townsend's Warbler	23	823	1031	83	0.451	0.048	10.5	0.007	0.216	0.049	22.8	0.007	0.704	0.171	24.3	0.012	...				
Hermit Warbler	34	1030	1125	29	0.599	0.083	13.9	0.023	0.069	0.033	47.7	0.013	0.360	0.171	47.5	0.010	...				
American Redstart	7	304	518	52	0.443	0.054	12.2	0.018	0.526	0.089	16.9	0.371	0.343	0.088	25.7	0.132	...	.t.			
Northern Waterthrush	5	121	162	14	0.626	0.122	19.5	0.652	0.257	0.114	44.3	0.007	0.389	0.195	50.2	0.049	t..	...			
MacGillivray's Warbler	85	5763	11260	1365	0.479	0.011	2.3	0.559	0.614	0.018	2.9	0.011	0.408	0.020	4.8	0.415	t..	..t			
Common Yellowthroat	27	1452	2958	386	0.499	0.021	4.2	0.007	0.556	0.032	5.7	0.012	0.470	0.043	9.1	0.006	...				
Wilson's Warbler	56	3638	5707	548	0.438	0.017	3.9	0.016	0.526	0.028	5.3	0.010	0.338	0.026	7.8	0.952	..t				
Yellow-breasted Chat	15	873	1607	195	0.448	0.028	6.2	0.878	0.560	0.047	8.3	0.105	0.474	0.062	13.1	0.118	t..				
Western Tanager	73	1386	1520	80	0.538	0.052	9.6	0.002	0.129	0.038	29.5	0.024	0.533	0.164	30.7	0.001	...				
Green-tailed Towhee	5	209	343	45	0.602	0.069	11.4	0.004	0.360	0.076	21.1	0.017	0.539	0.139	25.9	0.005	...				
Spotted Towhee	42	955	1492	188	0.476	0.030	6.4	0.575	0.508	0.046	9.1	0.078	0.460	0.060	13.0	0.019	t..	...			
Chipping Sparrow	37	760	935	62	0.403	0.053	13.1	0.055	0.203	0.056	27.7	0.062	0.673	0.193	28.7	0.446	...	..t			
Vesper Sparrow	3	48	60	8	0.688	0.141	20.5	0.002	0.346	0.161	46.5	0.008	0.320	0.195	61.0	0.001	...				
Savannah Sparrow	2	321	403	53	0.585	0.076	12.9	0.002	0.285	0.071	25.0	0.001	0.622	0.176	28.3	0.002	...				
Fox Sparrow	25	505	877	103	0.553	0.043	7.8	0.871	0.451	0.057	12.6	0.044	0.396	0.069	17.5	0.419	t..	t.t			
Song Sparrow	98	5868	12172	1515	0.470	0.011	2.2	0.250	0.598	0.017	2.8	0.047	0.500	0.023	4.6	0.004	...				
Lincoln's Sparrow	37	2091	4937	629	0.432	0.016	3.6	0.125	0.631	0.027	4.2	0.045	0.643	0.045	7.0	0.073	...				
White-crowned Sparrow	14	598	1037	145	0.474	0.033	7.0	0.024	0.544	0.052	9.6	0.004	0.493	0.072	14.6	0.039	...				
Dark-eyed Junco	83	5217	8874	1124	0.461	0.012	2.7	0.971	0.500	0.019	3.8	0.044	0.527	0.028	5.3	0.097	t..				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Black-headed Grosbeak	68	2057	2652	272	0.568	0.027	4.8	0.008	0.280	0.028	10.0	0.005	0.445	0.051	11.4	0.016	...				
Lazuli Bunting	25	1074	1375	93	0.552	0.044	8.0	0.002	0.245	0.043	17.5	0.004	0.321	0.062	19.4	0.050	...				
Red-winged Blackbird	18	799	899	55	0.784	0.085	10.8	0.017	0.148	0.043	29.1	0.008	0.346	0.103	29.7	0.047	...				
Brewer's Blackbird*†	10	51	54	2	0.586	0.304	51.9	0.000	0.032	0.094	289.7	0.000	1.000	2.874	287.4	0.000	...				
Brown-headed Cowbird	60	748	1105	140	0.486	0.039	8.0	0.030	0.485	0.055	11.3	0.124	0.483	0.072	14.9	0.027	...				
Bullock's Oriole	19	497	633	43	0.454	0.068	15.0	0.047	0.429	0.096	22.4	0.402	0.266	0.075	28.3	0.020	...	.t.			
Purple Finch	32	2386	2975	235	0.434	0.028	6.4	0.038	0.364	0.039	10.7	0.046	0.394	0.049	12.6	0.016	...				
Cassin's Finch	18	437	466	12	0.345	0.122	35.4	0.024	0.181	0.132	73.3	0.792	0.298	0.222	74.4	0.017	.t.				
House Finch†	5	300	340	15	0.477	0.118	24.8	0.029	0.070	0.064	91.7	0.018	1.000	0.930	93.0	0.025	...				
Pine Siskin*†	46	2178	2327	17	0.175	0.090	51.1	0.218	0.041	0.052	126.5	0.075	1.000	1.190	119.0	0.087	...				
Lesser Goldfinch*†	9	264	285	7	0.297	0.171	57.6	0.001	0.082	0.121	147.7	0.001	1.000	1.443	144.3	0.001	...				
American Goldfinch	20	1434	1930	171	0.470	0.032	6.8	0.640	0.328	0.040	12.3	0.996	0.441	0.063	14.3	0.015	tt.	.t.			
Mean (77 species)	34	1164	1847	203	0.482	0.071	16.4	0.162	0.333	0.072	36.4	0.114	0.524	0.247	38.9	0.093					
Std. Dev. (77 species)	25	1474	2877	415	0.122	0.054	15.1	0.266	0.166	0.047	44.3	0.224	0.199	0.415	42.5	0.195					
Mean (66 adequately-est. sp.)[13]	36	1285	2074	235	0.503	0.056	11.3	0.181	0.365	0.063	22.6	0.104	0.488	0.129	26.1	0.105					
Std. Dev. (66 species)	25	1541	3038	440	0.107	0.037	6.8	0.281	0.152	0.036	17.4	0.205	0.156	0.101	17.9	0.208					
SOUTHWEST MAPS REGION																					
Williamson's Sapsucker	5	82	106	6	0.572	0.172	30.1	0.003	0.171	0.121	70.9	0.032	0.315	0.242	76.7	0.001	...				
Red-naped Sapsucker	4	119	237	49	0.494	0.058	11.8	0.004	0.665	0.090	13.5	0.033	0.624	0.153	24.5	0.004	...				
Red-breasted Sapsucker	2	30	39	5	0.689	0.179	26.0	0.000	0.452	0.221	49.0	0.000	0.261	0.192	73.5	0.000	...				
Nuttall's Woodpecker	16	195	312	40	0.551	0.068	12.4	0.003	0.381	0.086	22.5	0.008	0.580	0.160	27.5	0.084	...				
Downy Woodpecker	20	217	339	43	0.605	0.066	11.0	0.003	0.431	0.082	19.0	0.009	0.353	0.094	26.8	0.019	...				
Hairy Woodpecker	10	71	106	16	0.834	0.097	11.7	0.002	0.182	0.069	38.0	0.025	0.410	0.177	43.3	0.002	...				
Northern Flicker*	21	140	158	7	0.310	0.158	51.0	0.003	0.191	0.195	102.2	0.004	0.658	0.684	104.0	0.001	...				
Olive-sided Flycatcher	2	55	77	12	0.870	0.088	10.1	0.000	0.724	0.128	17.7	0.000	0.027	0.027	100.0	0.000	...				
Western Wood-Pewee	15	278	362	29	0.384	0.073	19.1	0.016	0.446	0.124	27.7	0.064	0.394	0.136	34.5	0.078	...				
"Traill's" Flycatcher*	5	43	57	5	0.615	0.260	42.3	0.000	0.306	0.218	71.2	0.000	0.373	0.305	81.7	0.000	...				
"Western" Flycatcher	15	892	1019	43	0.595	0.069	11.5	0.051	0.183	0.054	29.5	0.918	0.208	0.064	30.6	0.004	.t.				
Black Phoebe	13	143	173	14	0.522	0.119	22.8	0.007	0.369	0.147	39.7	0.010	0.281	0.136	48.5	0.001	...				
Ash-throated Flycatcher	31	676	787	66	0.659	0.064	9.7	0.011	0.137	0.041	29.5	0.004	0.595	0.181	30.3	0.057	...				
Bell's Vireo	5	112	190	25	0.482	0.096	19.9	0.005	0.596	0.144	24.1	0.000	0.478	0.166	34.7	0.001	...				
Plumbeous Vireo*	8	54	77	9	0.722	0.203	28.1	0.001	0.206	0.117	56.8	0.001	0.537	0.322	60.0	0.000	...				
Warbling Vireo	15	1253	1576	95	0.539	0.044	8.2	0.005	0.460	0.060	13.1	0.008	0.135	0.025	18.3	1.000	..t				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Steller's Jay	9	98	137	24	0.762	0.075	9.8	0.001	0.234	0.070	29.8	0.645	0.497	0.169	34.1	0.018	.t.	...			
Western Scrub-Jay	13	64	74	5	0.643	0.194	30.2	0.001	0.084	0.090	107.0	0.004	0.664	0.698	105.1	0.001	...				
Mexican Jay*	3	35	42	2	0.531	0.377	71.0	0.000	0.166	0.233	140.7	0.000	0.284	0.381	134.4	0.000	...				
Tree Swallow	5	75	92	6	0.556	0.163	29.3	0.007	0.320	0.192	60.2	0.003	0.182	0.137	75.2	0.014	...				
Violet-green Swallow	5	111	150	13	0.570	0.126	22.1	0.004	0.248	0.112	45.1	0.983	0.368	0.191	52.0	0.005	.t.				
Black-capped Chickadee	7	110	179	20	0.366	0.092	25.0	0.021	0.600	0.166	27.7	0.005	0.673	0.271	40.3	0.001	...				
Mountain Chickadee	10	254	344	33	0.408	0.072	17.6	0.609	0.292	0.094	32.0	0.401	0.758	0.264	34.8	0.008	t..	.t.			
Chestnut-backed Chickadee	6	259	453	68	0.501	0.051	10.2	0.072	0.512	0.075	14.7	0.968	0.587	0.123	21.0	0.001	.t.				
Bridled Titmouse*	4	28	40	8	0.714	0.238	33.4	0.000	0.344	0.207	60.1	0.000	0.779	0.510	65.5	0.000	...				
Oak Titmouse	11	153	232	24	0.514	0.081	15.7	0.001	0.358	0.104	29.0	0.001	0.391	0.147	37.6	0.070	...				
Juniper Titmouse	4	44	82	16	0.655	0.133	20.3	0.000	0.409	0.139	34.0	0.000	0.759	0.310	40.9	0.001	...				
Bushtit†	30	975	1151	52	0.300	0.061	20.3	0.568	0.152	0.061	39.9	0.699	1.000	0.391	39.1	0.171	tt.	.t.	t..	.tt	
White-breasted Nuthatch	14	87	112	12	0.486	0.135	27.8	0.068	0.396	0.171	43.1	0.034	0.436	0.239	54.9	0.130	...				
Brown Creeper*	9	130	156	4	0.317	0.220	69.5	0.160	0.177	0.214	121.3	0.112	0.414	0.462	111.7	0.023	...				
Bewick's Wren	38	1047	1727	186	0.424	0.031	7.4	0.936	0.538	0.051	9.5	0.127	0.492	0.064	13.1	0.976	t.t				
House Wren	27	941	1417	117	0.388	0.038	9.8	0.002	0.439	0.062	14.0	0.014	0.499	0.085	17.0	0.001	...				
Golden-crowned Kinglet*	5	43	62	4	0.342	0.212	62.1	0.000	0.292	0.296	101.5	0.000	0.866	0.937	108.2	0.000	...				
Western Bluebird	10	90	126	7	0.380	0.143	37.6	0.006	0.355	0.212	59.9	0.012	0.278	0.201	72.3	0.000	...				
Swainson's Thrush	8	1819	3187	292	0.619	0.026	4.1	0.101	0.578	0.034	5.9	0.913	0.144	0.016	11.0	1.000	.tt				
Hermit Thrush	9	410	613	93	0.450	0.045	10.0	0.032	0.400	0.064	15.9	0.021	0.840	0.162	19.2	0.001	...				
American Robin	27	706	910	111	0.529	0.044	8.3	0.221	0.309	0.050	16.2	0.008	0.579	0.108	18.7	0.739	..t				
Wrentit	16	838	1583	213	0.540	0.029	5.4	0.652	0.618	0.043	6.9	0.037	0.346	0.043	12.5	0.365	t..	..t			
California Thrasher†	8	62	78	9	0.687	0.180	26.2	0.005	0.115	0.089	77.5	0.002	1.000	0.774	77.4	0.001	...				
Orange-crowned Warbler	15	1076	1332	73	0.413	0.051	12.4	0.069	0.318	0.067	21.0	0.029	0.320	0.075	23.4	0.097	...				
Virginia's Warbler	9	283	379	32	0.484	0.075	15.5	0.001	0.395	0.102	25.9	0.044	0.307	0.099	32.2	0.005	...				
Lucy's Warbler	5	256	330	33	0.507	0.084	16.7	0.006	0.260	0.084	32.2	0.002	0.667	0.229	34.3	0.002	...				
Yellow Warbler	18	1097	1603	167	0.479	0.035	7.3	0.777	0.526	0.052	9.9	0.022	0.357	0.049	13.7	0.120	t..				
Yellow-rumped Warbler	9	301	339	12	0.285	0.113	39.7	0.073	0.231	0.167	72.3	0.032	0.524	0.390	74.4	0.478	..t	...			
Black-throated Gray Warbler*†	1	23	27	2	0.704	0.582	82.7	0.000	0.082	0.175	212.4	0.000	1.000	1.908	190.8	0.000	...				
MacGillivray's Warbler	7	124	172	10	0.294	0.126	43.1	0.003	0.329	0.209	63.4	0.044	0.690	0.450	65.2	0.004	...				
Common Yellowthroat	22	1624	2476	240	0.525	0.033	6.2	0.957	0.426	0.040	9.5	0.010	0.399	0.046	11.5	0.005	t..				
Wilson's Warbler	9	2609	3421	194	0.446	0.029	6.6	0.020	0.510	0.047	9.2	0.967	0.142	0.019	13.2	1.000	.tt				
Yellow-breasted Chat	17	750	1334	178	0.522	0.035	6.6	0.058	0.521	0.048	9.2	0.036	0.510	0.066	13.0	0.034	...				
Summer Tanager	6	125	198	33	0.506	0.089	17.5	0.084	0.451	0.111	24.7	0.006	0.783	0.243	31.0	0.001	...				
Western Tanager	12	380	420	19	0.558	0.097	17.3	0.000	0.174	0.080	46.0	0.018	0.265	0.128	48.3	0.004	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Spotted Towhee	36	1170	1758	238	0.496	0.028	5.7	0.026	0.430	0.039	9.1	0.852	0.577	0.066	11.5	0.019	.t.				
California Towhee	17	392	559	87	0.536	0.048	9.0	0.072	0.356	0.059	16.5	0.018	0.687	0.135	19.6	0.150	...				
Rufous-crowned Sparrow	7	94	140	14	0.579	0.139	24.1	0.004	0.235	0.117	49.9	0.016	0.673	0.343	50.9	0.000	...				
Chipping Sparrow†	8	131	149	9	0.455	0.157	34.6	0.004	0.098	0.111	112.8	0.002	1.000	1.173	117.3	0.008	...				
Lark Sparrow	8	271	298	17	0.509	0.127	25.0	0.003	0.324	0.136	42.0	0.002	0.229	0.111	48.6	0.004	...				
Sage Sparrow*†	3	118	123	3	0.587	0.297	50.6	0.004	0.033	0.083	252.0	0.003	1.000	2.428	242.8	0.001	...				
Fox Sparrow	3	95	157	21	0.519	0.081	15.5	0.019	0.551	0.125	22.8	0.007	0.346	0.143	41.1	0.001	...				
Song Sparrow	26	2101	3515	451	0.520	0.022	4.2	0.717	0.479	0.030	6.2	0.289	0.513	0.042	8.2	0.091	t..	.t.			
Lincoln's Sparrow	3	112	383	35	0.437	0.057	13.0	0.002	0.876	0.080	9.1	0.002	0.172	0.099	57.3	0.000	...				
White-crowned Sparrow*	3	36	44	3	0.688	0.183	26.7	0.000	0.232	0.189	81.5	0.000	0.156	0.177	113.2	0.000	...				
Dark-eyed Junco	8	336	516	63	0.387	0.051	13.1	0.011	0.560	0.090	16.0	0.992	0.617	0.139	22.5	0.009	.t.				
Black-headed Grosbeak	35	1684	2150	216	0.526	0.030	5.8	0.127	0.345	0.037	10.6	0.006	0.380	0.048	12.7	0.779	..t				
Blue Grosbeak	11	187	228	20	0.409	0.114	28.0	0.012	0.488	0.171	35.1	0.003	0.408	0.189	46.3	0.003	...				
Lazuli Bunting	21	643	790	47	0.372	0.057	15.4	0.042	0.473	0.100	21.2	0.805	0.241	0.066	27.2	0.003	.t.				
Red-winged Blackbird*†	9	232	259	13	0.880	0.263	29.8	0.000	0.037	0.038	102.5	0.001	1.000	0.957	95.7	0.001	...				
Brown-headed Cowbird	30	275	419	59	0.463	0.057	12.3	0.000	0.568	0.087	15.3	0.001	0.524	0.118	22.6	0.001	...				
Bullock's Oriole	18	566	739	52	0.458	0.063	13.7	0.007	0.377	0.082	21.7	0.015	0.307	0.079	25.7	0.002	...				
Purple Finch	7	932	1202	113	0.531	0.043	8.2	0.049	0.304	0.047	15.3	0.914	0.445	0.081	18.1	0.008	.t.				
Cassin's Finch*†	5	143	154	5	0.320	0.175	54.8	0.001	0.088	0.148	168.7	0.003	1.000	1.704	170.4	0.000	...				
Lesser Goldfinch	23	916	992	27	0.422	0.089	21.2	0.007	0.124	0.065	52.5	0.002	0.408	0.213	52.1	0.793	..t				
American Goldfinch	14	549	622	26	0.407	0.089	21.8	0.150	0.101	0.061	59.9	0.227	0.854	0.507	59.4	0.034	...	.t.			
Mean (72 species)	12	450	636	60	0.519	0.112	22.3	0.096	0.349	0.108	46.8	0.159	0.508	0.309	53.1	0.117					
Std. Dev. (72 species)	9	541	800	82	0.131	0.091	16.8	0.222	0.175	0.060	46.6	0.315	0.249	0.427	44.0	0.270					
Mean (52 adequately-est. sp.)[13]	14	568	815	79	0.519	0.073	14.2	0.116	0.412	0.089	25.0	0.202	0.443	0.138	33.1	0.149					
Std. Dev. (52 species)	9	583	866	89	0.105	0.037	6.8	0.246	0.156	0.044	14.4	0.349	0.195	0.092	18.8	0.304					
NORTH-CENTRAL MAPS REGION																					
Red-bellied Woodpecker*	9	38	44	5	0.442	0.200	45.4	0.000	0.267	0.242	90.7	0.000	0.687	0.705	102.6	0.000	...				
Downy Woodpecker	22	283	361	34	0.405	0.075	18.4	0.001	0.229	0.085	37.2	0.004	0.940	0.373	39.7	0.002	...				
Hairy Woodpecker	16	59	69	8	0.471	0.153	32.4	0.028	0.752	0.212	28.2	0.002	0.186	0.115	61.7	0.002	...				
Northern Flicker*	18	79	99	4	0.340	0.190	55.8	0.003	0.340	0.289	85.0	0.003	0.240	0.229	95.3	0.001	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Western Wood-Pewee†	2	79	136	22	0.486	0.095	19.6	0.334	0.388	0.123	31.8	0.491	1.000	0.387	38.7	0.001	.t.	t..			
Eastern Wood-Pewee	15	147	179	12	0.522	0.124	23.8	0.039	0.368	0.158	42.9	0.024	0.215	0.114	53.1	0.012	...				
"Traill's" Flycatcher	12	649	1026	101	0.484	0.040	8.2	0.005	0.509	0.061	12.1	0.020	0.354	0.062	17.6	0.069	...				
Least Flycatcher	12	847	1161	94	0.368	0.043	11.8	0.006	0.431	0.071	16.4	0.771	0.457	0.089	19.5	0.022	.t.				
Great Crested Flycatcher	16	99	118	16	0.747	0.111	14.8	0.000	0.306	0.105	34.2	0.001	0.276	0.118	43.0	0.000	...				
White-eyed Vireo	2	32	74	11	0.515	0.106	20.5	0.000	0.569	0.174	30.6	0.000	0.340	0.242	71.1	0.000	...				
Warbling Vireo	8	105	114	5	0.413	0.193	46.8	0.012	0.216	0.214	99.2	0.031	0.320	0.337	105.2	0.004	...				
Red-eyed Vireo	24	631	851	85	0.534	0.045	8.4	0.135	0.391	0.059	15.2	0.925	0.345	0.067	19.4	0.107	.t.				
Blue Jay†	20	194	214	14	0.525	0.120	22.8	0.005	0.083	0.072	86.8	0.011	1.000	0.892	89.2	0.004	...				
Black-capped Chickadee	28	654	855	74	0.417	0.048	11.6	0.012	0.394	0.071	18.1	0.014	0.438	0.096	21.9	0.263	...	..t			
Tufted Titmouse	10	163	230	39	0.555	0.071	12.8	0.007	0.407	0.089	21.9	0.005	0.566	0.158	27.9	0.010	...				
White-breasted Nuthatch	15	76	88	6	0.589	0.185	31.5	0.001	0.187	0.141	75.4	0.005	0.331	0.265	80.1	0.001	...				
Carolina Wren	7	87	130	15	0.357	0.099	27.6	0.660	0.619	0.193	31.1	0.120	0.421	0.198	47.0	0.001	t..				
House Wren	18	892	1343	101	0.322	0.038	11.7	0.511	0.440	0.071	16.0	0.178	0.542	0.101	18.6	0.086	t..	...			
Veery	9	390	702	129	0.575	0.037	6.5	0.067	0.586	0.051	8.7	0.135	0.532	0.077	14.4	0.017	...				
Wood Thrush	12	263	406	40	0.453	0.069	15.2	0.008	0.317	0.084	26.5	0.004	0.744	0.218	29.3	0.017	...				
American Robin	26	787	955	54	0.380	0.056	14.8	0.009	0.423	0.090	21.2	0.054	0.270	0.070	26.1	0.033	...				
Gray Catbird	23	2196	3562	405	0.497	0.021	4.1	0.293	0.478	0.030	6.3	0.721	0.424	0.037	8.8	0.154	.t.	t..			
Brown Thrasher	5	85	108	12	0.660	0.115	17.4	0.004	0.169	0.086	50.9	0.006	0.546	0.300	55.0	0.021	...				
Blue-winged Warbler	4	112	198	16	0.525	0.097	18.4	0.021	0.495	0.144	29.1	0.019	0.188	0.093	49.7	0.045	...				
Nashville Warbler	4	183	212	8	0.372	0.137	36.7	0.014	0.422	0.234	55.4	0.005	0.178	0.121	67.8	0.043	...				
Yellow Warbler	15	1336	2085	265	0.548	0.026	4.7	0.001	0.398	0.033	8.3	0.002	0.451	0.049	10.8	0.003	...				
Chestnut-sided Warbler	4	380	651	71	0.378	0.045	12.0	0.044	0.572	0.083	14.6	0.002	0.625	0.132	21.2	0.004	...				
Yellow-rumped Warbler*†	1	37	45	2	0.386	0.296	76.6	0.000	0.097	0.234	241.2	0.000	1.000	2.454	245.4	0.000	...				
Black-and-white Warbler	7	121	159	18	0.512	0.101	19.8	0.080	0.514	0.143	27.8	0.009	0.256	0.107	41.9	0.002	...				
American Redstart	11	605	842	54	0.454	0.056	12.4	0.005	0.282	0.065	23.0	0.207	0.397	0.102	25.7	0.012	...				
Ovenbird	8	373	479	42	0.575	0.065	11.3	0.424	0.272	0.068	25.1	0.204	0.390	0.112	28.8	0.320	..t	t..	...	tt.	
Northern Waterthrush†	2	61	80	7	0.336	0.155	46.0	0.001	0.270	0.223	82.6	0.000	1.000	0.887	88.7	0.000	...				
Kentucky Warbler	2	88	176	41	0.610	0.073	12.0	0.003	0.698	0.090	12.9	0.042	0.540	0.133	24.7	0.006	...				
Mourning Warbler	3	122	220	32	0.421	0.072	17.1	0.048	0.608	0.119	19.6	0.024	0.664	0.203	30.6	0.002	...				
Common Yellowthroat	24	1299	2267	216	0.433	0.027	6.3	0.081	0.498	0.044	8.8	0.122	0.448	0.055	12.2	0.821	..t				
Scarlet Tanager*	11	64	73	4	0.352	0.207	58.8	0.000	0.370	0.344	93.2	0.002	0.298	0.320	107.3	0.001	...				
Eastern Towhee	7	48	72	7	0.462	0.149	32.3	0.034	0.443	0.227	51.1	0.148	0.393	0.272	69.2	0.001	...				
Chipping Sparrow†	9	172	218	13	0.400	0.119	29.7	0.000	0.134	0.096	71.9	0.087	1.000	0.718	71.8	0.005	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Clay-colored Sparrow	6	233	268	7	0.568	0.194	34.2	0.066	0.059	0.064	108.1	0.063	0.540	0.566	104.9	0.013	...				
Field Sparrow	8	593	871	93	0.426	0.043	10.1	0.005	0.392	0.062	15.9	0.003	0.600	0.114	19.0	0.001	...				
Savannah Sparrow*	3	39	49	3	0.479	0.221	46.1	0.000	0.441	0.336	76.3	0.000	0.114	0.131	115.1	0.000	...				
Song Sparrow	22	1137	1967	233	0.444	0.026	5.9	0.390	0.517	0.042	8.2	0.238	0.527	0.061	11.6	0.012	...	t..	.t.		
Lincoln's Sparrow	2	48	90	10	0.426	0.115	26.9	0.001	0.785	0.184	23.5	0.001	0.233	0.147	62.8	0.000	...				
Swamp Sparrow	6	201	357	32	0.386	0.062	15.9	0.004	0.776	0.110	14.1	0.009	0.231	0.081	35.1	0.002	...				
White-throated Sparrow	3	309	633	60	0.383	0.046	11.9	0.218	0.621	0.087	14.1	0.103	0.495	0.118	23.9	0.033	...				
Northern Cardinal	18	603	819	97	0.539	0.043	8.0	0.069	0.355	0.053	14.9	0.059	0.435	0.079	18.3	0.066	...				
Rose-breasted Grosbeak	18	285	319	12	0.233	0.108	46.6	0.042	0.317	0.223	70.2	0.424	0.509	0.378	74.3	0.005	...	.t.			
Black-headed Grosbeak*	1	55	72	4	0.584	0.221	37.9	0.011	0.109	0.114	105.2	0.001	0.743	0.819	110.2	0.001	...				
Indigo Bunting	16	793	1090	115	0.518	0.042	8.1	0.023	0.312	0.047	15.2	0.020	0.509	0.089	17.4	0.002	...				
Red-winged Blackbird†	9	303	318	6	0.388	0.178	46.0	0.006	0.035	0.078	220.5	0.005	1.000	2.210	221.0	0.003	...				
Brown-headed Cowbird	22	219	300	35	0.487	0.071	14.5	0.007	0.411	0.098	23.7	0.010	0.429	0.131	30.4	0.005	...				
Baltimore Oriole	14	309	376	39	0.615	0.072	11.7	0.013	0.184	0.061	33.2	0.784	0.613	0.218	35.5	0.002	.t.				
Bullock's Oriole*	1	52	66	3	0.778	0.269	34.5	0.000	0.052	0.062	119.3	0.000	0.482	0.569	118.1	0.000	...				
American Goldfinch	21	1635	2061	176	0.347	0.032	9.2	0.711	0.360	0.050	14.0	0.033	0.671	0.107	15.9	0.333	t..	..t			
Mean (54 species)	11	382	560	56	0.471	0.104	23.0	0.083	0.383	0.122	46.8	0.114	0.502	0.312	55.5	0.048					
Std. Dev. (54 species)	8	448	697	77	0.105	0.067	16.0	0.165	0.184	0.078	47.5	0.219	0.240	0.453	47.4	0.129					
Mean (35 adequately-est. sp.)[13]	13	528	791	82	0.481	0.063	13.3	0.112	0.448	0.087	21.0	0.139	0.460	0.127	29.4	0.071					
Std. Dev. (35 species)	8	495	770	84	0.095	0.029	5.7	0.191	0.150	0.042	10.3	0.248	0.162	0.072	15.2	0.155					
SOUTH-CENTRAL MAPS REGION																					
Common Ground-Dove*	6	274	302	8	0.553	0.229	41.4	0.002	0.051	0.057	112.3	0.001	0.819	0.854	104.2	0.005	...				
Yellow-billed Cuckoo	45	417	452	14	0.574	0.119	20.7	0.022	0.148	0.086	58.1	0.451	0.218	0.133	60.8	0.007	...	.t.			
Golden-fronted Woodpecker*†	4	107	134	7	0.199	0.128	64.3	0.047	0.345	0.309	89.8	0.008	1.000	0.922	92.2	0.003	...				
Ladder-backed Woodpecker	11	77	95	12	0.543	0.131	24.1	0.001	0.365	0.160	43.9	0.001	0.488	0.262	53.7	0.003	...				
Downy Woodpecker	28	257	322	35	0.598	0.073	12.2	0.023	0.274	0.074	27.1	0.147	0.383	0.119	31.0	0.128	...				
Eastern Wood-Pewee*	14	108	119	5	0.741	0.217	29.3	0.001	0.264	0.198	75.0	0.000	0.134	0.121	90.6	0.010	...				
Acadian Flycatcher	6	349	513	76	0.583	0.048	8.2	0.001	0.478	0.064	13.5	0.002	0.353	0.070	19.9	0.001	...				
Great Crested Flycatcher	20	144	169	13	0.476	0.121	25.3	0.070	0.262	0.138	52.8	0.745	0.449	0.271	60.3	0.021	.t.				
Brown-crested Flycatcher	2	215	278	37	0.495	0.078	15.8	0.009	0.252	0.090	35.6	0.071	0.926	0.371	40.1	0.004	...				
Eastern Kingbird*	11	63	68	2	0.832	0.277	33.3	0.000	0.225	0.218	96.9	0.002	0.044	0.055	123.8	0.000	...				
White-eyed Vireo	24	1380	2504	327	0.601	0.024	4.0	0.003	0.498	0.031	6.3	0.018	0.343	0.034	10.0	0.054	...				
Bell's Vireo	12	450	700	100	0.593	0.040	6.8	0.008	0.377	0.050	13.3	0.739	0.482	0.083	17.2	0.009	.t.				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8]				Recapture probability[9]				Proportion of residents[10]				Models selected[12]				
					φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	p	SE	CV(p)	$w(p_t)$[11]	τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	1	2	3	4	5
Red-eyed Vireo	15	328	404	45	0.575	0.066	11.5	0.004	0.221	0.063	28.5	0.030	0.622	0.194	31.1	0.042	...				
Western Scrub-Jay*	2	20	25	5	0.649	0.213	32.7	0.000	0.545	0.250	45.9	0.000	0.355	0.260	73.4	0.000	...				
Carolina Chickadee	37	556	646	35	0.527	0.073	13.9	0.010	0.124	0.049	39.3	0.082	0.582	0.232	39.9	0.003	...				
Black-capped Chickadee	6	131	160	11	0.471	0.134	28.5	0.374	0.192	0.120	62.5	0.092	0.570	0.360	63.2	0.190	t..	...	..t		
Tufted Titmouse	24	318	421	54	0.486	0.061	12.6	0.007	0.296	0.072	24.3	0.004	0.773	0.211	27.2	0.002	...				
Black-crested Titmouse	18	263	345	39	0.484	0.073	15.1	0.009	0.237	0.075	31.5	0.002	0.870	0.293	33.7	0.114	...				
Carolina Wren	31	888	1451	174	0.459	0.031	6.8	0.015	0.517	0.049	9.4	0.901	0.429	0.059	13.7	0.003	.t.				
Bewick's Wren	21	480	728	87	0.431	0.046	10.6	0.697	0.498	0.072	14.4	0.825	0.505	0.097	19.2	0.245	tt.				
House Wren	6	145	186	16	0.428	0.124	29.0	0.001	0.455	0.176	38.7	0.002	0.404	0.189	46.7	0.017	...				
Blue-gray Gnatcatcher	26	257	275	7	0.539	0.171	31.7	0.021	0.078	0.083	107.0	0.007	0.388	0.411	105.8	0.004	...				
Wood Thrush	7	94	138	17	0.382	0.105	27.4	0.096	0.383	0.162	42.4	0.088	0.971	0.466	48.0	0.003	...				
American Robin	13	106	122	7	0.376	0.150	40.0	0.012	0.184	0.178	96.4	0.024	0.728	0.748	102.7	0.003	...				
Gray Catbird	9	741	1102	153	0.581	0.035	6.0	0.022	0.467	0.045	9.7	0.659	0.370	0.052	13.9	0.951	.tt	..t			
Northern Mockingbird	16	348	438	15	0.323	0.101	31.2	0.037	0.178	0.104	58.5	0.042	0.499	0.281	56.4	0.107	...				
Brown Thrasher	15	288	368	31	0.408	0.074	18.2	0.005	0.572	0.125	21.9	0.015	0.293	0.096	32.9	0.011	...				
Long-billed Thrasher	3	133	181	26	0.628	0.100	15.9	0.026	0.396	0.114	28.8	0.512	0.552	0.198	35.9	0.000	.t.	...			
Blue-winged Warbler	4	244	362	49	0.555	0.060	10.9	0.012	0.490	0.083	16.9	0.013	0.361	0.089	24.8	0.001	...				
Northern Parula*†	6	45	51	3	0.345	0.253	73.3	0.000	0.163	0.268	164.0	0.000	1.000	1.733	173.3	0.000	...				
Yellow Warbler	3	103	144	23	0.353	0.088	25.0	0.146	0.515	0.158	30.7	0.018	0.867	0.349	40.3	0.009	...				
Prairie Warbler	3	128	166	16	0.508	0.122	24.0	0.044	0.213	0.116	54.4	0.035	0.812	0.485	59.7	0.005	...				
Black-and-white Warbler	12	163	183	11	0.709	0.130	18.3	0.001	0.258	0.119	46.2	0.006	0.152	0.082	54.1	0.087	...				
American Redstart	1	57	73	8	0.394	0.147	37.4	0.010	0.409	0.228	55.8	0.001	0.616	0.408	66.2	0.001	...				
Prothonotary Warbler†	5	118	153	9	0.533	0.152	28.5	0.000	0.097	0.075	77.4	0.001	1.000	0.757	75.7	0.001	...				
Worm-eating Warbler	2	67	87	7	0.597	0.147	24.6	0.006	0.429	0.195	45.5	0.007	0.146	0.100	68.7	0.007	...				
Swainson's Warbler*	2	36	73	6	0.516	0.219	42.4	0.000	0.320	0.213	66.6	0.000	0.520	0.392	75.4	0.000	...				
Ovenbird	5	80	113	15	0.649	0.103	15.9	0.000	0.333	0.115	34.7	0.002	0.346	0.158	45.6	0.003	...				
Louisiana Waterthrush	4	73	104	15	0.515	0.116	22.5	0.014	0.519	0.161	31.1	0.308	0.452	0.203	44.8	0.004	...	.t.			
Kentucky Warbler	11	457	776	131	0.608	0.037	6.1	0.005	0.535	0.050	9.3	0.003	0.371	0.056	15.2	0.008	...				
Common Yellowthroat	14	440	690	81	0.471	0.045	9.6	0.037	0.478	0.068	14.2	0.329	0.425	0.084	19.8	0.045	...	.t.			
Hooded Warbler	3	103	147	11	0.456	0.137	30.0	0.001	0.195	0.122	62.7	0.002	0.813	0.518	63.7	0.007	...				
Yellow-breasted Chat	8	651	1078	143	0.521	0.038	7.2	0.007	0.391	0.047	12.0	0.460	0.648	0.095	14.7	0.001	...	.t.			
Summer Tanager	19	223	283	35	0.531	0.076	14.3	0.009	0.377	0.095	25.2	0.024	0.441	0.137	31.1	0.073	...				
Olive Sparrow	3	208	410	66	0.510	0.053	10.3	0.016	0.738	0.073	9.9	0.016	0.552	0.114	20.7	0.007	...				
Eastern Towhee*	10	37	47	5	0.621	0.217	35.0	0.000	0.121	0.126	104.3	0.000	0.890	0.952	107.1	0.000	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Rufous-crowned Sparrow	7	81	121	16	0.523	0.109	20.9	0.233	0.431	0.145	33.7	0.012	0.400	0.177	44.1	0.001	...				
Field Sparrow	31	1108	1610	188	0.482	0.030	6.2	0.020	0.343	0.039	11.3	0.970	0.600	0.080	13.3	0.016	.t.				
Lark Sparrow*†	6	120	129	3	0.536	0.297	55.5	0.001	0.037	0.096	261.4	0.000	1.000	2.617	261.7	0.000	...				
Grasshopper Sparrow	6	193	285	28	0.336	0.079	23.4	0.073	0.455	0.140	30.9	0.454	0.728	0.262	36.0	0.001	...	.t.			
Northern Cardinal	48	2475	3714	567	0.581	0.018	3.1	0.201	0.356	0.021	6.0	0.582	0.554	0.041	7.3	0.007	.t.	...			
Blue Grosbeak*†	7	70	79	3	0.343	0.243	70.9	0.016	0.119	0.193	161.9	0.004	1.000	1.576	157.6	0.001	...				
Indigo Bunting	23	1181	1734	209	0.459	0.030	6.5	0.081	0.422	0.042	10.0	0.008	0.560	0.070	12.5	0.131	...				
Painted Bunting	31	1591	2136	236	0.558	0.029	5.2	0.051	0.439	0.038	8.6	0.827	0.336	0.038	11.4	0.087	.t.				
Dickcissel	15	630	708	26	0.440	0.078	17.7	0.014	0.209	0.084	40.2	0.024	0.299	0.131	43.8	0.031	...				
Eastern Meadowlark	11	51	61	5	0.594	0.172	29.0	0.000	0.347	0.215	61.9	0.000	0.237	0.190	80.0	0.000	...				
Bronzed Cowbird†	2	69	85	9	0.436	0.160	36.6	0.001	0.233	0.198	85.1	0.001	1.000	0.958	95.8	0.000	...				
Brown-headed Cowbird	39	477	618	70	0.474	0.051	10.8	0.058	0.364	0.068	18.7	0.109	0.521	0.118	22.7	0.558	..t	...			
Orchard Oriole	11	156	181	9	0.318	0.139	43.8	0.008	0.330	0.223	67.6	0.004	0.449	0.339	75.4	0.030	...				
American Goldfinch	19	520	615	37	0.339	0.069	20.5	0.213	0.186	0.078	41.8	0.124	0.855	0.365	42.7	0.005	...				
Mean (60 species)	13	348	494	57	0.506	0.111	23.4	0.047	0.329	0.118	49.7	0.164	0.558	0.352	55.9	0.051					
Std. Dev. (60 species)	11	432	663	93	0.112	0.068	15.8	0.108	0.149	0.067	44.8	0.276	0.254	0.452	44.6	0.144					
Mean (42 adequately-est. sp.)[13]	16	448	647	78	0.515	0.077	15.3	0.063	0.377	0.094	28.5	0.231	0.506	0.172	34.6	0.069					
Std. Dev. (42 species)	12	481	738	105	0.083	0.038	7.7	0.125	0.129	0.048	16.2	0.305	0.206	0.116	18.0	0.168					
NORTHEAST MAPS REGION																					
Red-bellied Woodpecker†	14	48	56	5	0.399	0.190	47.6	0.002	0.190	0.212	111.2	0.002	1.000	1.162	116.2	0.001	...				
Yellow-bellied Sapsucker†	12	99	130	14	0.406	0.123	30.4	0.029	0.252	0.151	59.8	0.026	1.000	0.666	66.6	0.020	...				
Downy Woodpecker	49	414	553	52	0.445	0.058	13.1	0.017	0.525	0.092	17.5	0.016	0.298	0.075	25.0	0.005	...				
Hairy Woodpecker	33	139	180	20	0.845	0.090	10.6	0.001	0.080	0.038	47.4	0.071	0.751	0.344	45.7	0.004	...				
Northern Flicker	27	90	103	5	0.561	0.190	33.8	0.001	0.093	0.100	107.9	0.001	0.564	0.603	106.9	0.004	...				
Eastern Wood-Pewee	30	160	210	21	0.532	0.091	17.1	0.005	0.313	0.104	33.3	0.643	0.365	0.146	40.0	0.023	.t.	...			
Acadian Flycatcher	11	135	170	6	0.739	0.172	23.3	0.000	0.072	0.062	85.6	0.000	0.320	0.262	81.8	0.001	...				
"Traill's" Flycatcher	17	636	859	63	0.502	0.050	10.0	0.007	0.541	0.077	14.2	0.203	0.152	0.035	23.3	0.043	...				
Eastern Phoebe	24	238	331	23	0.571	0.081	14.2	0.220	0.405	0.107	26.3	0.042	0.164	0.062	38.1	0.003	...				
Great Crested Flycatcher	27	142	161	12	0.663	0.122	18.5	0.017	0.102	0.071	70.0	0.046	0.603	0.433	71.9	0.042	...				
Eastern Kingbird	8	45	65	9	0.532	0.135	25.5	0.001	0.504	0.195	38.8	0.001	0.420	0.241	57.3	0.001	...				
White-eyed Vireo	13	295	480	56	0.479	0.060	12.6	0.003	0.396	0.079	20.0	0.003	0.629	0.150	23.9	0.001	...				
Yellow-throated Vireo*	4	27	31	3	0.694	0.237	34.2	0.000	0.321	0.257	80.1	0.000	0.224	0.228	101.8	0.000	...				
Blue-headed Vireo	13	121	153	10	0.366	0.134	36.6	0.012	0.265	0.166	62.6	0.003	0.586	0.381	65.0	0.005	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Red-eyed Vireo	55	1459	1936	208	0.582	0.031	5.3	0.007	0.295	0.033	11.0	0.037	0.450	0.058	12.9	0.003	...				
Blue Jay	43	268	288	14	0.869	0.108	12.4	0.001	0.164	0.074	45.1	0.006	0.110	0.056	50.7	0.224	...				
Carolina Chickadee	19	187	213	14	0.484	0.127	26.2	0.011	0.449	0.180	40.0	0.029	0.248	0.129	51.9	0.017	...				
Black-capped Chickadee	50	1099	1551	155	0.514	0.034	6.6	0.295	0.294	0.038	13.1	0.003	0.540	0.080	14.9	0.056	...	t..			
Tufted Titmouse	36	411	556	48	0.393	0.062	15.7	0.464	0.298	0.081	27.3	0.165	0.750	0.220	29.3	0.192	t..	...	..t		
White-breasted Nuthatch	23	99	125	9	0.424	0.138	32.5	0.015	0.328	0.187	57.2	0.156	0.421	0.274	64.9	0.007	...				
Carolina Wren	21	371	499	28	0.264	0.075	28.5	0.006	0.406	0.151	37.3	0.005	0.622	0.238	38.2	0.007	...				
House Wren	17	229	331	15	0.250	0.090	36.0	0.001	0.465	0.209	45.0	0.005	0.389	0.192	49.3	0.004	...				
Eastern Bluebird	9	76	128	9	0.451	0.133	29.6	0.003	0.349	0.174	49.7	0.049	0.372	0.232	62.3	0.003	...				
Veery	41	1792	3513	664	0.577	0.016	2.8	0.099	0.574	0.023	3.9	0.115	0.519	0.034	6.5	0.027	...				
Bicknell's Thrush	1	28	45	10	0.632	0.132	20.9	0.000	0.300	0.149	49.8	0.000	0.840	0.479	57.0	0.000	...				
Swainson's Thrush	6	91	184	39	0.621	0.077	12.4	0.006	0.686	0.094	13.8	0.001	0.529	0.135	25.5	0.084	...				
Hermit Thrush	21	328	608	90	0.457	0.047	10.3	0.259	0.631	0.074	11.7	0.752	0.667	0.120	17.9	0.002	.t.				
Wood Thrush	53	1981	3043	254	0.424	0.025	5.9	0.184	0.403	0.038	9.3	0.124	0.412	0.048	11.6	0.234	...	..t			
American Robin	54	1479	1873	133	0.429	0.037	8.7	0.394	0.329	0.049	15.0	0.430	0.422	0.072	17.1	0.297	...	tt.	ttt		
Gray Catbird	50	4849	7735	966	0.515	0.014	2.7	0.017	0.460	0.019	4.1	0.933	0.446	0.025	5.7	0.004	.t.				
Brown Thrasher	14	100	137	10	0.472	0.134	28.5	0.002	0.195	0.121	62.3	0.004	0.681	0.437	64.2	0.021	...				
Cedar Waxwing*†	29	1081	1119	2	0.733	0.309	42.2	0.000	0.001	0.005	509.5	0.000	1.000	5.031	503.1	0.000	...				
Blue-winged Warbler	18	352	444	39	0.442	0.067	15.2	0.031	0.387	0.096	24.9	0.040	0.380	0.117	30.8	0.231	...				
Nashville Warbler	8	235	283	9	0.356	0.144	40.6	0.042	0.162	0.132	81.1	0.379	0.512	0.395	77.3	0.007	...	.t.			
Northern Parula	5	106	137	11	0.368	0.127	34.4	0.016	0.531	0.227	42.7	0.112	0.367	0.210	57.2	0.024	...				
Yellow Warbler	28	1268	1879	215	0.509	0.028	5.5	0.017	0.475	0.040	8.4	0.011	0.356	0.043	12.0	0.539	..t	...			
Chestnut-sided Warbler	18	459	745	94	0.475	0.043	9.1	0.032	0.527	0.065	12.4	0.018	0.439	0.080	18.2	0.015	...				
Magnolia Warbler	11	401	618	53	0.346	0.054	15.5	0.966	0.738	0.104	14.1	0.037	0.312	0.078	25.0	0.006	t..				
Black-throated Blue Warbler	7	104	144	18	0.561	0.106	18.9	0.001	0.392	0.131	33.4	0.001	0.430	0.179	41.6	0.009	...				
Yellow-rumped Warbler	11	292	441	56	0.460	0.061	13.3	0.003	0.501	0.089	17.8	0.002	0.519	0.124	23.9	0.002	...				
Black-throated Green Warbler	17	337	524	63	0.402	0.056	13.9	0.015	0.589	0.095	16.1	0.171	0.571	0.128	22.4	0.053	...				
Blackburnian Warbler*	5	41	52	5	0.641	0.221	34.5	0.000	0.117	0.120	102.4	0.000	0.799	0.831	103.9	0.000	...				
Blackpoll Warbler	2	80	109	6	0.339	0.130	38.3	0.000	0.573	0.283	49.4	0.000	0.076	0.081	106.6	0.000	...				
Black-and-white Warbler	40	667	913	101	0.502	0.043	8.7	0.276	0.301	0.051	17.0	0.121	0.591	0.116	19.6	0.360	...	..t	t..		
American Redstart	36	1943	2746	270	0.525	0.027	5.1	0.029	0.331	0.031	9.5	0.010	0.432	0.048	11.2	0.994	..t				
Worm-eating Warbler	12	405	576	56	0.520	0.057	10.9	0.016	0.395	0.075	19.0	0.038	0.373	0.090	24.2	0.023	...				
Ovenbird	51	1752	2560	338	0.557	0.024	4.3	0.002	0.425	0.031	7.2	0.017	0.426	0.041	9.5	0.047	...				
Northern Waterthrush	4	96	127	12	0.401	0.110	27.5	0.002	0.498	0.189	38.0	0.001	0.383	0.203	52.8	0.032	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Louisiana Waterthrush	11	185	333	33	0.477	0.065	13.6	0.040	0.745	0.105	14.1	0.001	0.145	0.058	39.7	0.204	...				
Kentucky Warbler	5	57	88	12	0.569	0.137	24.1	0.000	0.535	0.186	34.7	0.001	0.324	0.166	51.3	0.002	...				
Mourning Warbler†	3	49	80	6	0.767	0.188	24.5	0.000	0.065	0.056	85.2	0.002	1.000	0.778	77.8	0.000	...				
Common Yellowthroat	45	2263	3619	429	0.502	0.020	4.0	0.003	0.493	0.029	5.9	0.004	0.383	0.033	8.5	0.004	...				
Hooded Warbler	15	499	868	93	0.460	0.043	9.5	0.079	0.610	0.069	11.4	0.006	0.361	0.066	18.4	0.117	...				
Canada Warbler	7	122	149	10	0.398	0.134	33.5	0.006	0.554	0.224	40.4	0.020	0.243	0.143	58.7	0.005	...				
Yellow-breasted Chat	7	214	303	33	0.501	0.079	15.8	0.007	0.356	0.097	27.3	0.010	0.484	0.152	31.5	0.022	...				
Scarlet Tanager†	37	298	345	15	0.623	0.116	18.6	0.024	0.042	0.034	80.6	0.082	1.000	0.785	78.5	0.010	...				
Eastern Towhee	35	543	764	86	0.489	0.048	9.8	0.009	0.331	0.058	17.6	0.001	0.595	0.121	20.3	0.002	...				
Chipping Sparrow	13	172	245	23	0.432	0.084	19.4	0.003	0.399	0.123	30.8	0.025	0.454	0.174	38.2	0.008	...				
Song Sparrow	37	1192	1999	144	0.336	0.032	9.4	0.727	0.511	0.061	12.0	0.154	0.461	0.071	15.4	0.082	t..				
Swamp Sparrow	8	131	232	33	0.422	0.072	17.0	0.146	0.721	0.114	15.9	0.009	0.455	0.138	30.3	0.153	...				
White-throated Sparrow	14	537	829	67	0.289	0.046	15.8	0.057	0.583	0.101	17.3	0.036	0.576	0.134	23.2	0.874	..t				
Dark-eyed Junco	15	322	461	33	0.407	0.077	18.9	0.012	0.259	0.085	32.7	0.077	0.750	0.253	33.7	0.071	...				
Northern Cardinal	41	826	1150	149	0.618	0.036	5.9	0.633	0.365	0.041	11.2	0.376	0.414	0.059	14.2	0.013	t..	.t.			
Rose-breasted Grosbeak	25	370	442	27	0.542	0.084	15.5	0.003	0.241	0.083	34.4	0.036	0.302	0.117	38.7	0.004	...				
Indigo Bunting	26	504	717	76	0.465	0.050	10.8	0.332	0.543	0.076	13.9	0.066	0.352	0.072	20.4	0.012	...	t..			
Red-winged Blackbird	20	471	548	41	0.587	0.069	11.8	0.298	0.320	0.076	23.9	0.582	0.244	0.071	29.3	0.055	.t.	...	tt.		
Common Grackle	21	300	318	11	0.316	0.137	43.5	0.003	0.209	0.192	92.0	0.006	0.464	0.466	100.4	0.016	...				
Brown-headed Cowbird	25	157	185	12	0.398	0.134	33.8	0.007	0.257	0.167	64.8	0.001	0.559	0.407	72.8	0.044	...				
Baltimore Oriole	22	305	402	28	0.418	0.075	17.9	0.049	0.476	0.123	25.7	0.275	0.267	0.093	34.7	0.052	...	.t.			
Purple Finch†	10	118	157	16	0.324	0.100	30.8	0.491	0.372	0.179	48.1	0.077	1.000	0.577	57.7	0.014	t..	...			
American Goldfinch	39	1780	2017	84	0.442	0.047	10.7	0.023	0.209	0.047	22.6	0.056	0.329	0.079	24.1	0.165	...				
Mean (71 species)	22	542	788	81	0.493	0.091	19.2	0.091	0.378	0.106	42.8	0.095	0.488	0.288	49.3	0.079					
Std. Dev. (71 species)	15	752	1176	151	0.126	0.057	11.4	0.186	0.175	0.062	62.0	0.182	0.222	0.609	60.9	0.175					
Mean (53 adequately-est. sp.)[13]	25	664	982	106	0.503	0.069	13.9	0.110	0.416	0.087	24.8	0.111	0.442	0.136	30.9	0.103					
Std. Dev. (53 species)	15	826	1298	168	0.112	0.037	7.0	0.202	0.158	0.045	16.9	0.201	0.161	0.103	17.4	0.196					
SOUTHEAST MAPS REGION																					
Red-bellied Woodpecker*†	43	143	162	9	0.175	0.117	66.9	0.061	0.351	0.324	92.2	0.189	1.000	1.015	101.5	0.036	...				
Downy Woodpecker	61	381	446	33	0.620	0.076	12.3	0.003	0.344	0.085	24.6	0.003	0.187	0.058	31.1	0.045	...				
Hairy Woodpecker	32	98	116	12	0.536	0.135	25.2	0.009	0.189	0.125	65.8	0.004	0.737	0.521	70.7	0.001	...				
Eastern Wood-Pewee†	42	201	239	20	0.386	0.103	26.7	0.001	0.194	0.113	58.4	0.001	1.000	0.615	61.5	0.001	...				
Acadian Flycatcher	47	1786	2584	316	0.483	0.024	5.1	0.010	0.556	0.037	6.6	0.022	0.375	0.037	9.9	0.621	..t	...			

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Great Crested Flycatcher	33	189	211	10	0.534	0.151	28.3	0.002	0.233	0.137	58.6	0.011	0.233	0.148	63.7	0.006	...				
White-eyed Vireo	43	1012	1846	216	0.465	0.028	5.9	0.025	0.561	0.044	7.8	0.025	0.416	0.051	12.3	0.133	...				
Red-eyed Vireo	56	2230	2886	341	0.620	0.024	3.9	0.434	0.212	0.020	9.7	0.067	0.568	0.059	10.5	0.021	...	t..			
Blue Jay	55	339	376	26	0.652	0.094	14.4	0.008	0.116	0.056	48.7	0.247	0.527	0.264	50.1	0.161	...				
Carolina Chickadee	65	569	692	56	0.493	0.061	12.4	0.001	0.282	0.067	23.8	0.001	0.446	0.118	26.5	0.002	...				
Tufted Titmouse	67	948	1334	178	0.511	0.032	6.3	0.932	0.434	0.044	10.2	0.034	0.487	0.064	13.2	0.033	t..				
Carolina Wren	65	1367	2244	229	0.369	0.026	7.0	0.975	0.582	0.049	8.4	0.004	0.545	0.065	11.9	0.080	t..				
House Wren	2	59	87	5	0.514	0.193	37.5	0.001	0.155	0.135	87.1	0.001	0.551	0.475	86.2	0.000	...				
Wood Thrush	56	2635	4784	509	0.455	0.018	3.9	0.011	0.552	0.029	5.3	0.005	0.410	0.033	8.0	0.003	...				
American Robin	19	489	526	18	0.429	0.107	25.0	0.064	0.103	0.074	71.8	0.659	0.606	0.441	72.8	0.008	.t.	...			
Gray Catbird	25	1054	1551	143	0.428	0.034	8.0	0.191	0.477	0.054	11.3	0.014	0.378	0.057	15.2	0.036	...				
Brown Thrasher	24	170	210	19	0.635	0.104	16.3	0.019	0.205	0.084	40.7	0.145	0.395	0.169	42.8	0.004	...				
Blue-winged Warbler	9	286	417	49	0.558	0.063	11.3	0.006	0.279	0.065	23.3	0.005	0.570	0.149	26.2	0.001	...				
Yellow Warbler†	1	45	61	7	0.391	0.173	44.3	0.000	0.317	0.234	73.9	0.001	1.000	0.832	83.2	0.000	...				
Prairie Warbler	18	365	468	61	0.400	0.077	19.3	0.005	0.253	0.089	35.3	0.016	0.620	0.227	36.6	0.003	...				
Black-and-white Warbler†	14	122	146	8	0.479	0.181	37.8	0.002	0.103	0.106	102.5	0.001	1.000	1.023	102.3	0.004	...				
American Redstart*†	2	36	43	4	0.465	0.235	50.7	0.001	0.149	0.202	135.5	0.000	1.000	1.421	142.1	0.000	...				
Prothonotary Warbler	14	348	446	41	0.512	0.071	13.8	0.034	0.261	0.076	28.9	0.005	0.534	0.171	32.1	0.005	...				
Worm-eating Warbler	16	309	441	53	0.529	0.061	11.5	0.004	0.404	0.079	19.4	0.002	0.463	0.114	24.7	0.048	...				
Swainson's Warbler	5	55	75	6	0.743	0.181	24.4	0.004	0.062	0.065	104.7	0.003	0.962	1.000	104.0	0.004	...				
Ovenbird	46	1588	2393	28	0.528	0.026	4.9	0.002	0.480	0.036	7.5	0.007	0.371	0.039	10.4	0.013	...				
Louisiana Waterthrush	19	295	504	68	0.520	0.055	10.5	0.035	0.516	0.077	14.9	0.007	0.477	0.100	21.0	0.034	...				
Kentucky Warbler	35	1232	2302	331	0.507	0.023	4.5	0.002	0.600	0.035	5.8	0.009	0.443	0.043	9.7	0.001	...				
Common Yellowthroat	41	1422	2428	211	0.439	0.027	6.2	0.063	0.503	0.044	8.8	0.004	0.318	0.041	12.9	0.143	...				
Hooded Warbler	29	619	1139	133	0.514	0.035	6.8	0.030	0.525	0.052	10.0	0.004	0.356	0.056	15.9	0.038	...				
Yellow-breasted Chat	24	524	732	48	0.292	0.057	19.6	0.545	0.323	0.094	29.3	0.169	0.800	0.241	30.1	0.029	t..	...			
Summer Tanager	28	198	236	14	0.294	0.108	36.6	0.006	0.504	0.220	43.6	0.005	0.390	0.214	54.8	0.006	...				
Scarlet Tanager	36	263	303	20	0.616	0.101	16.4	0.001	0.131	0.066	50.6	0.006	0.487	0.255	52.3	0.008	...				
Eastern Towhee	45	279	390	47	0.472	0.064	13.5	0.002	0.344	0.081	23.5	0.056	0.630	0.172	27.2	0.002	...				
Field Sparrow†	16	195	247	21	0.367	0.095	25.8	0.001	0.216	0.111	51.2	0.003	1.000	0.529	52.9	0.002	...				
Song Sparrow	2	167	270	27	0.410	0.072	17.5	0.048	0.520	0.127	24.3	0.032	0.360	0.129	35.8	0.006	...				
Northern Cardinal	69	2105	3204	453	0.543	0.020	3.8	0.010	0.392	0.026	6.5	0.023	0.561	0.046	8.2	0.008	...				
Indigo Bunting	47	1220	1687	183	0.521	0.033	6.4	0.033	0.306	0.037	12.0	0.024	0.527	0.072	13.7	0.009	...				
Common Grackle†	20	576	592	9	0.561	0.154	27.5	0.003	0.016	0.038	244.7	0.020	1.000	2.453	245.3	0.003	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5
Brown-headed Cowbird	34	147	171	9	0.321	0.124	38.5	0.004	0.660	0.257	39.0	0.017	0.228	0.140	61.6	0.002	...				
American Goldfinch	22	706	808	50	0.582	0.061	10.4	0.002	0.119	0.040	33.7	0.009	0.560	0.193	34.4	0.003	...				
Mean (41 species)	32	653	971	104	0.485	0.084	18.7	0.088	0.330	0.091	42.9	0.045	0.574	0.338	47.0	0.038					
Std. Dev. (41 species)	20	658	1077	131	0.108	0.055	14.4	0.223	0.172	0.067	45.0	0.112	0.240	0.470	44.8	0.100					
Mean (31 adequately-est. sp.)[13]	36	808	1220	134	0.513	0.063	12.1	0.113	0.350	0.064	26.8	0.052	0.495	0.166	30.1	0.049					
Std. Dev. (31 species)	19	684	1128	138	0.090	0.040	7.0	0.251	0.162	0.029	23.2	0.124	0.155	0.190	22.6	0.113					
ALASKA AND BOREAL CANADA MAPS REGIONS																					
Three-toed Woodpecker	3	20	30	5	0.742	0.150	20.2	0.000	0.347	0.184	53.1	0.000	0.266	0.268	100.6	0.000	...				
Western Wood-Pewee	2	84	110	12	0.461	0.135	29.3	0.000	0.621	0.203	32.6	0.000	0.320	0.163	51.1	0.000	...				
"Traill's" Flycatcher	13	584	819	50	0.383	0.053	13.7	0.023	0.506	0.094	18.7	0.007	0.236	0.062	26.2	0.023	...				
Gray Jay†	11	46	70	15	0.542	0.103	19.1	0.001	0.375	0.134	35.8	0.006	1.000	0.438	43.8	0.000	...				
Tree Swallow*†	1	77	91	6	0.223	0.151	67.8	0.001	0.311	0.325	104.3	0.001	1.000	1.147	114.7	0.000	...				
Black-capped Chickadee	10	244	389	47	0.426	0.057	13.4	0.284	0.401	0.086	21.5	0.479	0.782	0.206	26.3	0.201	.t.	...	..t	tt.	t..
Boreal Chickadee	10	132	199	29	0.492	0.081	16.4	0.003	0.365	0.105	28.8	0.006	0.827	0.283	34.3	0.004	...				
Arctic Warbler	2	249	453	49	0.339	0.054	15.9	0.151	0.605	0.107	17.6	0.017	0.623	0.161	25.9	0.009	...				
Gray-cheeked Thrush	6	253	539	74	0.459	0.047	10.3	0.001	0.683	0.075	10.9	0.000	0.518	0.106	20.4	0.008	...				
Swainson's Thrush	16	837	1384	190	0.456	0.029	6.4	0.073	0.590	0.047	7.9	0.161	0.477	0.060	12.7	0.103	...				
Hermit Thrush	9	611	1326	184	0.499	0.029	5.9	0.738	0.766	0.043	5.6	0.010	0.330	0.048	14.4	0.120	t..	...			
American Robin†	14	360	434	27	0.354	0.086	24.3	0.017	0.166	0.087	52.6	0.001	1.000	0.533	53.3	0.001	...				
Varied Thrush*†	10	105	123	4	0.258	0.196	76.1	0.013	0.157	0.251	159.7	0.005	1.000	1.606	160.6	0.002	...				
Orange-crowned Warbler	16	1324	2055	191	0.413	0.029	6.9	0.013	0.504	0.048	9.5	0.043	0.387	0.051	13.1	0.005	...				
Yellow Warbler	9	1114	1766	154	0.445	0.033	7.4	0.028	0.456	0.051	11.1	0.024	0.387	0.056	14.6	0.010	...				
Yellow-rumped Warbler	16	680	885	71	0.367	0.049	13.4	0.001	0.432	0.083	19.1	0.013	0.460	0.107	23.2	0.007	...				
Townsend's Warbler*	4	155	195	8	0.201	0.113	56.1	0.000	0.443	0.311	70.3	0.000	0.492	0.384	78.0	0.009	...				
Blackpoll Warbler	5	97	163	17	0.312	0.088	28.2	0.003	0.809	0.165	20.4	0.000	0.518	0.224	43.3	0.004	...				
American Redstart	2	256	366	46	0.571	0.062	10.8	0.080	0.308	0.069	22.3	0.919	0.470	0.123	26.2	0.009	.t.				
Ovenbird*	2	80	100	5	0.598	0.234	39.1	0.000	0.349	0.236	67.7	0.001	0.111	0.094	85.1	0.000	...				
Northern Waterthrush	9	213	363	48	0.528	0.058	11.0	0.035	0.725	0.081	11.2	0.029	0.276	0.071	25.9	0.002	...				
Mourning Warbler	1	59	91	10	0.377	0.131	34.7	0.000	0.323	0.186	57.6	0.001	0.892	0.565	63.4	0.000	...				
Wilson's Warbler	15	2861	4677	342	0.366	0.021	5.6	0.025	0.565	0.039	7.0	0.666	0.292	0.030	10.2	0.922	.tt	..t			
Canada Warbler	2	149	258	30	0.462	0.076	16.5	0.001	0.475	0.115	24.3	0.002	0.498	0.162	32.5	0.010	...				
American Tree Sparrow	7	199	331	34	0.483	0.069	14.2	0.003	0.500	0.105	21.0	0.007	0.350	0.108	30.9	0.009	...				
Chipping Sparrow	3	50	78	8	0.360	0.138	38.3	0.001	0.390	0.228	58.6	0.001	0.772	0.516	66.9	0.000	...				

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8]				Recapture probability[9]				Proportion of residents[10]				Models selected[12]				
					φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	p	SE	CV(p)	$w(p_t)$[11]	τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	1	2	3	4	5
Savannah Sparrow	6	130	166	12	0.303	0.115	37.9	0.001	0.716	0.230	32.1	0.002	0.340	0.188	55.3	0.001	...				
Fox Sparrow	13	391	638	81	0.518	0.046	8.8	0.196	0.556	0.068	12.2	0.048	0.383	0.075	19.6	0.562	..t	...			
Lincoln's Sparrow	10	277	513	27	0.347	0.070	20.3	0.001	0.368	0.114	30.9	0.008	0.453	0.165	36.5	0.004	...				
White-throated Sparrow	2	146	219	12	0.503	0.118	23.4	0.191	0.183	0.092	50.2	0.019	0.320	0.179	55.8	0.001	...				
White-crowned Sparrow	13	626	1046	115	0.435	0.038	8.8	0.040	0.412	0.057	13.8	0.260	0.663	0.112	16.8	0.014	...	.t.			
Golden-crowned Sparrow	5	279	537	76	0.533	0.047	8.8	0.001	0.490	0.067	13.7	0.014	0.535	0.109	20.4	0.007	...				
Dark-eyed Junco	15	630	1099	110	0.309	0.034	10.9	0.004	0.636	0.074	11.6	0.002	0.673	0.116	17.2	0.004	...				
Rusty Blackbird*†	2	23	28	3	0.676	0.293	43.4	0.000	0.077	0.119	155.9	0.000	1.000	1.535	153.5	0.000	...				
Pine Grosbeak	5	73	93	8	0.473	0.159	33.5	0.001	0.380	0.219	57.7	0.010	0.420	0.303	72.2	0.001	...				
Common Redpoll	14	1609	2011	18	0.437	0.111	25.4	0.005	0.023	0.016	68.5	0.009	0.779	0.489	62.7	0.000	...				
Mean (36 species)	8	417	657	59	0.435	0.092	22.8	0.054	0.445	0.125	38.8	0.077	0.551	0.301	47.4	0.057					
Std. Dev. (36 species)	5	555	876	72	0.115	0.061	17.1	0.133	0.186	0.078	36.8	0.198	0.252	0.375	36.9	0.176					
Mean (25 adequately-est. sp.)[13]	9	555	887	80	0.451	0.063	14.1	0.076	0.493	0.088	21.7	0.110	0.473	0.141	30.4	0.082					
Std. Dev. (25 species)	5	615	963	77	0.091	0.034	6.8	0.154	0.174	0.044	15.2	0.230	0.167	0.097	19.6	0.207					

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

[2] This model, developed by Pradel et. al (1997), modified by Nott and DeSante (2002), and fully formulated by Hines et al. (2003), includes both between- and within-year information on transients and permits the estimation of three parameters: survival probability (φ), recapture probability (p), and proportion of residents (τ) among those newly-captured adults which were not recaptured seven or more days later during the year they were initially marked. In the time-constant model, each of these three parameters is constrained to be constant over all years.

[3] Species included are those for which an average of at least 2.5 individual adult birds were captured per year over the ten years 1992-2001 (at least 25 year-unique records), for which there were at least two returns from all stations pooled, and for which survival and recapture probabilities were neither 1.000 or 0.000. Data were only included from stations where the species was a regular or usual breeder (i.e., attempted to breed during all or more than half of the years the station was operated).

[4] Number of stations that were operated for a least four consecutive years during the ten-year period 1992-2001 at which at least one adult individual of the species was captured, and at which the species was a regular or usual breeder. For capture-mark-recapture analyses, stations within 1 km of each other were merged into a single "super-station" to prevent individuals whose home range encompassed parts of both stations from being treated as two individuals.

[5] Total number of individual adult birds captured during the ten years 1992-2001 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.

[6] Total number of captures of adults of the species during the ten years 1992-2001 at stations where the species was a regular or usual breeder.

[7] Total number of returns during the ten years 1992-2001 at stations where the species was a regular or usual breeder. A return is defined as the first capture of an individual adult bird in any year other than the year during which it was initially marked (banded).

TABLE 4. Continued.

Species	No. stn.[4]	No. indv.[5]	No. capt.[6]	No. btwn. year recap.[7]	Survival probability[8] φ	SE(φ)	CV(φ)	$W(\varphi_t)$[11]	Recapture probability[9] p	SE	CV(p)	$w(p_t)$[11]	Proportion of residents[10] τ	SE(τ)	CV(τ)	$w(\tau_t)$[11]	Models selected[12] 1	2	3	4	5

[8] 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 during the previous year (breeding season). The estimated probability (φ), standard error of the estimate (SE), and coefficient of variation (CV = 100*SE/Est.) are presented.

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

[10] Defined as the estimated proportion of residents among those newly-captured adults which were not recaptured seven or more days later during the year they were initially marked. The estimated proportion (τ), standard error of the estimate (SE), and coefficient of variation (CV) are presented.

[11] The statistical support for time-dependence of each parameter is provided by summing the w_i for all models in which time dependence of the parameter of interest occurred (w_i ; Burnham and Anderson 1998). w_i={exp(-ΔQAICc/2)}/Σ {exp(-ΔQAICc/2)} where QAICc is the modified Akaike Information Criterion for the model and ΔQAICc is the difference between the QAICc of the model and the model with the lowest QAICc. Despite statistical support for time-dependence in one or more parameters (e.g.,φ_t), all parameter estimates presented in this table are for the time-constant model.

[12] Models involving time dependence were selected according to modified Akaike's Information Criterion (QAICc), with the selected model (Model 1) being the one with the lowest QAICc. All equivalent models (models with a QAICc within 2.0 units of the selected model) are shown and listed in order (Models 2-5) of increasing QAICc. 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 newly-captured adults.

[13] Adequately-estimated species are those for which the 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 5. 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 seven years, 1992-1998, and the ten years, 1992-2001.

	No. stations		No. species		Mean CV(φ)		Number (proportion) of species with CV(φ)<30%		CV(φ)<20%		CV(φ)<10%	
Region	7-YR	10-YR	7-YR	10-YR	7-YR	10-YR	7-YR	10-YR	7-YR	10-YR	7-YR	10-YR
NORTHWEST	105	136	67	77	19.5%	16.4%	55 (0.821)	67 (0.870)	43 (0.642)	58 (0.753)	22 (0.328)	34 (0.442)
SOUTHWEST	34	68	45	72	23.8%	22.3%	38 (0.844)	57 (0.792)	20 (0.444)	40 (0.556)	3 (0.067)	17 (0.236)
NORTH-CENTRAL	28	38	39	54	23.3%	23.0%	29 (0.744)	38 (0.704)	21 (0.538)	32 (0.593)	5 (0.128)	10 (0.185)
SOUTH-CENTRAL	56	62	43	60	25.4%	23.4%	32 (0.744)	44 (0.733)	20 (0.465)	28 (0.467)	7 (0.163)	12 (0.200)
NORTHEAST	40	73	51	71	23.9%	19.2%	36 (0.706)	55 (0.775)	24 (0.471)	45 (0.634)	9 (0.176)	16 (0.225)
SOUTHEAST	60	73	34	41	22.4%	18.7%	26 (0.765)	34 (0.829)	18 (0.529)	27 (0.659)	7 (0.206)	13 (0.317)
ALASKA/BOREAL CANADA	23	29	28	36	20.3%	22.8%	23 (0.821)	27 (0.750)	16 (0.421)	20 (0.556)	4 (0.143)	8 (0.222)
Mean	49	68	44	59	22.7%	20.8%	34 (0.778)	46 (0.779)	23 (0.501)	36 (0.603)	8 (0.173)	16 (0.261)
Std. Dev.	28	34	13	16	2.1%	2.7%	11 (0.051)	14 (0.057)	9 (0.075)	13 (0.091)	6 (0.081)	9 (0.090)

a range from 19.5% (Northwest) to 25.4% (South-central) and an average of 22.7 ± 2.1% for 1992-1998 data, and represent only an 8% average improvement (Table 5), compared to a 28% average improvement going from five to seven years of data. The reason for the relatively small average improvement is that substantial increases in precision for many of the more common species tended to be offset by poor precision for those species that fulfilled the revised (and relaxed) selection criteria. A better measure of the increased precision provided by 10 rather than seven years of data is the mean numbers of species over the seven regions having CV(φ) <30%, which increased by 35% from 34 species (with seven years of data) to 46 species (with 10 years of data). Similarly, the mean number of species per region having CV(φ) <20% increased by 57% from 23 to 36 species; and the mean number having CV(φ) <10% increased by 100% from 8 to 16 species (Table 5). The mean proportions of species over the seven regions having CV(φ) <30%, <20%, and <10% also increased by having 10 rather than seven years of data (Table 5), but, for the reasons given above, by amounts much less than the corresponding increases for mean numbers of species (by 0.1%, 20.4%, and 50.9%, respectively).

Mean regional survival probabilities for all species in each region (Table 4) ranged from 0.435 (Alaska/Boreal Canada) to 0.519 (Southwest) and averaged 0.484 ± 0.027 for the seven regions; mean recapture probabilities ranged from 0.329 (South-central) to 0.445 (Alaska/Boreal Canada) and averaged 0.364 ± 0.042; and mean proportion of residents among newly-captured adults ranged from 0.488 (Northeast) to 0.574 (Southeast) and averaged 0.529 ± 0.032.

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 "adequately estimated," i.e., species for which (a) survival estimates were based on at least five or more returns, (b) estimates for the proportion of residents among newly captured adults were <1.00, (c) SE(φ) <0.20, and (d) CV(φ) <30% (Table 4). Indeed, when consideration was limited in each region to these adequately estimated species, mean regional survival probabilities ranged from a low of 0.451 (Alaska/Boreal Canada) to a high of 0.519 (Southwest) and averaged 0.498 ± 0.024 for the seven regions; mean regional recapture probabilities ranged from 0.350 (Southeast) to 0.493 (Alaska/Boreal Canada) and averaged 0.409 ± 0.050; and proportion of residents among newly captured adults ranged from 0.442 (Northeast) to 0.506 (South-central) and averaged 0.472 ± 0.025.

Again, as in previous years, mean regional survival rates for adequately estimated species were higher for the three more southerly regions (Southwest: 0.519 ± 0.105; South-central: 0.515 ± 0.083; and Southeast: 0.513 ± 0.090) than for the three more northerly regions (Northwest: 0.503 ± 0.107; Northeast: 0.503 ± 0.112; and North-central: 0.481 ± 0.095), and were lowest for the far northern Alaska/Boreal Canada region (0.451 ± 0.091). In contrast, mean regional recapture probabilities for these same species tended to show the opposite pattern, being lower in the Southeast (0.350 ± 0.162) and South-central (0.377 ± 0.129) regions than in the Northeast (0.416 ± 0.158) and North-central (0.448 ± 0.150) regions, and highest of all in the Alaska/Boreal Canada region (0.493 ± 0.174). Breaking this pattern, however, were the western regions, where recapture probabilities were lower in the Northwest Region (0.365 ± 0.152) than the Southwest Region (0.412 ± 0.156). Mean regional proportion of residents among newly captured adults for these same species showed no distinct pattern, being lowest for the Northeast and Southwest regions (0.442 ± 0.161 and 0.443 ± 0.195, respectively), and highest for the South-central and Southeast regions (0.506 ± 0.206 and 0.495 ± 0.155, respectively).

In general, both for all species for which survival was estimated and for adequately estimated species, mean regional survival probabilities from 10 years of data were lower than those from seven years of data for each of the four central and eastern regions and for the Alaska/Boreal Canada Region (cf. Table 4 herein and Table 3 in DeSante and O'Grady 2000). In contrast, mean regional survival probabilities for both groups of species from 10 years of data were higher than those from seven years of data for both the Northwest and Southwest regions (cf. Table 4 here, Table 3 in DeSante and O'Grady 2000). To control for potential differences in the species being compared, we ran matched-pairs t-tests between survival estimates

from ten and seven 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 slightly, but non-significantly, lower for ten than for seven years of data for each of the seven regions [nearly significantly so (t = 1.71, n = 28, P = 0.098) by 0.029 (5.7%) for the North-central Region]. For all 224 species-region combinations with CV(φ) <30% for both sets of data, survival estimates were also slightly, but highly significantly (t = 2.65, n = 224, P = 0.009), lower by 0.015 (2.9%) for ten than for seven years of data.

Finally, for each species in each region, we modeled all possible combinations of time dependence in the three parameters, φ, p, τ (Table 4). We detected time dependence in at least one parameter (by having a time-dependent model that was at least an equivalent model) for 107 (26.0%) of the 411 species-region combinations (Table 6). 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 61 (14.8%) of the 411 species-region combinations. Time dependence in survival rate was detected for 47 (11.4%) of the 411 species-region combinations, and was found to be the selected model for 14 (3.4%) of the species-region combinations. Interestingly, time-dependence in survival was detected more frequently in the three more northerly regions (Northwest - 19.5% of species; North-central - 13.0%; and Northeast - 14.1%) than in the three more southerly regions (Southwest - 9.7%; South-central - 3.3%; and Southwest - 9.8%) or the Alaska/Boreal Canada Region (5.6%).

DISCUSSION

MAPS coverage of North America in 1999, 2000, and 2001 was widespread with useable data received in time for this report from 467, 474, and 484 stations, respectively. Although coverage was generally good, there still were gaps, most notably in the Great Basin, southwest deserts, Great Plains, deep South, and most of Canada. Continuity of station operation remained high during the three years (averaging 91.6%), but was slightly lower than the approximately 95% continuity rate that characterized the first five years of the program (1992-1996). Because station continuity is vital for continued success of MAPS, it is important that operators attempt to identify and train new operators to take over their station(s) when, for whatever reason, they find that they must discontinue operation.

POPULATION SIZE AND PRODUCTIVITY INDICES

Adult population sizes, as indexed by MAPS, decreased substantially and significantly between 1998 and 1999 in the Northwest and South-central regions and increased slightly and non-significantly in the remaining five regions, resulting in a small but significant decrease continent-wide. The patterns of changes in adult population size between 1999 and 2000 were generally reversed from those between 1998 and 1999, with a substantial and significant increase in the South-central region and decreases of varying size and significance in the other six regions, resulting in a highly significant decrease continent-wide. These patterns generally reversed again between 2000 and 2001, with significant decreases in adult population sizes in the Southwest and South-central regions and increases in four of the five remaining regions resulting in a very small and non-significant increase continent-wide. Indeed, in most regions, an alternating pattern of increases and decreases has characterized the annual changes in adult population size from 1997-1998 through 2000-2001, during which the numbers of stations available for between-year comparisons remained relatively constant (ranging 375 - 415 and averaging 395).

Of further interest is the fact that regional reproductive indices have also shown a generally alternating pattern of increases and decreases over the five pairs of years from 1996-1997 through 2000-2001, but the pattern of increases and decreases in productivity has generally been out-of-phase with the analogous pattern in adult population size. Thus, for example, regional increases in productivity in 1997 were often followed by regional increases in adult population size in 1998 that coincided with decreases in productivity in 1998, which were then followed by decreases in adult population size in 1999, etc. Indeed, 20 of 28 (71%; P = 0.036, binomial test) annual changes in reproductive index in the various regions were

TABLE 6. Number (proportion) of species in each region for which time-dependence in survival rate, φ_t, or time-dependence in any parameter, φ_t, p_t, or τ_t was detected using modified Cormack-Jolly-Seber capture-mark-recapture analyses from ten years (1992-2001) of MAPS data.

	Number (proportion) of species							
Model	Northwest	Southwest	North-central	South-central	Northeast	Southeast	Ak/Bor. Can.	All regions
φ_t selected[1]	5 (0.065)	3 (0.042)	1 (0.019)	1 (0.017)	2 (0.028)	2 (0.049)	0 (0.000)	14 (0.034)
φ_t equivalent[2]	10 (0.130)	4 (0.056)	6 (0.111)	1 (0.017)	8 (0.113)	2 (0.049)	2 (0.056)	33 (0.080)
φ_t detected[3]	15 (0.195)	7 (0.097)	7 (0.130)	2 (0.033)	10 (0.141)	4 (0.098)	2 (0.056)	47 (0.114)
φ time-independent[4]	62 (0.805)	65 (0.903)	47 (0.870)	58 (0.967)	61 (0.859)	37 (0.902)	34 (0.944)	364 (0.886)
Total	77	72	54	60	71	41	36	411
φ_t, p_t, or τ_t selected[5]	15 (0.195)	20 (0.278)	8 (0.148)	7 (0.117)	7 (0.099)	2 (0.049)	2 (0.056)	61 (0.148)
φ_t, p_t, or τ_t equivalent[5]	9 (0.117)	3 (0.042)	5 (0.093)	9 (0.150)	12 (0.169)	4 (0.098)	4 (0.111)	46 (0.112)
φ_t, p_t, or τ_t detected[5]	24 (0.312)	23 (0.319)	13 (0.241)	16 (0.267)	19 (0.268)	6 (0.146)	6 (0.167)	107 (0.260)
φ, p, and τ each time-independent[5]	53 (0.688)	49 (0.681)	41 (0.759)	44 (0.733)	52 (0.732)	35 (0.854)	30 (0.833)	304 (0.740)
Total	77	72	54	60	71	41	36	411

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

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

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

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

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

followed the next year in those regions by changes in adult population size that had the same sign. Interestingly, 14 of 18 (78%; $P = 0.031$, binomial test) significant or nearly significant regional changes in productivity (as determined by changes in the reproductive index for all species pooled or by the proportion of species with increases or decreases) were followed the next year by regional changes in adult population size of the same sign, while only 6 of 10 (60%; $P = 0.754$, binomial test) non-significant regional changes in productivity were followed by regional changes in adult population size of the same sign.

These alternating out-of-phase patterns in productivity and population size suggest that (a) increases in productivity in a given year may result in increases in adult population size the following year through increased recruitment of young birds, and (b) this increased density of breeding birds, coupled with a higher proportion of young, inexperienced breeders in the population, may suppress productivity presumably through increased competition for food or other critical resources needed for nesting. The fact that increases in adult population size in a given year were not always coincident with decreases in productivity that year suggest that density-independent factors (presumably including weather- and climate-related phenomena) may also drive changes in productivity. Moreover, the fact that increased productivity in a given year was not always followed the next year by increased adult population size suggests that other factors besides productivity (presumably survival of young and adults) also drive year-to-year changes in adult population size. Indeed, it should be emphasized that long-term population trends depend on the balance between recruitment of young and survival of adults (and immigration and emigration), even in situations in which alternating increases and decreases in adult population size are perfectly out-of-phase with analogous increases and decreases in productivity.

It is also of interest to note that the general pattern of changes in adult population size in the Northwest, Southwest, and South-central regions during the four between-year comparisons from 1997-1998 through 2000-2001 (increase, decrease, increase, decrease) was opposite the general pattern of changes during those years in the North-central, Northeast, and Southeast regions (decrease, increase, decrease, increase). This suggests that the annual changes in productivity (that greatly influence subsequent annual changes in adult population size) may be driven by weather factors that tend to act in concert over large areas of the continent, but that tend to differ between the eastern and western portions of the continent. In this respect, it is interesting that annual variations in productivity and population sizes for the South-central Region tend to be more similar to those in Northwest and Southwest regions, while annual variations in the North-central Region tend to be more similar to those in the Northeast and Southeast regions. We emphasize that weather conditions on the breeding grounds during the breeding season may not necessarily be the most important weather factors driving annual variations in landbird productivity. Indeed, Nott et al. (2002) used MAPS data to show that annual variations in productivity of Neotropical-wintering migratory landbirds that breed in national forests in the Pacific Northwest (Washington and Oregon) correlate best with annual variations in late-winter/early-spring weather on their west Mexican wintering grounds that are apparently driven by annual variations in the El Nino/Southern Oscillation climate cycle. In contrast, however, annual variations in productivity of temperate-wintering landbirds that breed in those same forests correlate best with variations in late-winter/early-spring weather on their breeding grounds that are apparently driven by annual variations in the North Atlantic Oscillation climate cycle. In both cases, however, it seems to be weather just prior to, rather than during, the breeding season that controls productivity.

SURVIVAL-RATE ESTIMATES

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 39%, from 49 to 68 stations, when data from 10 years (1992-2001) rather than seven years (1992-1998; DeSante and O'Grady 2000) were included in survivorship analyses. Because of a relaxation of the criteria for including

species in survival analyses (from 49 to 25 year-unique records), the mean number of species per region for which data were sufficient to be included in regional survivorship analyses increased by an average of 34%, from 44 to 59 species. The increase in the number of stations and in the length of the study (thus an increase in the total number of capture histories and the average number of years over which they were captured) resulted in a substantial increase in the precision of the parameter estimates obtained from capture-mark-recapture analyses. Thus, the mean number of species per region with CV(φ) <30%, <20%, and <10% increased by 35% (from 34 species with seven years of data to 46 with ten years of data), by 57% (from 23 to 36 species), and by 100% (from 8 to 16 species), respectively.

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 might be an expected result as the longer migration routes of more northerly nesting migratory species and the more severe weather faced by more northerly nesting permanent resident species may each reduce survival probabilities of adults. Moreover, these expected lower survival rates at higher latitudes may well be compensated by higher productivity at more northerly latitudes. Future analyses of MAPS data will test these hypotheses by modeling survival and productivity using latitude (and perhaps altitude) covariates.

It is of interest that survival rates for adequately-estimated species tended to be lower for the 10-yr data set, than for the 7-yr data set, in all seven regions. DeSante and O'Grady (2000) noted a similar difference between the 7-yr and 5-yr (1992-1996) data sets, although at least some of that difference likely was caused by inclusion of the within-year transient model (Hines et al. 2003, Nott and DeSante 2002) in the 7-yr but not the 5-yr data set. However, because both the 7- and 10-yr data sets included the within-year transient model, survival for these species during the last three years of the 10-yr study may well have been lower than in earlier years of the study. Moreover, if the analogous differences between the 7- and 5-yr data sets were not entirely due to the inclusion of the within-year transient model in the 7-yr data set, then a negative trend in survival among North American landbirds over the past 10 years may well exist. In future analyses, we will test this hypothesis directly by modeling survival as a linear function of year.

Interestingly, for capture-mark-recapture analyses utilizing the 10 years of data, the proportion of species for which time-dependent survival (or time-dependence in any parameter estimate) was detected was less than the analogous proportion utilizing seven years (1992-1998) of data for each of the seven regions except the Southeast Region (where the proportion of species with time-dependent survival from the 10-yr data set [0.098] was only slightly higher than the analogous proportion [0.088] from the 7-yr data set). Moreover, in only this one case was the actual *number* of species showing time-dependent survival (or time-dependence in any parameter estimate) greater for the 10-yr (4 species) than the 7-yr (3 species) data sets, despite the fact that we were able to estimate survival for more species from the 10-yr data sets than from the 7-yr data sets. Indeed, using the 10-yr data set and summing over all regions, only 47 species-region combinations (11.4%) showed time-dependent survival and 107 species-region combinations (26.0%) showed time-dependence in any parameter estimate. This compares to 56 species-region combinations (18.2%) that showed time-dependent survival and 124 species-region combinations (40.4%) that showed time-dependence in any parameter estimate using the 7-yr data set. This rather unexpected result suggests that estimates of annual survival (and annual estimates of other parameters) tended to be closer to the mean for the latter three years (1999-2001) than for the earlier seven years (1992-1998). These results, in conjunction with results showing mean regional survival rates from the 10-year data set tended to be lower than those from the 7-yr data set, reinforce the hypothesis that there may well be a negative trend in survival among North American landbirds. We hasten to add, however, that considering the great annual variability in weather and its likely effect upon annual variations in survival, at least 20 years of data may be necessary to detect meaningful trends in survival for most target species (Rosenberg et al. 2000).

RECENT RESULTS RELATED TO RESEARCH AND MANAGEMENT GOALS OF MAPS

During the past three years, we have continued to make considerable progress toward attaining the research and management goals of MAPS. In particular, we have formulated management strategies based on modeling demographic parameters of landbirds (adult population size, reproductive index, and trends in each of these two parameters) as functions of remote-sensed landscape characteristics within areas of 2-4 km radius surrounding MAPS stations on military installations and national forests (Nott et al. 2003, 2005). Now, in cooperation with foresters, natural resource managers, and land managers on these forests and installations, our management strategies have begun to be integrated into new and on-going land management designed simultaneously to conserve natural resources and enhance the particular forest or military mission. In each case, MAPS stations have been established or sustained to monitor the effectiveness of our avian management strategies.

Additional recent analyses have summarized results from 10 years (1992-2001) of MAPS data in Alaska and documented anomalously low productivity and survival rates for several species in South-central Alaska; examined the usefulness of MAPS stations on national wildlife refuges in USFWS Region 1 to monitor the demographics of bird species of conservation concern in target habitat types; and examined MAPS data from stations throughout the Northwest MAPS region (from SE Alaska to NW Wyoming and northern California) to formulate a strategy for maintaining existing stations and establishing new stations to effectively monitor the demographics of bird species of conservation concern and other target and focal species listed in the various Bird Conservation Plans in the Region. We have also assessed the statistical power to detect differences in survival between populations or changes in survival over time using MAPS data and determined the numbers of species for which adult survival rates can be effectively assessed and monitored in each of the seven MAPS regions and for all seven regions combined. We are currently combining these results with those from the above mentioned analyses in order to formulate a vision for enhancing and expanding the MAPS Program in order to optimize its utility as part of continent-wide Coordinated Bird Monitoring.

Finally, other current, on-going analyses of MAPS data are showing strong positive correlations between MAPS productivity indices and nest monitoring results from the Breeding Biology Research and Monitoring Database (BBIRD) for about 30 species of wood-warblers and between estimates of lambda from MAPS capture-mark-recapture data and population trends estimated from the North American Breeding Bird Survey (BBS) for these species. Additional current analyses combining MAPS, BBS, and MoSI (Monitoreo de Sobrevivencia Invernal – Monitoring Overwintering Survival; DeSante et al. 2005b) are providing results suggesting that population trends in these warbler species may be driven primarily by factors operating away from the their breeding grounds and affecting survival, especially survival of first-year birds.

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LITERATURE CITED

BAILLIE, S. R. 1990. Integrated population monitoring of breeding birds in Britain and Ireland. Ibis 132:151-161.

BAILLIE, S. R., R. E. GREEN, M. BODDY, AND S. T. BUCKLAND. 1986. An Evaluation of the Constant Effort Sites Scheme. British Trust for Ornithology, Thetford, U.K. 103 pp.

BOCK, C. E., AND Z. F. JONES. 2004. Avian habitat evaluation: should counting birds count? Frontiers in Ecology and Environment 2:403-410.

BURNHAM, K. P., AND D. R. ANDERSON. 1992. Data-based selection of an appropriate biological model: the key to modern data analysis. Pp. 16-30 *in* McCullough, D. C. and R. H. Barrett (eds.), Wildlife 2001: Populations. Elsevier Applied Science, London, U.K.

BURNHAM, K. P., AND D. R. ANDERSON. 1998. Model Selection and Inference: a Practical Information Theoretic Approach. Springer-Verlag, New York, NY

CLOBERT, J., J. D. LEBRETON, AND D. ALLAINE. 1987. A general approach to survival rate estimation by recaptures or resightings of marked birds. Ardea 75:133-142.

COCHRAN, W. G. 1977. Sampling Techniques, Third Edition. John Wiley & Sons, New York, NY.

DESANTE, D. F. 1992. Monitoring Avian Productivity and Survivorship (MAPS): a sharp, rather than blunt, tool for monitoring and assessing landbird populations. Pp. 511-521 *in* McCullough, D. C., and R. H. Barrett (eds.), Wildlife 2001: Populations. Elsevier Applied Science, London, U.K.

DESANTE, D. F. 1995. Suggestions for future directions for studies of marked migratory landbirds from the perspective of a practitioner in population management and conservation. Journal of Applied Statistics 22:949-965.

DESANTE, D. F., AND K. M. BURTON. 1994. The Monitoring Avian Productivity and Survivorship (MAPS) Program third annual report (1992). Bird Populations 2:62-89.

DESANTE, D. F., K. M. BURTON, AND D. R. O'GRADY. 1996. The Monitoring Avian Productivity and Survivorship (MAPS) Program fourth and fifth annual report (1993 and 1994). Bird Populations 3:67-120.

DESANTE, D. F., K. M. BURTON, J. F. SARACCO, AND B. L. WALKER. 1995. Productivity indices and survival rate estimates from MAPS, a continent-wide programme of constant-effort mist netting in North America. Journal of Applied Statistics 22:935-947.

DESANTE, D. F., K. M. BURTON, P. VELEZ, AND D. FROEHLICH. 2004b. MAPS Manual: 2004 Protocol. The Institute for Bird Populations, Point Reyes Station, CA.

DESANTE, D. F., K. M. BURTON, AND O. E. WILLIAMS. 1993b. The Monitoring Avian Productivity and Survivorship (MAPS) Program second annual report (1990-1991). Bird Populations 1:68-97.

DESANTE, D. F. AND T. L. GEORGE. 1994. Population trends in the landbirds of western North America. *In* J. R. Jehl, Jr. and N. K. Johnson (eds.), A Century of Avifaunal Change in Western North America. Studies in Avian Biology 15:173-190.

DESANTE, D. F., M. P. NOTT, AND D. R. KASCHUBE. 2005a. Monitoring, modeling, and management: why base avian management on vital rates and how should it be done? Pp 795-804 *in* Ralph, C.J., and T.D. Rich (eds.), Bird Conservation Implementation and Integration in the Americas. USDA Forest Service Gen. Tech. Rep. PSW-191.

DESANTE, D. F., AND D. R. O'GRADY. 2000. The Monitoring Avian Productivity and Survivorship (MAPS) Program 1997 and 1998 report. Bird Populations 5:49-101.

DESANTE, D. F., D. R. O'GRADY, K. M. BURTON, P. VELEZ, D. FROEHLICH, E. E. FEUSS, H. SMITH, AND E. D. RUHLEN. 1998. The Monitoring Avian Productivity and Survivorship (MAPS) Program sixth and seventh annual report (1995 and 1996). Bird Populations 4:69-122.

DESANTE, D. F., AND D. K. ROSENBERG. 1998. What do we need to monitor in order to manage landbirds? Pp.93-106 in Marzluff, J. M. and R. Sallabanks (eds.), Avian Conservation: Research and Management. Island Press, Washington, D.C.

DESANTE, D. F., J. F. SARACCO, D. K. O'GRADY, K. M. BURTON, AND B. L. WALKER. 2004a. Methodological Considerations of the Monitoring Avian Productivity and Survivorship (MAPS) Program. Studies in Avian Biology 29:28-45.

DESANTE, D. F., T. S. SILLETT, R. B. SIEGEL, J. F. SARACCO, C. A. ROMO DE VIVAR ALVAREZ, S. MORALES, A. CEREZO, D. R. KASCHUBE, M. GROSSELET, AND B. MILA. 2005b. MoSI (Monitoreo de Sobrevivencia Invernal): Assessing habitat-specific overwintering survival of Neotropical migratory landbirds. Pp. 926-936 *In* Bird Conservation Implementation and Integration in the Americas (C. J. Ralph and T. D. Rich, eds.). USDA Forest Service Gen. Tech. Rep. PSW-GTR-191.

DESANTE, D. F., O. E. WILLIAMS, AND K. M. BURTON. 1993a. The Monitoring Avian Productivity and Survivorship (MAPS) Program: overview and progress. Pp. 208-222 *in* Finch, D. M., and P. W. Stangel (eds.), Status and Management of

Migratory Birds. USDA Forest Service, Rocky Mt. Forest and Range Experimental Station, Ft. Collins, CO. General Technical Report RM-229.

DONOVAN, T. M., F. R. THOMPSON III, J. FAABORG, AND J. R. PROBST. 1995. Reproductive success of migratory birds in habitat sources and sinks. Conservation Biology 9:1380-1395.

FROEHLICH, D., D. F. DESANTE, AND P. VELEZ. 2004. MAPSPROG Version 3.7 User's Guide and Manual. The Institute for Bird Populations, Pt. Reyes Station, CA. 93 pp.

HINES, J. E., W. L. KENDALL, AND J. D. NICHOLS. 2003. On the use of the robust design with transient capture-recapture models. Auk 120:1151-1158

LEBRETON, J. -D., K. P. BURNHAM, J. CLOBERT, AND D. R. ANDERSON. 1992. Modeling survival and testing biological hypotheses using marked animals: a unified approach with case studies. Ecological Monographs 62:67-118.

MARRA, P. P., K. A. HOBSON, AND R. T. HOLMES. 1998. Linking winter and summer events in a migratory bird by using stable-carbon isotopes. Science 282:1884-1886.

NOON, B. R. AND J. R. SAUER. 1992. Population models for passerine birds: structure, parameterization, and analysis. Pp. 441-464 *in* Wildlife 2001: Populations. D. C. McCullough and R. H. Barrett (eds.), Elsevier Applied Science, London.

NOTT, M. P., AND D. F. DESANTE. 2002. Demographic monitoring and the identification of transients in mark-recapture models. Pp 727-736 *in* J. M. Scott and P. Heglund (eds.), Predicting species occurrences: issues of scale and accuracy. Island Press, New York.

NOTT, M. P., D. F. DESANTE, R. B. SIEGEL, AND P. PYLE. 2002. Influences of the El Niño/Southern Oscillation and the North Atlantic Oscillation on avian productivity in forests of the Pacific Northwest of North America. Global Ecology and Biogeography 11:333-342.

NOTT, M. P., D. F. DESANTE, AND N. MICHEL. 2003. Management Strategies for Reversing Declines in Landbirds of Conservation Concern on Military Installations: A Landscape-scale Analysis of MAPS Data. Unpublished report to the U.S. Department of Defense Legacy Resource Management Program. The Institute for Bird Populations, Point Reyes Station, CA. 119 p.

NOTT, M. P., D. F. DESANTE, P. PYLE, AND N. MICHEL. 2005. Managing Landbird Populations in Forests of the Pacific Northwest: Formulating Population Management Guidelines from Landscape-scale Analyses of MAPS Data from Avian Communities on Seven National Forests in the Pacific Northwest. Unpublished report to the National Fish and Wildlife Foundation and the USDA Forest Service, Northwest Region. The Institute for Bird Populations, Point Reyes Station, CA. 163 p.

PEACH, W. J., S. T. BUCKLAND, AND S. R. BAILLIE. 1996. The use of constant effort mist-netting to measure between-year changes in the abundance and productivity of common passerines. Bird Study 43:142-156.

PEACH, W. J., S. R. BAILLIE, AND D. E. BALMER. 1998. Long-term changes in the abundance of passerines in Britain and Ireland as measured by constant effort mist-netting. Bird Study 45:257-275.

POLLOCK, K. H., J. D. NICHOLS, C. BROWNIE, AND J. E. HINES. 1990. Statistical inference for capture-recapture experiments. Wildlife Monographs No. 107.

PRADEL, R., J. HINES, J.-D. LEBRETON, AND J. D. NICHOLS. 1997. Capture-recapture survival models taking account of transients. Biometrics 53:60-72.

PULLIAM, H. R. 1988. Sources, sinks, and population regulation. American Naturalist 132:652-661.

ROBBINS, C. S., D. BYSTRAK, AND P. H. GEISSLER. 1986. The Breeding Bird Survey: Its First Fifteen Years, 1965-1979. U.S. Fish and Wildlife Service, Resource Publication 157. 196 pp.

ROSENBERG, D. K., D. F. DESANTE, AND J. E. HINES. 2000. Monitoring survival rates of landbirds at varying spatial scales: an application of the MAPS Program. Pp. 178-184 *in* Bonney, R., D. N. Pashley, R. J. Cooper, and L. Niles (eds.), Strategies for Bird Conservation: the Partners in Flight Planning Process. Proceedings of the Third Partners in Flight Workshop; 1995 October 1-5; Cape May, NJ. Proceedings RMRS-P-16. Ogden, UT: USDA, Forest Service, Rocky Mountain Research Station.

SCHLAEPFER, M. A., M. C. RUNGE, AND P. W. SHERMAN. 2002. Evolutionary and ecological traps. Trends in Ecology and Evolution 17:474-480.

TEMPLE, S. A., AND J. A. WIENS. 1989. Bird populations and environmental changes: can birds be bio-indicators? American Birds 43:260-270.

VAN HORNE, B. 1983. Density as a misleading indicator of habitat quality. Journal of Wildlife Management 47:893-901.

WHITE, G. C. 1983. Numerical estimation of survival rates from band-recovery and biotelemetry data. Journal of Wildlife Management 47:716-728.

APPENDIX. Summary of the 49 MAPS stations newly established in 1999, the 37 stations newly established in 2000, the 49 stations newly established in 2001, and the 8 stations established prior to 1999 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 1999									
NORTHWEST REGION									
11218	Provo River - Old #2	J. Parrish	Federal/State/Private	UT	Heber	403-1112	1750	cottonwood-willow riparian/cattails	97
SOUTHWEST REGION									
12348	Palomarin Grid (Uppers)	D. Humple	PRBO Conservation Science	CA	Bolinas	375-1224	122	coastal scrub/douglas fir	92
SOUTH-CENTRAL REGION									
14493	Shelterwood Harvest	D. Twedt	U.S. Fish & Wildlife Service	LA	Delhi	321-0912	22	bottomland hardwood forest	94
14513	North 1/3 of Comp. 16	D. Twedt	U.S. Geological Survey /U.S. FWS	LA	Delhi	321-0912	21	oak-gum bottomland hardwood for.	94
14514	Forest Comp. 11, south	D. Twedt	U.S. Geological Survey /U.S. FWS	LA	Delhi	322-0911	21	oak-gum bottomland hardwood for.	94
14515	Not cut,unmanaged forest	D. Twedt	U.S. Geological Survey /U.S. FWS	LA	Delhi	321-0912	21	oak-gum bottomland, unharvested	94
14517	Cottonwood Brake stand	D. Twedt	U.S. Geological Survey /U.S. FWS	MS	Fitler	323-0910	21	pulpwood managed cottonwd forest	94
SOUTHEAST REGION									
16687	Pilot Knob	D. Skinner	Kentucky State Natural Prairie	KY	Westbend	375-0835	259	deciduous forest	98
II. Stations established in 1999									
NORTHWEST REGION									
11200	Wildcat Ranch	L. Vidal	Pitkin Cty/Wildcat Ranch	CO	Snowmass Village	391-1065	2438	deciduous shrubland	99
11201	Arco Desert	T. Reynolds	Private	ID	Atomic City	433-1123	1500	sagebrush steppe	99
11202	Pattee Creek	V. Guyer	U.S. Bureau of Land Management	ID	Tendoy	445-1133	1585	riparian willow/alder shrub	99
11203	Cheerwood	L. Fish	Private	OR	Blachly	441-1233	378	mixed woodland/mixed grassland	99
11991	Ranger Creek	K. Symington	Parks Canada/Friends of Banff NP	AB	Banff	511-1154	1400	mixed shrubland/grassland	99
11992	Neotrop.Bird Sanc. Roseb	R. Espinosa	Private	OR	Canyonville	425-1231	488	open madrone woodl., shrub unders	99
SOUTHWEST REGION									
12281	Overton WMA	M. Boyles	National Park Service	NV	Overton	363-1142	380	tamarisk-willow riparian corridor	99
12282	Chorro Flats	P. Nieto	AS-Morro Coast	CA	Morro Bay	352-1204	30	riparian/grasslands/marsh	99
12283	Oso Flaco	P. Nieto	Private	CA	Guadalupe	350-1203	15	riparian woodland/dune scrub	99
12288	Atascadero Creek	K. Whitney	AS-Santa Barbara	CA	Goleta	342-1194	10	riparian corridor w/marsh & woods	99
12291	Starr Ranch Sanctuary	S. DeSimone	National Audubon Society	CA	Mission Viejo	333-1173	236	oak-sycamore woods/sagebr. flats	99
12292	Irvine Park	D. DeSante	CCOCNCCP	CA	Orange Park Acres	334-1174	223	coastal sage scrub/live oak woodlnd	99
12293	Upper Laurel Canyon	D. DeSante	CCOCNCCP	CA	Laguna Beach	333-1174	195	coastal sage scrub/live oak woodlnd	99
12294	Upper Wood Canyon	D. DeSante	CCOCNCCP	CA	Laguna Hills	333-1174	140	coastal sage scrub	99
12295	Upper Weir Canyon	D. DeSante	CCOCNCCP	CA	Anaheim	335-1174	329	coastal sage scrub/grassland	99
12296	Gardner's Cove	K. Griggs	U.S. Fish & Wildlife Service	CA	Modesto	373-1211	28	oak woodland/cottonwood/willow	99
12300	O'Neill Forebay Wildl. Ar	L. Sparks	CA Fish & Game	CA	Santa Nella	370-1210	32	grassland/deciduous woodland	99
12312	UT Test & Training Rng.	J. Parrish	U.S. Department of Defense	UT	Lakeside	410-1125	1286	greasewood/shadscale	99
12326	Project Area	R. Burnett	PRBO Conservation Science	CA	Redding	403-1222	107	cottonwood-willow riparian	99
NORTH-CENTRAL REGION									
13359	Mary Gray Bird Sanc.	R. Weiss	Chipper Woods Bird Observatory	IN	Connersville	393-0851	289	2nd deciduous forest/grassland	99
13360	Alma College Bird Obs.	M. Bishop	Alma College	MI	Vestaburg	432-0845	259	deciduous forest	99
13361	North Oaks	M. Patty	Private	MN	North Oaks	450-0930	274	willow scrub wetland / oak savanna	99

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
13362	Shiawassee NWR	R. Grefe	Private	MI	Saginaw	432-0840	178	grassland/floodplain forest	99
13363	Lawrence Woods	N. Moore	Ohio Northern University	OH	Kenton	403-0833	305	deciduous woodland/meadow	99
13364	River Edge Nature Center	A. Sherkow	River Edge Nature Center	WI	Newburg	432-0880	280	deciduous forest/deciduous shrubl	99
13365	Miller Woods	S. Wilmore	U.S. EPA-Great Lakes National Park	IN	Gary	413-0871	183	dune & swale savanna and wetlands	99
NORTHEAST REGION									
15605	Nauset School	D. DeSante	National Park Service - Cape Cod	MA	Eastham	415-0695	15	oak/pine (high density)	99
15606	Marconi Beach	D. DeSante	National Park Service - Cape Cod	MA	Wellfleet	415-0695	12	pine (low density)	99
15607	Blueberry Hill	D. DeSante	National Park Service - Cape Cod	MA	Wellfleet	415-0695	15	oak/pine (low density)	99
15608	Higgins House	D. DeSante	National Park Service - Cape Cod	MA	Wellfleet	415-0700	15	pine (high density)	99
15609	Oak Dunes	D. DeSante	National Park Service - Cape Cod	MA	Truro	415-0700	30	oak (low density)	99
15610	Longnook Beach	D. DeSante	National Park Service - Cape Cod	MA	Truro	420-0700	46	oak (high density)	99
15611	Montezuma NWR	T. Jasikoff	U.S. Fish & Wildlife Service	NY	Seneca Falls	425-0764	118	deciduous shrubland/dec. woodland	99
15612	Apple Orchard	J. Bullis	Electric Utility Companies	NJ	Harmony	404-0750	287	old apple orchard	99
15613	Willowbrook	R. Veit	PSC-Cuny Grant	NY	New York	403-0740	12	floodplain forest	99
15614	Boise de L'Heritage	G. Burelle	Private	PQ	Montreal	454-0733	12	?	99
15615	Nissiquogue River	P. Pelkowski	Long Island Community Foundation	NY	Smithtown	405-0731	8	closed canopy forest and field	99
15616	Beall Tract	J. Tinsman	?	WV	Davis	390-0792	985	maple-beech-cherry forest	99
15634	Stokely Creek Control	S. Holmes	Natural Resources Canada	ON	Sault Ste. Marie	464-0841	380	tolerant hardwood	99
15670	Gilsland Farm	J. Walker	?	ME	Falmouth	434-0701	6	deciduous forest/mixed shrubland	99
SOUTHEAST REGION									
16688	Spring Creek	J. Lamb	U.S. Department of Defense-Air Force	TN	Tullahoma	352-0860	345	fire managed oak & loblolly pine	99
16689	Cowan's Ford Wildl. Ref.	J. Esely	Mecklenburg County	NC	Huntersville	352-0805	221	mixed woodland/grassland	99
16690	Wassaw Island, South	P. Range	U.S. Fish & Wildlife Service	GA	Isle of Hope	315-0805	3	salt marsh to oak-pine forest	99
16691	South. Illinois Bird Obs.	C. Hutcheson	Private	IL	Makanda	373-0891	183	deciduous forest/mixed shrubland	99
16692	Sage Point	D. Skinner	Kentucky State Natural Prairie	KY	Westbend	375-0835	274	oak-hickory forest w/ utility row	99
16693	Woodcock Lane	T. Casselman	U.S. Fish & Wildlife Service/CMBO	NJ	Dias Creek	390-0745	3	deciduous woodland/dec. shrubland	99
16694	E.B. Forsythe NWR	T. Casselman	U.S. Fish & Wildlife Service/CMBO	NJ	Oceanville	392-0742	5	marsh and adjacent woods	99
16697	Fort Stewart A-7	L. Carlile	U.S. Department of Defense	GA	Flemington	315-0812	7	longleaf pine/wiregrass flatwoods	99
ALASKA AND BOREAL CANADA									
18805	Gros Morne	W. Burdett	Parks Canada	NF	Rocky Harbour	493-0575	20	shrubland/evergreen forest	99
III. Stations established in 2000									
NORTHWEST REGION									
11205	Lindzey's Place	A. Lyon	Private	WY	Laramie	411-1060	2286	cottonwood/willow riparian	00
11206	Dike	M. Bailey	U.S. Fish & Wildlife Service	WA	McKenna	470-1224	5	decid. shrub corridor/wetlands	00
11207	Restoration	M. Bailey	U.S. Fish & Wildlife Service	WA	McKenna	470-1224	10	oldfield	00
11208	Riverine	M. Bailey	U.S. Fish & Wildlife Service	WA	McKenna	470-1224	9	big-leaf maple-cottonwd rip. forest	00
11209	Surge Plain	M. Bailey	U.S. Fish & Wildlife Service	WA	McKenna	470-1224	10	decid. rip. surge plain-tide infl	00
11210	Lucky	G. Kaltenecker	U.S. FS/U.S. BLM/ID Fish & Game	ID	Boise	433-1160	1845	montane decid shrubland/doug-fir	00
11211	Lee Vining Creek	S. Heath	NFWF/U.S.BLM/U.S.FS/PRBO/Mono	CA	Lee Vining	375-1190	1960	black cottonwood/willow riparian	00
11212	Mill Creek	S. Heath	NFWF/U.S.BLM/U.S.FS/PRBO/Mono	CA	Lee Vining	380-1190	2036	riparian	00

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
11213	Rush Creek	S. Heath	NFWF/U.S.BLM/U.S.FS/PRBO/Mono	CA	Lee Vining	375-1190	2963	willow riparian passive restoration	00
11214	Wilson Creek	S. Heath	NFWF/U.S.BLM/U.S.FS/PRBO/Mono	CA	Lee Vining	380-1190	2073	willow riparian/pasture/ditch	00
11229	Snow Cow	J. Alexander	Klamath Bird Observatory	OR	Canyonville	424-1220	1585	rip. willow, mixed hardwood/pine	00
SOUTHWEST REGION									
12302	Headgate Rock	J. Kahl, Jr.	U.S. Bureau of Reclamation	AZ	Parker	341-1141	110	salt cedar/mesquite/arrowweed	00
12303	Christman Island	K. Griggs	U.S. Fish & Wildlife Service	CA	Vernalis	373-1211	30	cottonwood-willow-valley oak rip.	00
12304	Ernest Debs Reg. Park	D. Cooper	NAS	CA	Los Angeles	340-1181	155	ca black walnut/live oak woodland	00
12305	Sierra Ajos	T. Wood	NPS/U.S. BLM/U.S. EPA	SO	Canannea, Sonora	305-1095	1920	mixed oak-pine madrean woodland	00
12306	Morelos	T. Wood	NPS/U.S. BLM/U.S. EPA	SO	Canannea, Sonora	311-1101	1333	cottonwood-willow riparian woods	00
12307	Goleta Slough	K. Whitney	?	CA	Isla Vista	342-1195	3	meadow shrubland/deciduous woodl	00
12313	Garden Wash	J. Whetstone	U.S. Bureau of Land Management	AZ	Sierra Vista	313-1100	1250	cotton-willow riparian/small pond	00
12335	Florida Canyon	W. Leitner	Private	AZ	Madera Canyon	314-1105	4250	cottonwood-mesquite rip./grassland	00
NORTH-CENTRAL REGION									
13366	Buffalo Riv. Monitor. Sta	G. Hoch	?	MN	Glyndon	465-0962	300	grassland/deciduous forest	00
13367	1961 Kirtland's Warbler	M. Petrucha	U.S. FWS/U.S. Geological Survey	MI	Rose City	442-0841	381	evergreen forest	00
SOUTH-CENTRAL REGION									
14474	Audubon Inst. Banding St	M. Myers	Audubon Nature Institute	LA	Meraux/Violet	295-0895	1	lowland hardwood forest	00
14475	Bell Slough	C. Rideout	AR Game & Fish Commission	AR	Mayflower	345-0922	77	bald cypress-swamp tupelo forest	00
14476	Stringfellow WMA	M. Ealy	TX Parks and Wildlife Department	TX	Brazoria	285-0955	2	oak-hackberry-green ash forest	00
14477	Hackberry Grove	J. Gallagher	TX Parks and Wildlife Department	TX	Artesia Wells	281-0992	160	hackberry/mesquite mixed brush	00
NORTHEAST REGION									
15618	Mashamack Preserve	M. Scheibel	The Nature Conservancy	NY	Shelter Island	410-0721	3	deciduous woodland/tidal marsh	00
15619	Carp Ridge	M. Caskey	?	ON	Constance Bay	452-0760	100	sugar maple forest/meadow	00
15620	Grt Smoky Mtns Tremont	P. Super	NPS - Great Smokies/CO Pl	TN	Townsend	353-0834	430	hardwood riparian forest	00
15621	Kettle Creek	D. Speicher	Private	PA	Reeders	405-0751	243	mixed for.;riparian and upland	00
15622	Skytop	D. Speicher	Private	PA	Skytop	411-0751	524	ripar. decid. for. w/ norway spruce	00
15623	Helmer Marsh	J. van Niel	U.S. Fish & Wildlife Service/Private	NY	Montezuma	430-0764	120	shrub/pioneer tree on forest edge	00
15624	Adventure	G. Radko	MD Orn.Soc/MD Ntl Capital Prk/Hood C	MD	Potomac	390-0771	91	grassland/deciduous woodland	00
15625	Corson's Wood/Brook	R. Veit	PSC-Cuny Grant	NY	Staten Island	403-0740	43	?	00
15626	Fundy National Park 2	D. Diamond	Fundy National Park	NB	Alma	453-0650	20	deciduous forest/mixed woodland	00
15640	Queens College Center	P. Schmidt	Private	NY	Lloyd Harbor	405-0732	32	?	00
SOUTHEAST REGION									
16700	Reedy Marsh Trail	J. Sasser	Johnston Community College	NC	Four Oaks	352-0781	29	bottomland hardwood forest	00
ALASKA AND BOREAL CANADA									
18806	Residence	A. Wotton	Provincial/Federal	AB	Slave Lake	552-1144	592	boreal-mixed woodland	00
IV. Stations established in 2001									
NORTHWEST REGION									
11215	Wallula - McNarry NWR	H. Browers	U.S. Fish & Wildlife Service	WA	Wallula	460-1185	106	cottonwood-willow riparian corrid	01
11216	Wildlife Research	T. Smucker	Plum Creek Timber Co./Private	MT	Seely lake	471-1133	1200	mixed forest/willow riparian cor.	01
11217	Snagboat Bend	J. Hagar	U.S. Fish & Wildlife Service	OR	Peoria	442-1231	73	cotton-willow riparian	01

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
11219	Schwaubacker's Landing	D. Wachob	Teton Science School	WY	Moose	434-1104	1980	cottonwood riparian corridor	01
11220	Jarvis Lane Housing Dev.	D. Wachob	Teton Science School	WY	Wilson	433-1105	1888	cottonwood riparian corridor	01
11230	Little Applegate	J. Alexander	Klamath Bird Observatory	OR	Ashland	421-1230	494	?	01
11231	Willow Wind	J. Alexander	Klamath Bird Observatory	OR	Ashland	421-1224	549	riparian willow/blackberry field	01
11258	McCarran Ranch	E. Ammon	U.S. FWS/TNC/GBBO	NV	Sparks	393-1193	1312	degraded cottonwood/willow rip.	01
SOUTHWEST REGION									
12308	Emerald Canyon	D. DeSante	CCOCNCCP	CA	Laguna Beach	333-1174	264	coastal sage scrub in steep canyon	01
12309	Round Canyon	D. DeSante	CCOCNCCP	CA	Irvine	334-1174	217	coastal sage scrub/oak woodland	01
12310	Sycamore Hills	D. DeSante	CCOCNCCP	CA	Laguna Woods	333-1174	186	coastal sage scrub	01
12311	Whiting Ranch	D. DeSante	CCOCNCCP	CA	Lake Forest	334-1173	276	coastal sage scrub/oak woodland	01
12314	Nav. Weap. Sta, Det. Fall	T. Campbell	Private	CA	Fallbrook	332-1171	95	cottonwood-willow riparian/scrub	01
12315	Solstice Canyon	W. Sakai	Private/LA Audubon Society	CA	Malibu	340-1184	59	riparian w costal scrub&chaparral	01
12316	Great Egret	S. Hudson	NFWF/City of San Jose	CA	San Jose	372-1215	2	riparian corridor in urban area	01
12317	Red-shouldered Hawk	S. Hudson	NFWF/City of San Jose	CA	San Jose	372-1215	2	riparian corridor in urban area	01
12318	Sharp-shinned Hawk	S. Hudson	NFWF/City of San Jose	CA	San Jose	372-1215	2	riparian corridor in urban area	01
12319	Turkey Vulture	S. Hudson	NFWF/City of San Jose	CA	San Jose	372-1215	2	riparian corridor in urban area	01
12320	White-tailed Kite	S. Hudson	NFWF/City of San Jose	CA	San Jose	372-1215	2	riparian corridor in urban area	01
12327	Saeltzer Dam	R. Burnett	PRBO Conservation Science	CA	Redding	402-1222	152	cottonwood-willow riparian	01
NORTH-CENTRAL REGION									
13368	Hitchcock Nature Area	C. Williams	Pottawatamie County Counsel	IA	Honey Creek	412-0955	396	bur oak-hickory forest/dogwd. edg	01
13369	Boyer Chute NWR	E. Grenon	U.S. Fish & Wildlife Service	NE	Ft. Calhoun	412-0955	305	cottonwood-mulberry riparian corr	01
13372	Scissons Envir. Ed. Cent.	T. Haughian	Saskatoon Catholic Schools Foundation	SK	Arelee	521-1072	495	native prairie/grassland/shrublnd	01
SOUTH-CENTRAL REGION									
14478	Lacassine NWR 1	W. Syron	U.S. Fish & Wildlife Service	LA	Lake Arthur	295-0924	2	mixed harwood/freshwater marsh	01
14479	Proving Grounds Res.Stat.	A. Kinslow	Private/EPA	MO	Fordland	371-0930	131	fragmented oak-hickory riparian	01
14480	Sulphur River WMA	C. Rideout	AR Game & Fish Commission	AR	Fouke	331-0935	62	bottomland hardwood	01
14481	Lower Ouachita WMA	C. Rideout	AR Game & Fish Commission	AR	Crossett	330-0920	21	sand prairie/bottomland hardwood	01
14482	Bird's Creek	J. Johnson	U.S. Department of Defense-Army	LA	Cravens	310-0930	29	mixed hardwood/long leaf riparian	01
NORTHEAST REGION									
15627	S. Fork Potomac River	D. DeSante	U.S. Department of Defense-Navy	WV	Brandywine	383-0791	536	riparian corridor/mixed conif. forest	01
15628	Beaver Creek	D. DeSante	U.S. Department of Defense-Navy	WV	Brandywine	383-0791	658	mixed coniferous-deciduous forest	01
15629	Flat Rock Brook Nat. As.	P. Magasich	Private	NJ	Englewood	405-0735	85	deciduous woods/suburbia	01
15630	Beaver Marsh	L. Doss	Marvelwood School	CT	Kent	414-0732	399	marsh edge w h.hornbeam&w.birch	01
15631	South Shore Nature Cent.	J. Horman	Private	NY	East Islip	404-0731	1	upl.oak-hick./r.maple-tupelo swmp	01
15632	Trinity College Field Sta	C. Millard	Private	CT	Ashford	415-0721	102	oak-hickory-red maple forest	01
15633	CT Aud. Center Pomfret	C. Millard	Audubon Council of CT	CT	Pomfret Center	415-0715	115	mixed decid.-conifer/open meadows	01
15635	Hoffman Center	I. Fernandes	Hoffman Foundation	NY	East Norwich	405-0733	59	mixed woodland/grassland in sub.	01
15636	Five Rivers	P. Nye	NY State Department of Environment	NY	Delmar	423-0735	50	open field/mixed decid.for./ripar	01
15637	James A Zaepfel N.S.	T. LeBlanc	Private - Cattaraugus Loc.	NY	Napoli	421-0785	502	shrubland/old field	01
15638	Mississquoi NWR	M. LaBarr	U.S. FWS/Audubon Vermont	VT	Swanton	445-0731	35	maple-ash bottomland forest/edge	01

APPENDIX. Continued.

Stn. no.	Station name	Operator	Sponsor	Prov./ State	Nearest town	10′ block	Elev. (m)	Habitat(s)	First Year
15639	Rapidan WMA	J. Cooper	Virginia Dept. of Game & Inld. Fisheries	VA	Wolftown	382-0782	488	mesic hardwood forest/riparian cor	01
15652	Long Road	D. Speicher	Private	PA	Canadensis	411-0751	442	deciduous forest/hemlock forest	01
15653	Two Mile Run	D. Speicher	Private	PA	Blakeslee	410-0753	472	boreal bog	01
SOUTHEAST REGION									
16695	North Montgomery Cnty	F. Bassett	Hummer/Bird Study Group/Private	AL	Montgomery	322-0861	50	mixed woodland/riparian corridor	01
16696	Poinsett Elec. Comb. Rng.	J. Hovis	U.S. Department of Defense - Air Force	SC	Pinewood	334-0802	60	bay&hardwd ridge w longleaf pine	01
16699	Ichuaway	J. Stober	Joseph W. Jones Ecological	GA	Newton	311-0842	120	mature longleaf pine forest	01
16701	Weekiwachee Preserve	C. Black	SW Florida Water Management District	FL	Spring Hill	282-0823	3	hardw hammock/pine flat/karst	01
16704	NC Wesleyan College	M. Brooks	North Carolina Wesleyan College	NC	Rocky Mount	360-0774	28	oldfield/mixed woodland/suburbia	01
16705	Foxsparrow Farms	F. Moore	Private/Hummer-Bird Study	AL	Steele	335-0861	400	mature oldfield	01
16707	Cahaba Mountain	B. Braman	Private	AL	Springville	334-0863	48	pine & hardwood hillside/meadow	01

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REVIVING RESIDENT BIRD COUNTS: THE 2001 AND 2002 BREEDING BIRD CENSUS[1]

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Abstract. Resident Bird Counts (RBC), two of the oldest bird monitoring programs in North America, include the Breeding Bird Census (BBC) and The Winter Bird Population Study. Last published in 1996, RBC will now be a regular feature in Bird Populations. The RBC revival starts with publication of the BBC, a territory- or spot-mapping program, for 2001 (34 reports) and 2002 (25 reports).

RESTABLECIMIENTO DE LOS CONTEOS DE AVES RESIDENTES: LOS CENSOS DE AVES REPRODUCTORAS DE 2001 Y 2002

Resúmen. Los Conteos de Aves Residentes (RBC por sus siglas en inglés), dos de los más antiguos programas de monitoreo en Norteamérica, incluyen el Censo de Aves Reproductoras (BBC por sus siglas en inglés) y el Estudio de Poblaciones de Aves Invernantes. Publicado por última vez en 1996, RBC ahora será una característica regular en /Bird Populations/. El restablecimiento de RBC comienza con la publicación del BBC, un programa de mapeo de territorios o de puntos, de 2001 (34 informes) y 2002 (25 informes).

INTRODUCTION

We announce the return of Resident Bird Counts (RBC), last published in the Journal of Field Ornithology in 1996 for census year 1995. Resident Bird Counts (RBCs) include the Breeding Bird Census and Winter Bird Population Study initiated in 1937 and 1948, respectively. These counts are among the oldest bird monitoring programs in North America and much has been written about the methods, objectives, uses, and history (see Lowe this volume: Breeding Bird Census bibliography).

Although publication of RBCs ceased in 1996, researchers and citizen scientists have continued to conduct censuses and send data to the Cornell Laboratory of Ornithology. Hence, it is the publication of results that is being revived here and not the censuses themselves. In the past, however, publication motivated data collection to some degree. Thus, when publication stopped, many fewer reports were submitted. By reviving publication we hope to indirectly revive data collection.

The RBC revival starts with publication of the Breeding Bird Census (BBC) for 2001 and 2002,

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which are years consistent with the other annual reports in this volume of Bird Populations.

WHY REVIVE?

The RBC is a valuable monitoring program. Relative to other monitoring programs, the RBC provides an opportunity to examine a very long time series, the analyses of which indicate that interpretation of population trends depends on the length of the study period (King et al. this volume). Continuing and hopefully expanding the counts will add to the already unprecedented (at least in North America) time series. Further, interpreting the results of population monitoring is complex, as is the setup of monitoring programs, and in our opinion no methodological panacea is in sight. Multiple methods such as the Breeding Bird Survey, the BBC, and constant-effort mist netting should be used for validation and interpretation of results. The RBC has already proven valuable in this regard (see King et al. this volume and Lowe this volume: Breeding Bird Census bibliography).

At a time when ornithologists are once again debating ways to count birds, the spot-mapping method, employed by the RBC, remains the benchmark used for validation of emerging counting techniques. Publication makes these data more accessible.

The RBC is one of the oldest citizen-science projects in North America. RBC citizen science provides an opportunity to collect bird and habitat data over a very large span of space and time. Simultaneously, citizen scientists learn more about the natural history of birds in their region and about the scientific process. Moreover, they gain environmental awareness through participation.

Publication of RBC will likely play an important role in motivating further data collection. In the past, when publication ceased, the number of reports plummeted. It is our hope that regular publication will once again breathe life into collection and submission of RBC data.

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; 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 affect populations on the study plot (e.g., predators, parasitism, disturbance, habitat change, large population fluctuations from previous years). **Other Observers:** Full names. **Acknowledgements:** If applicable.

THE FUTURE

Resident Bird Counts will now be a regular feature in Bird Populations. Publication will move forward at the pace of this journal and will be temporally in phase with reports from other monitoring programs around the world.

Depending on time and resources, we hope to eventually fill the gap in publication for all RBC.

Use of RBC data will be made more powerful with more years of study and with the addition of study plots (see Lowe this volume). The addition of replicate plots by habitat is desirable to address methodological concerns related to, for example, extrapolation of results to regions or habitat types.

The RBC will be most useful when the data are made available beyond publication. It is our ultimate goal to make all RBC data easily available through the Avian Knowledge Network (AKN; http://www.avianknowledge.net/). The AKN can provide the means for RBC data to be gathered (online data entry), archived, organized, discovered, and accessed. Further, the AKN has the potential to provide analyses and subsequent data visualizations of RBC data. For example, the AKN could deliver population trend results by species across several spatial scales. The RBC will be made even more powerful by its inclusion with all datasets federated by the AKN.

PARTICIPATION

Professional and amateur ornithologists alike are invited to participate. A contributing census is a great classroom activity, if supervised. We encourage participants to submit any data that have not been turned in yet, revisit previously censused plots, and to establish new ones. These data are most valuable when census effort is long-term and we encourage participants to visit their plot(s) for at least five years; ten would be better but any number will be useful. When it is no longer possible for you to do the survey, attempt to find someone to take over.

Contact Tom Gardali (tgardali@prbo.org) for instructions and data forms.

THE 2001 AND 2002 BREEDING BIRD CENSUS

A total of 59 Breeding Bird Census reports are included, 34 in 2001 and 25 in 2002 (Tables 1 and 2). The counts come from 7 states, 1 Canadian province, and the District of Columbia. California has the most counts with 17 (9 in 2001 and 8 in 2002) followed by Connecticut with 10 (5 in 2001 and 5 in 2002) and New York with 9 (5 in 2001 and 4 in 2002). Included here are a total of 4 plots being published for the first time.

TABLE 1. Summary of Breeding Bird Census reports from 2000.

Habitat	State or Prov.	Author(s)	Plot Size (ha)	Terr. per T40 ha	No. spp.	Hrs. Obs.	Yrs.
Broadleaf Forests							
1. Irrigated Mixed Willow Riparian	CA	S.K. Heath et al.	15.0	123	21	350.0	2
2. Recovering Mixed Willow-Black Cottonwood Riparian I	CA	S.K. Heath et al.	39.0	187	28	453.6	2
3. Recovering Mixed Willow-Black Cottonwood Riparian II	CA	S.K. Heath et al.	24.5	162	25	433.9	2
4. Remnant Black Cottonwood Riparian Forest	CA	S.K. Heath et al.	15.0	239	28	308.9	2
5. Mixed Hardwood Poletimber	CT	D. Rosgen	8.5	532	49	19.0	35
6. Second-Growth Hardwood Forest	CT	D. Rosgen	10.1	396	42	16.5	35
7. Central Hardwood Forest with Scattered Pine	DC	M.E. D'Imperio	26.3	192	27	29.2	52
8. Mixed Upland Broadleaf Forest	DC	M.E. D'Imperio	14.2	593	33	55.0	43
9. Oak-Maple-Poplar Hollow	PA	L. Ingram	11.3	145	13	32.8	9
10. Oak-Maple Ridge-Top Forest	PA	D.R. Barber	19.4	78	15	22.0	20
11. Oak-Maple Slope Forest	PA	D.R. Barber	16.9	101	20	22.9	20
12. Hardwood Bottom	SC	P.A. Koehler	11.4	307	19	20.3	3
13. Virgin Hardwood Swamp Forest	SC	M. Dawson	8.9	288	19	15.5	12
14. Mature Maple-Beech-Birch Forest	TN	H. Wilson et al.	10.2	347	13	22.7	9
Needleleaf Forests							
15. Cedar Forest	ID	S.R. Robinson	12.3	171	21	14.7	10
16. Upland Christmas Tree Farm	NY	E.W. Brooks	10.7	282	22	11.6	19
17. Upland Scotch Pine Plantation	NY	E.W. Brooks	9.3	202	25	9.2	33
18. Loblolly Pine Plantation	SC	P.A. Koehler	9.7	109	13	19.0	4
Broadleaf/Needleleaf Forests							
19. Climax Hemlock-White Pine Forest with Transition Hardwoods	CT	D. Rosgen	10.5	537	45	22.5	35
20. Young Mixed Hardwood-Conifer Stand	CT	D. Rosgen	8.5	428	44	14.5	24
21. Riparian Woodland	ID	S.R. Robinson	8.9	227	24	13.7	5
22. Mixed Upland Forest	NY	L. Bowdery et al.	42.3	148	44	33.7	7
23. Upland Mixed Pine-Spruce-Hardwood Plantation	NY	E.W. Brooks	16.6	190	27	10.7	28
Mixed Habitats							
24. Field, Ridge, Shrubby Trees, and Woods	ON	M.F.G. Clark	5.8	848	16	14.0	8
25. Shrubby Trees, Ridge, and Woods	ON	M.F.G. Clark	7.3	323	18	12.6	9
Non-forested Wetlands							
26. Desert Riparian-Freshwater Marsh	CA	E.A. Cardiff	15.4	436	31	26.8	24
27. Shrubby Swamp and Sedge Hummocks	CT	D. Rosgen	8.1	943	43	21.0	35

TABLE 1. Continued.

Habitat	State or Prov.	Author(s)	Plot Size (ha)	Terr. per T40 ha	No. spp.	Hrs. Obs.	Yrs.
Shrublands							
28. Coastal Scrub	CA	A. Dotolo	8.1	148	18	178.2	27
29. Disturbed Coastal Scrub A	CA	D. Jongsomjit, M.E. Flannery	4.7	174	21	164.0	27
30. Disturbed Coastal Scrub B	CA	P. Erwin	8.1	222	21	369.1	27
31. Grazed Coastal Scrub	CA	M.I. Huang	45.0	127	27	429.8	7
Successional Fields							
32. Abandoned Upland Pasture	NY	V.M. Pitzrick	8.0	540	41	6.8	18
33. Clear-Cut-Longleaf Pine Regeneration	SC	S.J. Wagner et al.	12.5	75	14	15.5	7
Cultivated							
34. Conventional Dairy Farm	PA	R.C. Keller	23.1	137	32	18.3	11

TABLE 2. Summary of Breeding Bird Census reports for 2002.

Habitat	State or Prov.	Author(s)	Plot Size (ha)	Terr. per T40 ha	No. spp.	Hrs. Obs.	Yrs.
Broadleaf Forests							
1. Irrigated Mixed Willow Riparian	CA	S.K. Heath et al.	15.0	157	25	370.6	3
2. Recovering Mixed Willow-Black Cottonwood Riparian I	CA	S.K. Heath et al.	39.0	188	27	521.0	3
3. Recovering Mixed Willow-Black Cottonwood Riparian II	CA	S.K. Heath et al.	29.5	205	32	483.2	3
4. Remnant Black Cottonwood Riparian Forest	CA	S.K. Heath et al.	15.0	284	29	426.5	3
5. Mixed Hardwood Poletimber	CT	D. Rosgen	8.5	656	50	17.5	36
6. Second-Growth Hardwood Forest	CT	D. Rosgen	10.1	392	46	16.5	36
7. Central Hardwood Forest with Scattered Pine	DC	M.E. D'Imperio	26.3	157	19	25.4	53
8. Mixed Upland Broadleaf Forest	DC	M.E. D'Imperio	14.2	514	30	45.0	44
9. White Oak Savannah	ON	M.F.G. Clark	10.4	219	19	16.5	8
10. Oak-Maple-Poplar Hollow	PA	L. Ingram	11.3	158	15	25.7	10
11. Hardwood Swamp Forest	SC	M.R. Dawson	8.1	481	18	13.0	12
Needleleaf Forests							
12. Upland Christmas Tree Farm	NY	E.W. Brooks	10.7	333	20	12.5	20
13. Upland Scotch Pine Plantation	NY	E.W. Brooks	9.3	252	30	8.4	34
14. High Altitude Red Spruce Forest	TN	A. Trently	9.9	115	10	25.8	10
Broadleaf/Needleleaf Forests							
15. Climax Hemlock-White Pine Forest with Transition Hardwoods	CT	D. Rosgen	10.5	522	46	23.0	36
16. Young Mixed Hardwood-Conifer Stand	CT	D. Rosgen	8.5	435	50	16.0	25
17. Riparian Woodland	ID	S.R. Robinson	8.9	236	25	13.5	6
18. Upland Mixed Pine-Spruce-Hardwood Plantation	NY	E.W. Brooks	16.6	213	32	10.9	29
Mixed Habitats							
19. Pitch Pine-Slabrock	NY	L. Bowdery et al.	15.8	137	28	27.6	3
20. Field, Ridge, Shrubby Trees, and Woods	ON	M.F.G. Clark	5.8	793	19	13.5	9
Non-forested Wetlands							
21. Desert Riparian-Freshwater Marsh	CA	E.A. Cardiff	15.4	278	29	25.5	25
22. Shrubby Swamp and Sedge Hummocks	CT	D. Rosgen	8.1	1086	46	25.0	36
Shrublands							
23. Coastal Scrub	CA	A. Rosenthal, D. Jongsomjit	8.1	237	22	203.7	28
24. Disturbed Coastal Scrub A	CA	B. MacDonald, D. Jongsomjit	4.7	221	25	176.9	28
25. Disturbed Coastal Scrub B	CA	E. Morrison, D. Jongsomjit	8.1	299	21	265.2	28

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BREEDING BIRD CENSUS: 2001

1. IRRIGATED MIXED WILLOW RIPARIAN
BOSQUE RIBEREÑO DE SAUCE, IRRIGADO

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Location: California; Mono Co.; Mono City; Wilson Creek; 38°03'N, 119°09'W; Lundy & Negit Island Quadrangles, USGS. **Continuity:** Established 2000; 2 yr. **Size:** 15 ha. **Description of Plot:** For at least a century, Wilson Creek's primary purpose has been that of a ditch, transporting water to Mono Lake after being extracted from Mill Creek and passed through a hydroelectric plant. Wilson Creek is a part of a large system of flooded and irrigated pasture used for sheep grazing. Main stem stream supports narrowleaf and yellow willow in narrow strips and up to 50 m-wide patches respectively. The canopy of mostly yellow willow barely exceeds 5 m. Nearly continuous ground cover is primarily Mexican and Nevada rush, creeping wild rye, and woolley sedge. Edge: Less than 25% of the plot's perimeter is bordered by the same habitat, as the plot encompasses a 3-km section of the stream and is bordered by Great Basin sagebrush scrub, irrigated pasture, and a small sub-division. Topography and Elevation: The plot is nearly level with a slope of <5% grade. Elevation ranges from 2060 m to 2070 m. **Weather:** Mean temp., 15.6°C (range -4–35°C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term means (1950–1988, Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation was below average in May and June and above average in July and August. **Coverage:** 350.5 h; 60 visits (57 sunrise, 3 sunset); 8 May–17 Jul. **Census:** Song Sparrow, 17.0 (45; 12N,11FL); Spotted Towhee, 10.5 (28; 1N); Yellow Warbler, 7.0 (19; 3N,2FL); Green-tailed Towhee, 4.0 (11); Northern Flicker, 2.0; Brewer's Sparrow, 1.5 (1N,3FL); American Kestrel, 1.0; Belted Kingfisher, 1.0; American Robin, 1.0; Common Yellowthroat, 1.0; Black-billed Magpie, col. (9N,12FL); Northern Rough-winged Swallow, col. (1N); Cliff Swallow, col. (4N,9FL); Red-winged Blackbird, col. (2N,3FL); Gadwall, unk. (1N,7FL); Mallard, unk.; Green-winged Teal, unk. (1N); Mourning Dove, unk.; Savannah Sparrow, unk.; Western Meadowlark, unk. (2N,1FL); Brown-headed Cowbird, unk. (12N,9FL). **Total:** 21 species; 46.0 territories (123/40 ha). **Visitors:** Northern Pintail, Mountain Quail, Killdeer, Wilson's Snipe, Common Nighthawk, Hairy Woodpecker, Willow Flycatcher, Dusky Flycatcher, Western Kingbird, Loggerhead Shrike, Warbling Vireo, Pinyon Jay, Mountain Chickadee, Sage Thrasher, MacGillivray's Warbler, Western Tanager, Fox Sparrow, Black-headed Grosbeak, Brewer's Blackbird, Bullock's Oriole, Cassin's Finch. **Remarks:** Despite Wilson Creek's primary purpose as a water transport system, its riparian vegetation supported birds associated with early successional riparian vegetation. Bird species richness here includes species associated with the irrigated grasslands adjacent to the creek. Nonetheless, Wilson Creek supported fewer territories and species than Mono Lake's other primary tributary streams. Cowbirds parasitized 67% of potential host species (Yellow Warbler, Song Sparrow, and Red-winged Blackbird) nests. Predation accounted for 50% of all nest failures. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. We also did not map species that primarily used the irrigated pasture next to our study plots (Savannah Sparrow, Western Meadowlark), though their territories encompassed the riparian somewhat. These species' territories are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management Bishop Field Office, United States Forest Service Partners in Flight - Region 5, Inyo National Forest, Mono Lake Committee, California Department of Fish and Game, Mono Lake Tufa State Reserve, White Mountain Research Station - Eastern Sierra Institute for Collaborative Education, Joel Ellis, and Jan Simis. This is PRBO contribution No. 1525.

2. RECOVERING MIXED WILLOW–BLACK COTTONWOOD RIPARIAN I

BOSQUE RIBEREÑO DE ÁLAMO Y SAUCES, EN RECUPERACIÓN I

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Location: California; Mono Co.; Lee Vining; Rush Creek; 37°56'N, 119°04'W; Lee Vining Quadrangle, USGS. **Continuity:** Established 2000; 2 yr. **Size:** 39 ha. **Description of Plot:** See Western Birds 35:197–209 (2004). **Weather:** Mean temp., 17.9°C (range -3–37°C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term means (1950–1988, Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation was below average in May and June and above average in July and August. **Coverage:** 453.6 h; 92 visits (87 sunrise, 5 sunset); 5 May–28 Jul. **Census:** Yellow Warbler, 88.5 (91; 104N,105FL); Spotted Towhee, 29.0 (30; 5N,8FL); Song Sparrow, 24.5 (25; 18N,12FL); Green-tailed Towhee, 8.0 (8); American Robin, 7.0 (7; 5N,6FL); Northern Flicker, 4.0 (4; 3N,4FL); Willow Flycatcher, 3.0 (3; 2N,7FL); MacGillivray's Warbler, 3.0; Brewer's Sparrow, 3.0 (1N,3FL); Savannah Sparrow, 3.0; Black-headed Grosbeak, 3.0 (2N,3FL); Bewick's Wren, 2.0; House Wren, 2.0 (1N); American Dipper, 1.0 (1N); Bullock's Oriole, 1.0; Blue-gray Gnatcatcher, 0.5; Belted Kingfisher, +; Black-billed Magpie, col. (2N,4FL); Violet-green Swallow, col.; Northern Rough-winged Swallow, col. (2N); Red-winged Blackbird, col. (10N,11FL); Brewer's Blackbird, col. (4N,10FL); Gadwall, unk.; Mallard, unk. (3N,15FL); Green-winged Teal, unk. (1N,3FL); Spotted Sandpiper, unk. (4N,11FL); Mourning Dove, unk. (1N,1FL); Brown-headed Cowbird, unk. (47N,22FL). **Total:** 28 species; 182.5 territories (187/40ha). **Visitors:** Northern Pintail, California Quail, Black-crowned Night-Heron, Red-tailed Hawk, American Kestrel, Killdeer, Wilson's Snipe, Common Nighthawk, Red-breasted Sapsucker, Western Wood-Pewee, Gray Flycatcher, Dusky Flycatcher, Say's Phoebe, Western Kingbird, Warbling Vireo, Western Scrub-Jay, Pinyon Jay, Common Raven, Cliff Swallow, Marsh Wren, Mountain Bluebird, Sage Thrasher, Orange-crowned Warbler, Common Yellowthroat, Western Tanager, Sage Sparrow, Blue Grosbeak, Lazuli Bunting, Cassin's Finch, House Finch, Lesser Goldfinch. **Remarks:** The riparian breeding bird community demonstrated signs of recovery, eighteen and ten years after the cessation of complete stream diversions and livestock grazing, respectively. Shrub and ground nesters occurred in highest densities indicating the habitat value of the early successional stage vegetation (primarily Woods' rose and a willow mix). Cavity and canopy nesters were scant, indicating the lack of available cavities or canopy trees for nesting sites. 2001 marked the first nesting record for the state endangered Willow Flycatcher on Rush Creek, likely representing a re-occupation of the stream by this species (see Western Birds 35:197–209 (2004)). Cowbirds parasitized 41% of potential host species' (Yellow Warbler, Song Sparrow, and Red-winged Blackbird) nests. Predation accounted for 56% of all nest failures. We did not determine territorial densities for colonial or polygamous species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' territories are indicated as "col." (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management Bishop Field Office, United States Forest Service Partners in Flight - Region 5, Inyo National Forest, Mono Lake Committee, California Department of Fish and Game, Mono Lake Tufa State Reserve, White Mountain Research Station - Eastern Sierra Institute for Collaborative Education, Joel Ellis, and Jan Simis. This is PRBO contribution No. 1522.

3. RECOVERING MIXED WILLOW–BLACK COTTONWOOD RIPARIAN II

BOSQUE RIBEREÑO DE ÁLAMO Y SAUCES, EN RECUPERACIÓN II

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Location: California; Mono Co.; Lee Vining; Lee Vining Creek; 37°58'N, 119°06'W; Lee Vining Quadrangle, USGS. **Continuity:** Established 2000; 2 yr. **Size:** 24.5 ha. **Description of Plot:** Irregularly shaped; encompasses riparian vegetation associated with the stream corridor. The stream/vegetation are currently under passive restoration after decades of water diversion (until 1986), livestock grazing (until 1991), and a 1954 fire. Half of the plot contains large islands of sagebrush scrub or Woods' rose located between strips of narrowleaf, yellow, or shiny willow and black cottonwood saplings which lie along the braided side channels and main stem. The second half of the plot is characterized by dense stands of black cottonwood saplings and trees and mixed willow scrub, interspersed with soil, gravel, and cobble bars or patches of forbs consisting primarily of lupine, mugwort, Indian paintbrush, and bouncing Bette. Small stands of exotic white polar, Lombardi poplar,

and native Jeffrey pine represent the majority of the high canopy (mean 13 m, range 5–30 m). Overall, vegetation can be termed mid-successional with cottonwood saplings reaching 5 m. Edge: Less than 25% of the plot's perimeter is bordered by the same habitat, as the plot encompasses a 1.8 km section of a major watershed stream and is bordered by Great Basin sagebrush scrub. Topography and Elevation: The plot is nearly level with a slope of <5% grade. Elevation ranges from 1951 m to 1975 m. **Weather:** Mean temp., 16.2˚C (range -4–34˚C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term means (1950–1988, Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation was below average in May and June and above average in July and August. **Coverage:** 433.9 h; 74 visits (73 sunrise, 1 sunset); 7 May–8 Aug. **Census:** Yellow Warbler, 31.5 (51; 29N,52FL); Song Sparrow, 22.0 (36; 12N,27FL); Spotted Towhee, 16.0 (26; 1N,4FL); Green-tailed Towhee, 12.0 (20; 3N,3FL); American Robin, 4.0 (7; 3N,3FL); Bullock's Oriole, 3.0 (5; 2N,8FL); Brewer's Sparrow, >2.0 (3N,4FL); European Starling, 2.0 (2N,12FL); American Kestrel, 1.0 (1N,5FL); Belted Kingfisher, 1.0; Northern Flicker, 1.0 (1N,6FL); Steller's Jay, 1.0 (1N); House Wren, 1.0 (1N); Lazuli/Indigo Bunting hybrid, 1.0 (1N); Lazuli Bunting, 1.0; Black-billed Magpie, col. (1N); Violet-green Swallow, col.; Northern Rough-winged Swallow, col. (1N); Red-winged Blackbird, col. (9N,8FL); Brewer's Blackbird, col. (15N,12FL); Mallard, unk. (2N); Green-winged Teal, unk. (2N); Killdeer, unk.; Spotted Sandpiper, unk. (10N,28FL); Brown-headed Cowbird, unk. (14N,3FL). **Total:** 25 species; 99.5 territories (162/40ha). **Visitors:** Common Nighthawk, Red-breasted Sapsucker, Hairy Woodpecker, Western Wood-Pewee, Willow Flycatcher, Dusky Flycatcher, Western Kingbird, Warbling Vireo, Western Scrub-Jay, Clark's Nutcracker, Cliff Swallow, Mountain Chickadee, Orange-crowned Warbler, MacGillivray's Warbler, Western Tanager, Black-headed Grosbeak, Cassin's Finch. **Remarks:** The riparian breeding bird community appeared to be responding to passive restoration efforts. Shrub and ground nesters occurred in highest densities indicating the habitat value of the early successional stage vegetation. Canopy and cavity nesters were beginning to occupy the emerging native black cottonwoods, but primarily used the exotics and native pines that have remained throughout periods of disturbance. Cowbirds parasitized 28% of potential host species' (Yellow Warbler, Song Sparrow, and Red-winged Blackbird) nests. Predation accounted for 68% of all nest failures. We did not determine densities for colonial or polygamous species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' are indicated as "col." (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence.
Acknowledgements: Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management Bishop Field Office, United States Forest Service Partners in Flight - Region 5, Inyo National Forest, Mono Lake Committee, California Department of Fish and Game, Mono Lake Tufa State Reserve, White Mountain Research Station - Eastern Sierra Institute for Collaborative Education, Joel Ellis, and Jan Simis. This is PRBO contribution No. 1523.

4. REMNANT BLACK COTTONWOOD RIPARIAN FOREST

REMANENTES DE BOSQUE RIBEREÑO DE ÁLAMO

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Location: California; Mono Co.; Mono City; Mill Creek; 38˚03'N, 119˚08'W; Lundy Quadrangle, USGS. **Continuity:** Established 2000; 2 yr. **Size:** 15 ha. **Description of Plot:** Irregularly shaped; encompasses riparian vegetation associated with the stream which has been diverted for hydroelectric power generation and irrigation for at least a century. Minimal stream flows maintained a remnant but decadent black cottonwood riparian forest. Jeffrey pines comprise most of the canopy on the upstream end of the plot (mean 13 m, range 5–20 m). Many of Mill Creek's historic "bottomland riparian" side channels consist of unvegetated cobble or have been replaced by upland Great Basin sagebrush scrub. Although still greatly compromised, stream flow has been higher and nearly year-round in recent years; patches of narrowleaf or yellow willow, Woods' rose, forbs, sedges, and grasses are regenerating and black cottonwood saplings make up a fair amount of the understory. Mill Creek takes a near 90-degree turn in the middle of the study plot; the lower half of the plot is far less vegetated than the upper section. Edge: Less than 25% of the plot's perimeter is bordered by the same habitat, as the plot encompasses a 3 km section of a major watershed stream and is bordered by Great Basin sagebrush scrub and a small subdivision. Topography and Elevation: The plot is nearly level with a slope of <5%. Elevation ranges from 1972 m to 2048 m. **Weather:** Mean temp., 18.6˚C (range -1–36˚C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term means (1950–1988, Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation was below average in May and June and above average in

July and August. **Coverage:** 308.9 h; 75 visits (68 sunrise, 7 sunset). 6 May–13 Aug. **Census:** Spotted Towhee, 19.0 (51; 7N,8FL); Bewick's Wren, 7.5 (20; 1N,2FL); Northern Flicker, 6.0 (16; 6N,4FL); American Robin, 6.0 (11N,6FL); European Starling, 6.0 (5N,11FL); Yellow Warbler, 6.0 (14N,3FL); Brewer's Sparrow, 6.0; House Wren, 5.0 (13; 4N,13FL); Song Sparrow, 5.0 (4N,1FL); Green-tailed Towhee, 4.5 (12; 1N); American Kestrel, 4.0 (11; 3N,8FL); Bullock's Oriole, 4.0 (3N,5FL); Hairy Woodpecker, 2.0 (1N); Western Wood-Pewee, 2.0 (1N,2FL); Cassin's Finch, 2.0 (1N); Killdeer, 1.0; Belted Kingfisher, 1.0; Bushtit, 1.0 (1N,2FL); Lazuli Bunting, 1.0 (1N); Juniper Titmouse, 0.5 (1N,3FL); Blue-gray Gnatcatcher, + (1N,4FL); Black-billed Magpie, col. (5N,7FL); Violet-green Swallow, col.; Brewer's Blackbird, col. (15N,16FL); Mallard, unk. (4N); California Quail, unk.; Mourning Dove, unk; Brown-headed Cowbird, unk. (12N,5FL). **Total:** 28 species; 89.5 territories (239/40 ha). **Visitors:** Mountain Quail, Great Blue Heron, Black-crowned Night-Heron, Cooper's Hawk, Great Horned Owl, Common Nighthawk, Red-breasted Sapsucker, Downy Woodpecker, Willow Flycatcher, Gray Flycatcher, Dusky Flycatcher, Black Phoebe, Warbling Vireo, Steller's Jay, Western Scrub-Jay, Pinyon Jay, Clark's Nutcracker, Common Raven, Northern Rough-winged Swallow, Cliff Swallow, Mountain Chickadee, American Dipper, Sage Thrasher, Orange-crowned Warbler, MacGillivray's Warbler, Common Yellowthroat, Western Tanager, Black-headed Grosbeak, Red-winged Blackbird, Yellow-headed Blackbird, Great-tailed Grackle. **Remarks:** Total bird density here was lower than Mono Lake's other tributary streams, but remnant black cottonwood and Jeffrey pine forest here supported many more cavity and canopy nesters. Cowbirds parasitized 48% of potential host species' (Spotted Towhee, Yellow Warbler, Song Sparrow, and Lazuli Bunting) nests. Predation accounted for 67% of all nest failures. Cowbirds and predators were associated with the housing development adjacent to Mill Creek: large flocks of cowbirds foraged at bird feeders and two banded adult breeders (American Robin, Green–tailed Towhee) were killed by housecats. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management Bishop Field Office, United States Forest Service Partners in Flight - Region 5, Inyo National Forest, Mono Lake Committee, California Department of Fish and Game, Mono Lake Tufa State Reserve, White Mountain Research Station - Eastern Sierra Institute for Collaborative Education, Joel Ellis, and Jan Simis. This is PRBO contribution No.1524.

5. 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; 35 yr. **Size:** 8.5 ha. **Description of Plot:** See Aud. Field Notes 19:609–610 (1965) and J. Field Ornithol. 64(Suppl.):36 (1993). Rapidly growing Asiatic bittersweet, Japanese barberry, and multiflora rose are routinely cut along the trails. **Weather:** Mean start temp., 24.5°C (range 15–30°C). Temperatures were close to average in May (13.8°C vs. 14.2°C) and June (18.9°C vs. 18.5°C). They were below normal in July (18.7°C vs. 21.2°C). May and June were much wetter than normal, while July was much drier than normal. May had a total of 11.3 cm of rain fall over the course of ten days. The average May rainfall is 10.6 cm. June had eight wet days, with a total of 19.3 cm of rain. Normal June rainfall is 9.9 cm. July had 12 wet days, but only 3.8 cm of rain. Normal July rainfall is 13.2 cm. All data are from the White Memorial Foundation's weather station. **Coverage:** 19.0 h; 10 visits (1 sunrise, 4 sunset); 4, 11, 19, 29 May; 5, 14, 25 Jun; 5, 13, 21 Jul. **Census:** Ovenbird, 11.5 (54; 1N,37FL); Red-eyed Vireo, 9.5 (45; 14FL); Veery, 9.0 (42; 18FL); Eastern Towhee, 9.0 (1N,16FL); Gray Catbird, 6.5 (31; 2N,23FL); Wood Thrush, 5.5 (26; 12FL); Tufted Titmouse, 4.5 (21; 2N,31FL); American Redstart, 4.0 (19; 16FL); Common Yellowthroat, 4.0 (9FL); Black-capped Chickadee, 3.5 (16; 1N,20FL); American Robin, 3.5 (1N,11FL); Chestnut-sided Warbler, 3.5 (11FL); Scarlet Tanager, 3.5 (5FL); Blue Jay, 3.0 (14; 1N,6FL); Black-and-white Warbler, 3.0 (1N,9FL); Northern Cardinal, 3.0 (2N,6FL); Wild Turkey, 1.5 (8FL); Downy Woodpecker, 1.5 (3FL); Great Crested Flycatcher, 1.5; American Crow, 1.5 (1N,7FL); Mourning Dove, 1.0; Red-bellied Woodpecker, 1.0; Eastern Wood-Pewee, 1.0; Eastern Phoebe, 1.0 (2N,9FL); Yellow-throated Vireo, 1.0; White-breasted Nuthatch, 1.0 (6FL); Blue-winged Warbler, 1.0 (3FL); Yellow Warbler, 1.0 (4FL); Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0 (2FL); Baltimore Oriole, 1.0; House Finch, 1.0 (4FL); American Goldfinch, 1.0; Cooper's Hawk, 0.5; Broad-winged Hawk, 0.5; Barred Owl, 0.5; Hairy Woodpecker, 0.5; Northern Flicker, 0.5; Warbling Vireo, 0.5; Fish Crow, 0.5; House Wren, 0.5; Blue-gray Gnatcatcher, 0.5; Hermit Thrush, 0.5; Cedar Waxwing,

0.5; Song Sparrow, 0.5 (4FL); Red-winged Blackbird, 0.5; Common Grackle, 0.5 (4FL); Purple Finch, 0.5; Pileated Woodpecker, +. **Total:** 49 species; 113.0 territories (532/40 ha). **Visitors:** Black-throated Green Warbler. **Remarks:** The total number of species remained at a record-high 49 for the second year in a row. Species composition was much the same as last year, except for the addition of Eastern Wood-Pewee, Hermit Thrush, Warbling Vireo, and Common Grackle; and the loss of American Woodcock, Brown Creeper, Black-throated Blue Warbler, and Black-throated Green Warbler. The number of territories increased to 113.0 this year; up from 108.0 last year, and 83.5 in 1999. The record-high was 120.5 in 1983, while the 1991–2000 average is 93. Ovenbird continued to be the most common species for the tenth consecutive year, with an increase to 11.5 territories this year. Red-eyed Vireo moved into the number two spot, while Veery dropped to number three; tied with Eastern Towhee (which increased by 1.5 territories from last year). Other Observer: John Eykelhoff.

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

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Site Number: CT2765006. **Location:** Connecticut; Litchfield Co.; Morris; White Memorial Foundation; 41°42'N, 73°12'W; Litchfield Quadrangle, USGS. **Continuity:** Established 1965; 35 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). **Weather:** Mean start temp., 21.9°C (range 17–28°C). Temperatures were close to average in May (13.8°C vs. 14.2°C) and June (18.9°C vs. 18.5°C). They were below normal in July (18.7°C vs. 21.2°C). May was a little wetter than normal, with a total of 11.3 cm of rain falling over the course of ten days. The average May rain total is 10.6 cm. June was much wetter than normal, with a total of 19.3 cm of rain falling over the course of eight days. Normal June rainfall is 9.9 cm. July ended-up being much drier than normal, despite twelve days with at least a little rain. The total for the month was only 3.8 cm of rain, compared to an average July figure of 13.2 cm. The seasonal streams and wetland dried up by 6 July. All data are from the White Memorial Foundation's weather station. **Coverage:** 16.5 h; 10 visits (1 sunrise, 7 sunset); 7, 14, 27 May; 7, 16, 25 Jun; 6, 16, 20, 27 Jul. Maximum number of observers/visit, 3. **Census:** Red-eyed Vireo, 16.0 (63; 22FL); Ovenbird, 12.5 (50; 2N,28FL); Veery, 11.0 (44; 16FL); Eastern Wood-Pewee, 4.0 (16); American Robin, 4.0 (2N,16FL); Tufted Titmouse, 3.5 (14; 1N,13FL); Wood Thrush, 3.5 (1N,10FL); American Redstart, 3.5 (8FL); Scarlet Tanager, 3.5 (10FL); Great Crested Flycatcher, 2.5; Black-capped Chickadee, 2.5 (1N,11FL); Gray Catbird, 2.5 (6FL); Yellow-bellied Sapsucker, 2.0; Blue Jay, 2.0 (3FL); American Crow, 2.0 (2N,8FL); Common Yellowthroat, 2.0 (3FL); Wild Turkey, 1.5 (1N,9FL); Downy Woodpecker, 1.5 (1N,4FL); Eastern Towhee, 1.5; Northern Cardinal, 1.5 (2FL); Red-bellied Woodpecker, 1.0 (2FL); Hairy Woodpecker, 1.0 (1N,3FL); Northern Flicker, 1.0 (3FL); Eastern Phoebe, 1.0 (4FL); Yellow-throated Vireo, 1.0; White-breasted Nuthatch, 1.0 (1N,5FL); Blue-gray Gnatcatcher, 1.0; Chestnut-sided Warbler, 1.0; Black-and-white Warbler, 1.0 (3FL); Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0; Baltimore Oriole, 1.0 (2FL); American Goldfinch, 1.0; Broad-winged Hawk, 0.5; Mourning Dove, 0.5; Pileated Woodpecker, 0.5; Hermit Thrush, 0.5; Cedar Waxwing, 0.5; Black-throated Green Warbler, 0.5; Louisiana Waterthrush, 0.5; Song Sparrow, 0.5; Red-tailed Hawk, +. **Total:** 42 species; 100.0 territories (396/40 ha). **Visitors:** Eastern Kingbird, Magnolia Warbler. **Remarks:** The number of breeding species dropped to 42 this year, which is two less than the 10-year average. The number of territories also decreased this year, but it was very close to the 10-year average of 101. Most species experienced small declines this year, but American Redstart and Gray Catbird each declined by 1.5 territories from last year. Barred Owl, Brown Creeper, Least Flycatcher, Pine Warbler, Blackburnian Warbler, Chipping Sparrow, Purple Finch, and House Finch disappeared entirely from the plot. By contrast, Ovenbird increased by 1.5 territories to a record-high figure of 12.5. Seven species increased by 0.5 or 1.0 territory each compared to last year. Red-tailed Hawk and Yellow-throated Vireo returned after a two-year absence. Black-throated Green Warbler was a new species for this plot (at least since 1992). Red-eyed Vireo remained the most abundant species. **Other Observers:** Eric Adam, John Eykelhoff, and Ray Packard.

7. CENTRAL HARDWOOD FOREST WITH SCATTERED PINE
BOSQUE CENTRAL DE MADERAS DURAS CON PIÑOS DISPERSOS

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Location: District of Columbia; Washington; Rock Creek Park; 38°57'N, 77°3'W; Washington West Quadrangle, USGS. **Continuity:** Established 1948; 52 yr. **Size:** 26.3 ha. **Description of Plot:** See Aud. Field Notes 2:153–154 (1948). **Weather:** Mean start temp., 16.1°C (range 4–24°C). Six visits were clear, four were partly cloudy (one with light-intermittent rain), three were cloudy (two with rain or fog and drizzle).

Coverage: 29.2 h; 13 visits (10 sunrise, 0 sunset); 3, 7, 14, 21, 29 Apr; 5, 12, 27 May; 6, 9, 23, 30 Jun; 7 Jul. **Census:** Ovenbird, 14.0 (21); Wood Thrush, 13.5 (21; 1FL); Red-eyed Vireo, 13.0 (20); Acadian Flycatcher, 12.0 (18); Tufted Titmouse, 10.5 (16; 4FL); Northern Cardinal, 7.5 (11); Northern Flicker, 7.0 (11); Carolina Chickadee, 6.0 (9; 3FL); Downy Woodpecker, 5.5 (8); Red-bellied Woodpecker, 4.5 (7); Brown-headed Cowbird, 4.0 (6); Carolina Wren, 3.5 (5); Hairy Woodpecker, 3.0 (5; 1N); Eastern Wood-Pewee, 3.0; American Crow, 3.0 (1FL); White-breasted Nuthatch, 3.0; American Robin, 3.0; Eastern Towhee, 3.0; Pileated Woodpecker, 1.0 (1N); Blue-gray Gnatcatcher, 1.0; Gray Catbird, 1.0; Louisiana Waterthrush, 1.0; Scarlet Tanager, 1.0; Song Sparrow, 1.0; Indigo Bunting, 1.0; Mourning Dove, 0.5; Eastern Phoebe, +. **Total:** 27 species; 126.5 territories (192/40 ha). **Visitors:** Mallard, Red-tailed Hawk, Chimney Swift, Great Crested Flycatcher, Yellow-throated Vireo, Blue Jay, Veery, European Starling, Black-and-white Warbler, Common Grackle. **Remarks:** There were barely enough maps this year, and data were a bit weak for some species.

8. 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; 43 yr. **Size:** 14.2 ha. **Description of Plot:** See Aud. Field Notes 14:502-503 (1960). There is some new construction on a major scale beginning outside the southwest corner but bordering the plot. **Weather:** Mean start temp., 14.6°C (range 1–27°C). Sixteen visits were clear, one was partly cloudy, 10 were cloudy (3 drizzling). **Coverage:** 55.0 h; 27 visits (0 sunrise, 0 sunset); 25, 28 Mar; 1, 4, 7, 12, 15, 17, 20, 26, 29 Apr; 2, 5, 10, 12, 15, 17, 20, 24, 27, 31 May; 2, 8, 10, 14 Jun; 8, 15 Jul. **Census:** Carolina Wren, 28.0 (79; 1N,7FL); Northern Cardinal, 17.0 (48; 1N); Tufted Titmouse, 15.0 (42; 2N,6FL); Red-eyed Vireo, 13.0 (37); Red-bellied Woodpecker, 12.5 (35; 1N); Gray Catbird, 12.5 (1FL); Carolina Chickadee, 12.0 (34; 7FL); Veery, 10.0 (28); Wood Thrush, 8.5 (24); Downy Woodpecker, 8.0 (23; 1N,14+FL); Northern Flicker, 8.0 (1N,2FL); White-breasted Nuthatch, 8.0; American Crow, 7.0 (20; 4N,16+FL); Eastern Towhee, 5.5 (15); Acadian Flycatcher, 5.0 (14); American Robin, 5.0; Eastern Wood-Pewee, 4.5 (13); Blue-gray Gnatcatcher, 4.0 (11; 1N,1FL); Hairy Woodpecker, 3.5 (10; 1N,1FL); Pileated Woodpecker, 3.0 (8); Blue Jay, 3.0 (3N,3FL); Common Grackle, 3.0 (4FL); Great Crested Flycatcher, 2.0 (1N); House Finch, 2.0; Mourning Dove, 1.5 (1N); House Wren, 1.5; Northern Mockingbird, 1.5; House Sparrow, 1.5 (1N); Mallard, 1.0; Red-shouldered Hawk, 1.0; Chimney Swift, 1.0; European Starling, 1.0 (2N,7+FL); Song Sparrow, 0.5. **Total:** 33 species; 210.5 territories (593/40 ha). **Visitors:** Turkey Vulture, Sharp-shinned Hawk, Eastern Phoebe, White-eyed Vireo, Fish Crow, Northern Parula, Ovenbird, Louisiana Waterthrush, Common Yellowthroat, Scarlet Tanager, Brown-headed Cowbird, American Goldfinch. **Remarks:** There are steadily increasing numbers of runners, bikers, and people with dogs off leash. There are also an increasing number of deer; 16 were seen along with many heavily used deer trails. Other Observer: Nancy Benco.

9. OAK–MAPLE–POPLAR HOLLOW

BOSQUE DE ROBLE–ARCE–ALAMO HUECO

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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; 9 yr. **Size:** 11.3 ha. **Description of Plot:** See J. Field Ornithol. 65(Suppl.):61 (1994). **Weather:** Mean start temp., 14.1°C (range 4–29°C). There was some mist during one visit. It was a very dry period with wind calm on 16 of 17 visits. Normal May temperatures: mean 16.7°C, minimum 11.1°C, maximum 22.2°C. Source: National Climatic Data Center, Asheville, NC (2000). **Coverage:** 32.8 h; 17 visits (17 sunrise, 0 sunset); 22, 23(2), 29, 30 Apr; 10, 13, 17, 19, 23, 24, 29, 31 May; 4, 7, 11, 16 Jun. **Census:** Wood Thrush, 7.0 (25); Red-eyed Vireo, 6.0 (21); Veery, 4.5 (16); Ovenbird, 4.5; Tufted Titmouse, 4.0 (14; 2FL); Scarlet Tanager, 4.0; Blue Jay, 2.5; Northern Cardinal, 2.5; Red-bellied Woodpecker, 2.0; Mourning Dove, 1.5; Pileated Woodpecker, 1.0; Eastern Wood-Pewee, 1.0; Downy Woodpecker, 0.5. **Total:** 13 species; 41.0 territories (145/40 ha). **Visitors:** Wild Turkey, Hairy Woodpecker, Northern Flicker, Great Crested Flycatcher, American Crow, White-breasted Nuthatch, Brown Creeper, Carolina Wren, American Robin, Gray Catbird, Cedar Waxwing, Black-and-white Warbler, Worm-eating Warbler, Chipping Sparrow, American Goldfinch. **Remarks:** There is a crow roost outside the census area to the north and east in predominately evergreen habitat. Yellow-breasted Chat was heard on three separate visits widely spread about the census area (two times in April and once in July). Carolina Wren was seen 23 March outside the census area. It was heard twice on 4 July and five times on 11 July, all widely spread. **Other Observers:** Richard Bonnett, Nancy Kennedy, Kenneth

Lebo, Patricia Mangas, Barry Pounder, Phyllis Reynolds, Lynn Scheirer, William Ulrich, and David Reynolds.

10. OAK–MAPLE RIDGE-TOP FOREST
BOSQUE DE ROBLE–ARCE DE TOPE DE COLINAS

DAVID R. BARBER
Hawk Mountain Sanctuary
1700 Hawk Mountain Road
Kempton PA 19529

Site Number: PA1382312. **Location:** Pennsylvania; Berks Co.; Kempton; Owl's Head; 40°44'N, 75°50'W; New Ringgold Quadrangle, USGS. **Continuity:** Established 1982; 20 yr. **Size:** 19.4 ha. **Description of Plot:** See Am. Birds 37:55 (1983). **Weather:** Mean start temp., 14.4°C (range 4–19°C). Six days had clear skies, two days were partly cloudy (16–50% cloud cover), three days were mostly cloudy (51–75% cloud cover), and one day was overcast (>75% cloud cover). One day was calm (0 on Beaufort scale), ten days had light winds (1 or 2 on Beaufort), and one day was breezy (3 on Beaufort). **Coverage:** 22.0 h; 12 visits (12 sunrise); 23, 25 Apr; 24, 29 May; 2, 5, 13, 18, 19, 21, 24, 27 Jun. **Census:** Ovenbird, 13.5 (28; 4N,10FL); Red-eyed Vireo, 3.5 (7); Blue Jay, 3.0 (6); Common Yellowthroat, 3.0; Scarlet Tanager, 3.0; Hermit Thrush, 2.5; Downy Woodpecker, 2.0; Great Crested Flycatcher, 1.5; Eastern Towhee, 1.5; Indigo Bunting, 1.5; Cedar Waxwing, 1.0; Baltimore Oriole, 1.0; Wood Thrush, 0.5; Rose-breasted Grosbeak, 0.5; Mourning Dove, +. **Total:** 15 species; 38.0 territories (78/40 ha). **Visitors:** Yellow-billed Cuckoo, Hairy Woodpecker, Eastern Wood-Pewee, Black-capped Chickadee, White-breasted Nuthatch, Veery, Black-and-white Warbler, American Goldfinch. **Other Observers:** David Kruel, Mark Vukovich.

11. OAK–MAPLE SLOPE FOREST
BOSQUE DE ROBLE–ARCE DE LADERAS

DAVID R. BARBER
Hawk Mountain Sanctuary
1700 Hawk Mountain Road
Kempton PA 19529

Site Number: PA1382313. **Location:** Pennsylvania; Berks Co.; Kempton; River of Rocks; 40°45'N, 75°50'W; New Ringgold Quadrangle, USGS. **Continuity:** Established 1982; 20 yr. **Size:** 16.9 ha. **Description of Plot:** See Am. Birds 37:55 (1983). **Weather:** Mean start temp., 14.3°C (range 5–19°C). Six days had clear skies, two days were partly cloudy (16–50% cloud cover), one day was mostly cloudy (51–75% cloud cover), and three days were overcast (>75% cloud cover). One day was calm (0 on Beaufort scale), eight days had light winds (1 or 2 on Beaufort), and three days were breezy (3 on Beaufort). **Coverage:** 22.9 h; 12 visits (12 sunrise); 20, 23 Apr; 19, 24, 29 May; 4, 9, 13, 17, 19, 22, 26 Jun. **Census:** Red-eyed Vireo, 9.0 (21); Ovenbird, 9.0 (2N); Black-and-white Warbler, 3.0 (7); Scarlet Tanager, 3.0; Downy Woodpecker, 2.0; Tufted Titmouse, 2.0; Black-throated Green Warbler, 2.0; Hairy Woodpecker, 1.5; Wood Thrush, 1.5; Eastern Wood-Pewee, 1.0; Great Crested Flycatcher, 1.0; Blue Jay, 1.0; Black-capped Chickadee, 1.0; White-breasted Nuthatch, 1.0; Worm-eating Warbler, 1.0 (1N,2FL); Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0; Yellow-billed Cuckoo, 0.5; Pileated Woodpecker, 0.5; Indigo Bunting, 0.5. **Total:** 20 species; 42.5 territories (101/40 ha). **Visitors:** Wild Turkey, Northern Goshawk, Mourning Dove, Red-bellied Woodpecker, Northern Flicker, Blue-gray Gnatcatcher, Hermit Thrush, Cedar Waxwing, American Redstart, Common Yellowthroat, Northern Cardinal, Baltimore Oriole, American Goldfinch. Other Observer: Mark Vukovich.

12. HARDWOOD BOTTOM
MADERAS DURAS ANEGADAS

PAUL A. KOEHLER
National Audubon Society
4542 Silver Bluff Road
Jackson SC 29831

Site Number: SC0495040. **Location:** South Carolina; Aiken Co.; Jackson; Silver Bluff Audubon Center and Sanctuary; 33°19'N, 81°52'W; Jackson Quadrangle, USGS. **Continuity:** Established 1995; 3 yr. **Size:** 11.4 ha. **Description of Plot:** See J. Field Ornithol. 67(Suppl.):49–50 (1996). **Weather:** Mean start temp., 16.7°C (range 10–31°C). The total rainfall during the census period was 11.51 cm (0.86 cm above normal). Sources: The Augusta Chronicle newspaper; National Weather Service, Columbia, SC; and the Silver Bluff Audubon Center and Sanctuary rain gauge. **Coverage:** 20.3 h; 10 visits (9 sunrise, 1 sunset); 2, 4, 8, 14, 16, 22, 24, 26, 30 May; 3 Jun. **Census:** Northern Parula, 16.0 (56); Blue-gray Gnatcatcher, 15.5 (54); Acadian Flycatcher, 14.5 (51); Red-eyed Vireo, 9.5 (33); Northern Cardinal, 7.0 (25); Carolina Wren, 4.0 (14); Downy Woodpecker, 3.0 (11); Carolina Chickadee, 3.0; Red-bellied Woodpecker, 2.0; Pileated Woodpecker, 2.0; Tufted Titmouse, 2.0; Summer Tanager, 2.0; Brown-headed Cowbird, 2.0; Wild Turkey, 1.0; Yellow-billed Cuckoo, 1.0; Eastern Wood-Pewee, 1.0; Great Crested Flycatcher, 1.0; Yellow-throated Vireo, 0.5; Indigo Bunting, 0.5. **Total:** 19 species; 87.5 territories (307/40 ha). **Visitors:** Wood Duck, Red-shouldered Hawk, Mourning Dove, Chimney Swift, Ruby-throated Hummingbird, Hairy Woodpecker, American Crow, Yellow-throated Warbler, Pine Warbler, Black-and-white Warbler, Prothonotary Warbler, Louisiana Waterthrush.

13. 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; 12 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., 16.9°C (range 10–28°C). April and May were very dry and mild. The wind was consistently still during visits. **Coverage:** 15.5 h; 11 visits (10 sunrise, 0 sunset); 23, 29 Apr; 3, 5, 7, 12, 19, 20, 24, 27 May; 1 Jun. **Census:** Blue-gray Gnatcatcher, 15.0 (67); White-eyed Vireo, 7.0 (31); Northern Cardinal, 5.0 (22); Carolina Wren, 4.5 (20); Northern Parula, 4.5; Red-bellied Woodpecker, 4.0 (18); Red-eyed Vireo, 3.5 (16); Tufted Titmouse, 3.0 (13); Prothonotary Warbler, 3.0; Great Crested Flycatcher, 2.5; Downy Woodpecker, 2.0; Acadian Flycatcher, 2.0; American Crow, 2.0; Yellow-billed Cuckoo, 1.5; Pileated Woodpecker, 1.0; Carolina Chickadee, 1.0; White-breasted Nuthatch, 1.0; Summer Tanager, 1.0; Swainson's Warbler, 0.5. **Total:** 19 species; 64.0 territories (288/40 ha). **Visitors:** Red-shouldered Hawk, Barred Owl, Chimney Swift, Yellow-throated Vireo, Yellow-throated Warbler, Pine Warbler, Hooded Warbler. Other Observer: Norman Brunswig.

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

HAYDEN WILSON, LAURA J. MITCHELL* AND BONNIE JOHNSON
**Cherokee National Forest*
P.O. Box 2010
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; 9 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., 15.7°C (range 11–24°C). **Coverage:** 22.7 h; 9 visits (5 sunrise, 4 sunset); 20, 21 May; 10, 11, 17, 18, 24, 25, 30 Jun. **Census:** Dark-eyed Junco, 25.5 (100; 4FL); Veery, 20.5 (80); Ovenbird, 14.5 (57); Blue-headed Vireo, 12.5 (49); Black-throated Blue Warbler, 5.0 (20); Red-eyed Vireo, 2.5; Blackburnian Warbler, 2.5 (1FL); Black-capped Chickadee, 1.5; Hairy Woodpecker, 1.0; Tufted Titmouse, 1.0; White-breasted Nuthatch, 1.0; Chestnut-sided Warbler, 1.0; Rose-breasted Grosbeak, +. **Total:** 13 species; 88.5 territories (347/40 ha). **Visitors:** Ruffed Grouse, Barred Owl, Downy Woodpecker, Carolina Chickadee, Eastern Towhee. **Remarks:** Flyovers included Chimney Swift, American Crow, and Common Raven. **Acknowledgments:** We wish to acknowledge the logistical and financial support of the USDA Forest Service, Cherokee National Forest.

15. CEDAR FOREST
BOSQUE DE CEDRO

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

Site Number: ID6492039. **Location:** Idaho; Bonner Co.; Sagle; Gamble (Gamlin) Lake; 48°13'N, 116°23'W; Talache Quadrangle, USGS. **Continuity:** Established 1992; 10 yr. **Size:** 12.3 ha. **Description of Plot:** See J. Field Ornithol. 64(Suppl.):62 (1993) and 67(Suppl.):53–54 (1996). **Weather:** Mean start temp., 14.9°C (range 7–23°C). Temperatures were within the averages of the past ten years. **Coverage:** 14.7 h; 8 visits (4 sunrise, 4 sunset); 16, 17, 24, 25, 31 May; 1, 21, 22 Jun. **Census:** Townsend's Warbler, 5.5 (18); Chestnut-backed Chickadee, 5.0 (16); Red-breasted Nuthatch, 5.0; Swainson's Thrush, 5.0; Red-naped Sapsucker, 4.0 (13); Western Tanager, 4.0; Winter Wren, 3.5 (11; 1+FL); Plumbeous Vireo, 3.0 (10); Golden-crowned Kinglet, 3.0; Black-capped Chickadee, 2.0; American Robin, 2.0; Yellow-rumped Warbler, 1.5; Wild Turkey, 1.0; Pileated Woodpecker, 1.0; Dusky Flycatcher, 1.0; Common Raven, 1.0 (1N); Mountain Chickadee, 1.0; Orange-crowned Warbler, 1.0; Nashville Warbler, 1.0; Chipping Sparrow, 1.0; Black-headed Grosbeak, 1.0. **Total:** 21 species; 52.5 territories (171/40 ha). **Visitors:** Ruffed Grouse, Common Nighthawk, Rufous Hummingbird, Hairy Woodpecker, Northern Flicker, Western Wood-Pewee, Hammond's Flycatcher, Cordilleran Flycatcher, Gray Jay, White-breasted Nuthatch, Brown Creeper, Varied Thrush, Yellow Warbler, Dark-eyed Junco, Brown-headed Cowbird.

16. UPLAND CHRISTMAS TREE FARM
FINCAS DE ARBOLES DE NAVIDAD DE ALTURAS

ELIZABETH W. BROOKS
1435 Waterwells Road
Alfred Station, NY 14803

Site Number: NY2483108. **Location:** New York, Allegany Co., Andover; Kent Christmas Tree Farm;

42°10′N, 77°50′W; Andover Quadrangle, USGS. **Continuity:** Established 1983; 19 years. **Size:** 10.7 ha. **Description of Plot:** See Am. Birds 38:91 (1984). **Weather:** Mean start temp., 19.4°C (range 10–27.2°C). Data collected at the Alfred Cooperative Weather Station indicated that average daily temperatures in June (17.6°C) and July (18.0°C) were both above average. The June precipitation total (9.53 cm) was about average, but July (3.89 cm) was well below the 57-year mean. **Coverage:** 11.6 h; 9 visits (0 sunrise, 2 sunset); 8 Apr; 5, 12, 20, 27 Jun; 4, 11, 19, 27 Jul. **Census:** Chipping Sparrow, 19.0 (71; 2N); Song Sparrow, 16.0 (60; 3N,8FL); Cedar Waxwing, 7.0 (26; 1N); American Robin, 5.0 (19; 1N); Purple Finch, 4.0 (15); Yellow-rumped Warbler, 3.5 (13); Field Sparrow, 3.0 (11; 3N); Common Grackle, 3.0; American Goldfinch, 3.0; Mourning Dove, 2.0 (1N); Prairie Warbler, 2.0; Blue Jay, 1.5; American Woodcock, 1.0; Eastern Towhee, 1.0; Bobolink, 1.0; Brown-headed Cowbird, 1.0; Chestnut-sided Warbler, 0.5; Common Yellowthroat, 0.5; Grasshopper Sparrow, 0.5; Indigo Bunting, 0.5; Red-winged Blackbird, 0.5; Horned Lark, +. **Total:** 22 species; 75.5 territories (282/40 ha). **Visitors:** Yellow-billed Cuckoo, Eastern Kingbird, Red-eyed Vireo, Black-capped Chickadee, and Gray Catbird. **Remarks:** Number of territories (75.5) was down from last year but well above the mean (58). Common Grackles, a new species, nested in a section of mature (6–8 m) spruce. Savannah Sparrow was missing for the first time in the 19 years of the study. No nests were found parasitized by cowbirds. **Acknowledgments:** Appreciation to Rick Walker for weather data and to Tom and Kathy Kent for their continued interest and permission to conduct the study on their land.

17. UPLAND SCOTCH PINE PLANTATION
PLANTACION DE PIÑO ESCOCES EN ALTURAS

ELIZABETH W. BROOKS
1435 Waterwells Road
Alfred Station, NY 14803

Site Number: NY2470024. **Location:** New York; Allegany Co., Alfred; Foster Plantation; 42°7′N, 77°45′W; Andover Quadrangle, USGS. **Continuity:** Established 1969; 33 consecutive years. **Size:** 9.3 ha. **Description of Plot:** See Aud. Field Notes 23:743–744 (1969), Am. Birds 38:38 (1984), J. Field. Ornithol. 66(Suppl.):69 (1995), and 1998 Upland Scotch Pine Plantation BBC (unpublished). **Weather:** Mean start temp., 21.4°C (range 17.8–26.7°C). For additional weather comments, see Upland Christmas Tree Farm BBC. **Coverage:** 9.2 h; 8 visits (0 sunrise, 5 sunset); 23 Apr; 7, 14, 21, 29 Jun; 6, 13, 21 Jul. **Census:** Common Yellowthroat, 5.0 (22); Magnolia Warbler, 4.0 (17); American Robin, 3.5 (15); Yellow-rumped Warbler, 3.5; Dark-eyed Junco, 3.5; Chipping Sparrow, 3.0 (13); Cedar Waxwing, 2.5; Mourning Dove, 2.0; Blue Jay, 2.0; Chestnut-sided Warbler, 2.0; White-throated Sparrow, 2.0; Indigo Bunting, 2.0; Purple Finch, 2.0; Ovenbird, 1.5; Ruffed Grouse, 1.0; Yellow-bellied Sapsucker, 1.0; Black-capped Chickadee, 1.0; Golden-crowned Kinglet, 1.0; Eastern Towhee, 1.0; Song Sparrow, 1.0; Blue-headed Vireo, 0.5; Red-breasted Nuthatch, 0.5; House Wren, 0.5; Gray Catbird, 0.5; Blackburnian Warbler, 0.5. **Total:** 25 species; 47.0 territories (202/40 ha). **Visitors:** American Woodcock, Veery, Hermit Thrush, Brown Thrasher, American Redstart, Canada Warbler, Field Sparrow, and American Goldfinch. **Remarks:** American Woodcock, Alder Flycatcher, and Field Sparrow were missing; Nashville Warbler was missing after being observed during 17 of the past 21 years since its first appearance in 1977. Dark-eyed Junco numbers were the highest ever. **Acknowledgments:** Appreciation to Cynthia Clements and Phil Foster for permission to conduct the study on their land and to Rick Walker for weather data.

18. LOBLOLLY PINE PLANTATION
PLANTACION DE PIÑO LOBLOLLY

PAUL A. KOEHLER
National Audubon Society
4542 Silver Bluff Road
Jackson SC 29831

Site Number: SC0493134. **Location:** South Carolina; Aiken Co.; Jackson; Silver Bluff Audubon Center and Sanctuary; 33°19'N, 81°52'W; Jackson Quadrangle, USGS. **Continuity:** Established 1993; 4 yr. **Size:** 9.7 ha. **Description of Plot:** See J. Field Ornithol. 65 (Suppl.):76 (1994). **Weather:** Mean start temp., 16.0°C (range 11–28°C). The total rainfall during the census period was 13.59 cm (2.58 cm above normal). Sources: The Augusta Chronicle newspaper; National Weather Service, Columbia, SC; and the Silver Bluff Audubon Center and Sanctuary rain gauge. **Coverage:** 19.0 h; 10 visits (9 sunrise, 1 sunset); 3, 7, 9, 15, 17, 23, 25, 28, 31 May; 4 Jun. **Census:** Pine Warbler, 4.5 (19); Summer Tanager, 4.5 (1N); Eastern Wood-Pewee, 2.0; Great Crested Flycatcher, 2.0; Carolina Chickadee, 2.0; Tufted Titmouse, 2.0; Indigo Bunting, 2.0; Brown-headed Cowbird, 2.0; Northern Cardinal, 1.5; Red-bellied Woodpecker, 1.0; Downy Woodpecker, 1.0; Red-eyed Vireo, 1.0; Carolina Wren, 1.0. **Total:** 13 species; 26.5 territories (109/40 ha). **Visitors:** Red-headed Woodpecker, Pileated Woodpecker, Yellow-throated Vireo, Blue Jay, American Crow, White-breasted Nuthatch, House Wren, Blue-gray Gnatcatcher, Eastern Towhee.

19. CLIMAX HEMLOCK–WHITE PINE FOREST WITH TRANSITION HARDWOODS

BOSQUE CLIMAX DE PICEA–PIÑO 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; 35 yr. **Size:** 10.5 ha. **Description of Plot:** See Aud. Field Notes 19:594–595 (1965) and J. Field Ornithol. 67(Suppl.):60 (1996). Substantial regeneration (mainly seedling hemlocks) has occurred in the areas affected by blow-downs in 1998, 1999, and 2000. Only ten new blow-downs occurred this year. Hemlock wooly adelgid was found on six trees this year. The sub-canopy seems to be getting denser in much of this forest. Many low spots were flooded in May and June but completely dry in July. The wild food crop of all types seems to be excellent this year. **Weather:** Mean start temp., 23.4°C (range 12–32°C). Temperatures were close to average in May (13.8°C vs. 14.2°C) and June (18.9°C vs. 18.5°C). They were below normal in July (18.7°C vs. 21.2°C). May was a little wetter than normal, with a total of 11.3 cm of rain falling over the course of ten days. The average May rainfall is 10.6 cm. June was much wetter than normal, with a total of 19.3 cm of rain falling over the course of eight days. Normal June rainfall is 9.9 cm. July was much drier than normal, despite 12 wet days. Only 3.8 cm of rain fell, compared to an average of 13.2 cm. Source: White Memorial Foundation weather station. **Coverage:** 22.5 h; 11 visits (1 sunrise, 6 sunset); 3, 10, 17, 24 May; 1, 7, 10, 19, 28 Jun; 7, 12 Jul. Maximum number of observers/visit, 3. **Census:** Black-throated Green Warbler, 16.0 (61; 1N,41FL); Veery, 15.0 (57; 24FL); Ovenbird, 13.5 (51; 1N,27FL); Red-eyed Vireo, 11.0 (42; 13FL); Blackburnian Warbler, 10.5 (40; 13FL); Hermit Thrush, 7.0 (27; 17FL); Pine Warbler, 6.5 (25; 25FL); Blue-headed Vireo, 4.5 (17; 5FL); Scarlet Tanager, 4.5 (1N,9FL); Great Crested Flycatcher, 4.0 (15; 2N,10FL); Black-capped Chickadee, 4.0 (2N,18FL); Wood Thrush, 3.5 (13; 4FL); Black-and-white Warbler, 3.0 (11; 10FL); Wild Turkey, 2.5 (1N,22FL); Eastern Wood-Pewee, 2.5; Blue Jay, 2.5 (3FL); Yellow-rumped Warbler, 2.5 (3FL); Mourning Dove, 2.0 (2FL); Yellow-bellied Sapsucker, 2.0 (3FL); American Crow, 2.0 (2N,8FL); Canada Warbler, 2.0; Purple Finch, 2.0 (2N,8FL); Hairy Woodpecker, 1.5 (3FL); Pileated Woodpecker, 1.5 (2FL); Red-breasted Nuthatch, 1.5 (4FL); Brown Creeper, 1.5 (5FL); American Robin, 1.5 (6FL); Northern Cardinal, 1.5 (2FL); Broad-winged Hawk, 1.0 (1N,2FL); Tufted Titmouse, 1.0 (6FL); Brown-headed Cowbird, 1.0; Great Horned Owl, 0.5; Barred Owl, 0.5 (2FL); Downy Woodpecker, 0.5; Northern Flicker, 0.5; White-breasted Nuthatch, 0.5; Winter Wren, 0.5; Gray Catbird, 0.5; Magnolia Warbler, 0.5; American Redstart, 0.5; Dark-eyed Junco, 0.5; Common Grackle, 0.5; American Goldfinch, 0.5; Blue-gray Gnatcatcher, +; Eastern Towhee, +. **Total:** 45 species; 141.0 territories (537/40 ha). **Visitors:** Red-bellied Woodpecker. **Remarks:** Populations of many bird species exploded this year; only a few declined but no more than by one or more territories. The total number of species climbed to 45 (from 42 last year), which is the second highest figure ever recorded in this plot (tied with 1985). The highest ever was 48 species in 1994. Greater habitat diversity due to succession in blow-down areas may be the reason for this increase. This may also be partially responsible for the massive increase in territorial males this year. Other factors could be young from 1999 and 2000 (both very productive years) returning to their natal area, immigration to this protected area from nearby properties being destroyed for development, and an abundant available food supply. Maybe it's a combination of these factors that caused the number of territorial males to soar to a record-shattering figure of 141.0. The previous high was last year's 124.0 territories; the previous 10-year average was 115. The species showing the greatest increases in numbers were those most positively affected by succession: Veery, Hermit Thrush, and Red-eyed Vireo. **Other Observers:** Eric Adam, Clara Buitrago, John Eykelhoff, and Russ Naylor.

20. 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; 24 yr. **Size:** 8.5 ha. **Description of Plot:** See Am. Birds 33:72 (1979). **Weather:** Mean start temp., 18.9°C (range 13–27°C). Temperatures were close to average in May (13.8°C vs. 14.2°C) and June (18.9°C vs. 18.5°C). They were below normal in July (18.7°C vs. 21.2°C). May was a little wetter than normal, June was much wetter than normal, and July was much drier than normal. May's rainfall total was 11.3 cm, compared to an average of 10.6 cm. Ten days experienced at least some precipitation in May. June's rainfall total was 19.3 cm, compared to an average of 9.9 cm. Eight days experienced at least some rainfall in June. July had showers on 12 days, but only 3.8 cm of rain fell,

compared to an average of 13.2 cm. Source: White Memorial Foundation weather station. **Coverage:** 14.5 h; 8 visits (1 sunrise, 7 sunset); 14, 24 May; 4, 9, 18 Jun; 2, 14, 25 Jul. **Census:** Veery, 10.5 (49; 12FL); Ovenbird, 9.5 (45; 20FL); Red-eyed Vireo, 9.0 (42; 9FL); Wood Thrush, 4.5 (21; 10FL); Scarlet Tanager, 4.5 (1N,13FL); Hermit Thrush, 3.5 (16; 7FL); Black-capped Chickadee, 3.0 (14; 2N,14FL); American Redstart, 3.0 (4FL); Great Crested Flycatcher, 2.5 (3FL); American Robin, 2.5 (2N,8FL); Gray Catbird, 2.5 (4FL); Louisiana Waterthrush, 2.5 (6FL); Yellow-bellied Sapsucker, 2.0; Eastern Wood-Pewee, 2.0; Tufted Titmouse, 2.0 (1N,12FL); White-breasted Nuthatch, 2.0 (1N,9FL); Blue Jay, 1.5 (3FL); American Crow, 1.5 (3FL); Blue-gray Gnatcatcher, 1.5 (4FL); Black-throated Blue Warbler, 1.5; Black-and-white Warbler, 1.5; Common Yellowthroat, 1.5; Eastern Towhee, 1.5; Northern Cardinal, 1.5 (4FL); Rose-breasted Grosbeak, 1.5; Wild Turkey, 1.0; Downy Woodpecker, 1.0; Hairy Woodpecker, 1.0; Pileated Woodpecker, 1.0; Eastern Phoebe, 1.0 (1N,4FL); Black-throated Green Warbler, 1.0; Baltimore Oriole, 1.0 (1N,3FL); American Goldfinch, 1.0; Mourning Dove, 0.5; Barred Owl, 0.5; Blue-headed Vireo, 0.5; Brown Creeper, 0.5; Chestnut-sided Warbler, 0.5; Magnolia Warbler, 0.5; Chipping Sparrow, 0.5; Brown-headed Cowbird, 0.5; Northern Flicker, +; Worm-eating Warbler, +; Purple Finch, +. **Total:** 44 species; 91.0 territories (428/40 ha). **Visitors:** Pine Warbler. **Remarks:** The number of species breeding in this plot dropped back to the 10-year average of 44 this year. The number of territorial males also decreased slightly, from 92.5 last year to 91.0 this year. This is only 2 territories less than the 10-year average, so it looks like bird numbers are fairly stable in this plot. A significant shake-up occurred among the five most common species, however, due to a combination of the continued increase in Veery and Ovenbird populations and a serious decline in Wood Thrush and American Redstart numbers. Veery rose to number one this year, from number three last year, and in 1999 and 1998. Their population has risen steadily: from 5.5 territories in 1998 to 6.0 in 1999 to 8.0 in 2000 to 10.5 this year. The second most common species this year, Ovenbird, also held this position in 1999 and last year. Red-eyed Vireo dropped to the number three spot this year after being number one last year and in 1999. Other Observer: Russ Naylor.

21. 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; 5 yr. **Size:** 8.9 ha. **Description of Plot:** See 1997 BBC report (unpublished). In preparation for the construction of a recreation site, 47 ponderosa pine trees were cut and removed from the plot. An additional 72 ponderosa pine, 18 hawthorn, 11 quaking aspen, and 3 others were transplanted to other locations within the plot. **Weather:** Mean start temp., 10.9°C (range 5–15°C). The mean start temperature of 10.9°C and the maximum of 15°C were the coldest reported temperatures during five years of censusing. The minimum of 5°C was comparable to the minimum of 4°C reported in 1997 and 1998. No flooding occurred this year. **Coverage:** 13.7 h; 8 visits (6 sunrise, 2 sunset); 15, 16, 24, 29 May; 4, 5, 18, 26 Jun. **Census:** American Robin, 5.5 (25); Yellow Warbler, 5.5; Tree Swallow, 4.0 (18; 2N); Song Sparrow, 4.0; European Starling, 3.0 (13; 2N); Yellow-rumped Warbler, 3.0; Red-winged Blackbird, 3.0; Brown-headed Cowbird, 3.0; Mountain Chickadee, 2.0 (1FL); Black-headed Grosbeak, 2.0; House Finch, 2.0; Black-capped Chickadee, 1.5; Canada Goose, 1.0; Mallard, 1.0; California Quail, 1.0; Spotted Sandpiper, 1.0; Rufous Hummingbird, 1.0; Northern Flicker, 1.0 (1N); Willow Flycatcher, 1.0; Gray Catbird, 1.0; Cedar Waxwing, 1.0; Spotted Towhee, 1.0; Brewer's Blackbird, 1.0; Bullock's Oriole, 1.0. **Total:** 24 species; 50.5 territories (227/40 ha). **Visitors:** Great Blue Heron, Osprey, Bald Eagle, Killdeer, Ring-billed Gull, Calliope Hummingbird, Western Wood-Pewee, Warbling Vireo, Violet-green Swallow, Barn Swallow, Common Yellowthroat, Chipping Sparrow. **Remarks:** The nests noted for Tree Swallow, European Starling, and Northern Flicker were in artificial nest boxes. Tree Swallows attempted a second breeding effort during this census.

22. MIXED UPLAND FOREST

BOSQUE EN ALTURAS MIXTOS

LYNN BOWDERY, ALLAN BOWDERY, TOM SARRO, LIN FAGAN AND BARBARA RUBIN
Daniel Smiley Research Center, Mohonk Lake
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New Paltz NY 12561

Site Number: NY1383002. **Location:** New York; Ulster Co.; New Paltz; Duck Pond Watershed; 41°46'N, 74°9'W; Mohonk Lake Quadrangle, USGS. **Continuity:** Established 1975; 7 yr. **Size:** 42.3 ha. **Description of Plot:** See Am. Birds 29:1083 (1975). A roughly rectangular plot (shortest side 335 m, longest 915 m) with a closed canopy dominated by red oak, sugar maple, and eastern hemlock. The stand is 61–100 years of age with a mean canopy height of 17 m (range 12–21 m). The understory is dominated by striped maple, sassafras, and witch-hazel. The ground cover is dominated by low blueberry, mountain laurel, and Virginia creeper. There is one pond with a maximum diameter of 61 m and a maximum depth of 2 m, there

is one permanent stream with a maximum width of 1.5 m and a maximum depth of 0.5 m, and there are several ephemeral streams. 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 >500 ha in size. Topography and Elevation: The plot has a SE-facing slope of >16% grade. Minimum elevation 183 m, maximum 274 m. **Weather:** Mean start temp., 14.3°C (range 8–24°C). The average temperature for May was 16°C (1.6°C above normal), and the precipitation was 10.5 cm (2% below average). The average temperature for June was 21.4°C (2.6°C above normal), and the precipitation was 13.0 cm (30% above average). Source: Mohonk Lake Cooperative Weather Station. **Coverage:** 33.7 h; 13 visits (12 sunrise, 1 sunset); 9, 14, 17, 21, 25, 29, 31 May; 5, 7, 12, 14, 18, 26 Jun. Maximum number of observers/visit, 6. **Census:** Red-eyed Vireo, 15.0 (14); Ovenbird, 13.5 (13); Eastern Wood-Pewee, 11.0 (10); Gray Catbird, 11.0 (1+FL); Scarlet Tanager, 11.0; Wood Thrush, 10.0 (9); Worm-eating Warbler, 9.0 (9); Common Yellowthroat, 6.0 (6); Tufted Titmouse, 5.5 (5); Black-and-white Warbler, 5.0 (5); Song Sparrow, 5.0; Rose-breasted Grosbeak, 5.0; Louisiana Waterthrush, 4.0 (4; 4+FL); Great Crested Flycatcher, 3.0 (3); Blue Jay, 3.0 (1FL); Baltimore Oriole, 3.0 (1FL); American Goldfinch, 3.0; Red-winged Blackbird, 2.5; Red-bellied Woodpecker, 2.0; Eastern Phoebe, 2.0; Black-capped Chickadee, 2.0; White-breasted Nuthatch, 2.0; Blue-winged Warbler, 2.0; American Redstart, 2.0; Brown-headed Cowbird, 2.0 (1FL); Mallard, 1.0; Common Snipe, 1.0 (1FL); Yellow-billed Cuckoo, 1.0; Downy Woodpecker, 1.0; Hairy Woodpecker, 1.0; Northern Flicker, 1.0; Pileated Woodpecker, 1.0; Eastern Kingbird, 1.0; Eastern Bluebird, 1.0 (2FL); Veery, 1.0; American Robin, 1.0; Cedar Waxwing, 1.0; Yellow Warbler, 1.0; Chipping Sparrow, 1.0; Northern Cardinal, 1.0; Ruby-throated Hummingbird, 0.5; Yellow-throated Vireo, 0.5; American Crow, 0.5; Common Grackle, 0.5. **Total:** 44 species; 156.5 territories (148/40 ha). **Visitors:** Wild Turkey, Great Blue Heron, Sharp-shinned Hawk, Red-tailed Hawk, Mourning Dove, Black-billed Cuckoo, Brown Creeper, Northern Mockingbird, Black-throated Blue Warbler, Yellow-rumped Warbler, Black-throated Green Warbler, Eastern Towhee, Swamp Sparrow, Indigo Bunting. **Other Observers:** Lisa Daddona, Ruth Elwell, Paul Huth, Becky Marshall, Becky Sarro, John Thompson, and Molly Trauten. **Acknowledgments:** Thanks for the cooperation of the Mohonk Preserve.

23. UPLAND MIXED PINE–SPRUCE–HARDWOOD PLANTATION

PLANTACION MIXTA DE PIÑO–ABETO–MADERAS DURAS EN ALTURAS

ELIZABETH W. BROOKS
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Alfred Station, NY 14803

Site Number: NY2474107. **Location:** New York; Allegany Co., Ward; Phillips Creek State Reforestation Tract; 42°8′N, 77°45′W; Andover Quadrangle, USGS. **Continuity:** Established 1974; 28 consecutive years. **Size:** 16.6 ha. **Description of Plot:** See Am. Birds 28:699–700 (1974), J. Field Ornithol. 63 (Suppl.):79–80 (1992), and 66 (Suppl.):79–80 (1995). **Weather:** Mean start temp., 20.0°C (range 15.6–22.8°C). See Upland Christmas Tree Farm BBC for additional weather comments. **Coverage:** 10.7 h; 8 visits (0 sunrise, 3 sunset); 4, 11, 18, 25 Jun; 1, 8, 16, 27 Jul. **Census:** Magnolia Warbler, 9.0 (22); Blackburnian Warbler, 9.0; Dark-eyed Junco, 7.5 (18); Golden-crowned Kinglet, 7.0 (17); Black-throated Green Warbler, 7.0; Yellow-rumped Warbler, 5.5 (13); American Robin, 4.0 (10); Blue-headed Vireo, 3.0 (7; 1N,3FL); Red-breasted Nuthatch, 3.0; Common Yellowthroat, 2.5; Blue Jay, 2.0; Black-capped Chickadee, 2.0; Brown Creeper, 2.0; Winter Wren, 2.0; Mourning Warbler, 2.0; Purple Finch, 2.0; Broad-winged Hawk, 1.0; Yellow-bellied Sapsucker, 1.0; Hermit Thrush, 1.0; Wood Thrush, 1.0; Cedar Waxwing, 1.0; Chestnut-sided Warbler, 1.0; Ovenbird, 1.0; Chipping Sparrow, 1.0; Ruffed Grouse, 0.5; American Crow, 0.5; Song Sparrow, 0.5. **Total:** 27 species; 79.0 territories, (190/40 ha). **Visitors:** Sharp-shinned Hawk, Red-shouldered Hawk, Mourning Dove, Great Crested Flycatcher, Canada Warbler, Indigo Bunting, White-winged Crossbill, and American Goldfinch. **Remarks:** Total territories (79.0) was slightly below the 27-year average (85.3). Brown-headed Cowbird was missing for only the fifth time since 1974, and Indigo Bunting was missing for only the second time. Selective harvesting of red pine in a 4.9 ha section of the plot during the breeding season may have negatively affected Black-throated Green Warbler totals. **Acknowledgments:** Appreciation to Rick Walker and Dennis Smith for weather data.

24. FIELD, RIDGE, SHRUBBY TREES, AND WOODS

CAMPOS, COLINAS, ARBUSTOS Y BOSQUES

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

Location: Ontario; Municipality of Hamilton-Wentworth; Dundas; Dundas Valley Plot #1; 43°15'N, 79°54'W. **Continuity:** Established 1994; 8 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., 21.3°C (range 16.5–27.0°C). Temperatures for the 3-month study period were close to the 30-yr norm. Precipitation levels were 6% below the norm per month, with July's rainfall 72% below the norm. Source: Environment Canada. **Coverage:** 14.0 h; 8 visits (0 sunrise, 4 sunset); 2, 12, 26 May; 9, 14 Jun; 2, 3, 6 Jul. **Census:** Yellow Warbler, 42.0 (290); Gray Catbird, 28.0 (193); Song Sparrow, 11.0 (76; 1FL); Northern Cardinal, 8.0 (55); American Goldfinch, 8.0; Blue-winged Warbler, 5.0 (34); Field Sparrow, 5.0; Indigo Bunting, 4.0 (28); American Robin, 3.0 (21); Rose-breasted Grosbeak, 2.0; Baltimore Oriole, 2.0 (2FL); Northern Flicker, 1.0; Wood Thrush, 1.0; Eastern Towhee, 1.0; Common Grackle, 1.0; Brown-headed Cowbird, 1.0. **Total:** 16 species; 123.0 territories (848/40 ha). **Visitors:** Great Crested Flycatcher, Warbling Vireo, Blue Jay, Black-capped Chickadee, Brown Thrasher, Cedar Waxwing, Common Yellowthroat, Red-winged Blackbird, House Finch. **Remarks:** Slightly higher temperatures and lower rainfall than the 30-yr norms resulted in total breeding territories (123.0) about 6% below the 8-yr mean on this revised plot. As with last year, most breeding species were on the plot in early May. For the three most numerous foraging groups (warblers, seed-eaters, and mimids), the percentage of total breeding pairs was very close to the 8-yr mean. The two warbler species accounted for 38% and the seven seed-eaters for 32% for a total of 70% of all territories. Ongoing vegetative succession may account for the apparent decline in breeding Common Yellowthroats, Willow Flycatchers, and Brown Thrashers. Eastern Towhee and Wood Thrush were new this year, bringing the total number of breeding species over eight years to 32.

25. SHRUBBY TREES, RIDGE, AND WOODS

ARBUSTOS, COLINAS Y BOSQUES

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

Location: Ontario; Municipality of Hamilton-Wentworth; Dundas; Dundas Valley Plot #2; 43°14'N, 80°0'W. **Continuity:** Established 1990; 9 yr. **Size:** 7.3 ha. **Description of Plot:** See J. Field Ornithol. 60(Suppl.):14–15 (1989) and 64(Suppl.):89 (1993). This plot continues to "thicken up" in its shrub layer areas. **Weather:** Mean start temp., 18.9°C (range 13–25°C). Temperatures for the 3-month study period were close to the 30-yr norm. Precipitation levels were 6% below the norm per month, with July's rainfall 72% below the norm. Source: Environment Canada. **Coverage:** 12.6 h; 8 visits (0 sunrise, 5 sunset); 7, 16, 23, 30 May; 13, 25, 28 Jun; 5 Jul. **Census:** Yellow Warbler, 14.0 (77); Gray Catbird, 13.0 (71); Northern Cardinal, 7.0 (38); American Robin, 3.0 (16); Song Sparrow, 3.0; Black-capped Chickadee, 2.0 (2FL); Wood Thrush, 2.0; Common Yellowthroat, 2.0; Eastern Towhee, 2.0; Indigo Bunting, 2.0; American Goldfinch, 2.0; Blue Jay, 1.0; Cedar Waxwing, 1.0; Blue-winged Warbler, 1.0; Field Sparrow, 1.0; Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0; Baltimore Oriole, 1.0. **Total:** 18 species; 59.0 territories (323/40 ha). **Visitors:** Downy Woodpecker, Pileated Woodpecker, Eastern Wood-Pewee, American Crow, Scarlet Tanager, Red-winged Blackbird. **Remarks:** Breeding territory totals have varied widely on this plot over its nine-year study history, ranging from 90.5 (23 species) in 1996 to 40.5 (10 species) in 1998. The more open north-facing half of the plot typically hosts many more breeders than the south-facing half, which is heavily wooded and steeply sloped up to the central ridge. This year's breeding pair total of 59.0 (18 species) is seven pairs below the nine-year mean. The top three breeders (Yellow Warbler, Gray Catbird, and Northern Cardinal) accounted for 58% of all breeding territories. Only two pairs of chickadees bred this year on this largely wooded plot; the nine-year mean for bark foragers (four species overall) is a low 2.8. Flycatchers, once regular breeders, have not bred for the past three study years.

26. DESERT RIPARIAN–FRESHWATER MARSH

DESIERTO RIVEREÑO–PANTANO

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Redlands CA 92374-4560

Location: California; San Bernardino Co.; Morongo Valley; Big Morongo Wildlife Reserve; 34°3'N, 116°35'W; Morongo Valley Quadrangle, USGS. **Continuity:** Established 1977; 24 yr. **Size:** 15.4 ha. **Description of Plot:** See J. Field Ornithol. 62(Suppl.):76 (1991), 64(Suppl.):92–93 (1993), and 65(Suppl.):106–107 (1994). **Weather:** Mean start temp., 12.0°C (range 8–16°C). **Coverage:** 26.8 h; 8 visits (8 sunrise); 13, 20, 25 Apr; 2, 7, 16, 23, 30 May. **Census:** Lesser Goldfinch, 21.0 (55); Bewick's Wren, 18.0 (47; 2N,1FL); House Wren, 17.0 (44; 4N,4FL); Song

Sparrow, 16.0 (42; 2N); Spotted Towhee, 11.0 (29; 2N); Common Yellowthroat, 10.0 (26; 5N); House Finch, 9.0 (23; 3N); Bushtit, 8.0 (21; 2N); Brown-headed Cowbird, 5.0 (13); Nuttall's Woodpecker, 4.0 (10; 2N); Western Scrub-Jay, 4.0 (3FL); Yellow-breasted Chat, 4.0; Summer Tanager, 4.0; Virginia Rail, 3.0 (8); Anna's Hummingbird, 3.0 (1N); Brown-crested Flycatcher, 3.0 (2N); Verdin, 3.0 (1N); California Thrasher, 3.0; European Starling, 3.0 (3N); Phainopepla, 3.0 (1N); Gambel's Quail, 2.0; Mourning Dove, 2.0; Black Phoebe, 2.0 (2N,4FL); Ash-throated Flycatcher, 2.0; California Towhee, 2.0; Cooper's Hawk, 1.0 (1N,3FL); Ladder-backed Woodpecker, 1.0 (1N,1FL); Oak Titmouse, 1.0; Yellow Warbler, 1.0; Blue Grosbeak, 1.0; Hooded Oriole, 1.0 (1N). **Total:** 31 species; 168.0 territories (436/40 ha). **Visitors:** Mountain Quail, Red-tailed Hawk, American Kestrel, Black-chinned Hummingbird, Costa's Hummingbird, Vermilion Flycatcher, Cassin's Kingbird, Western Kingbird, American Crow, Common Raven, Cactus Wren, Black-headed Grosbeak, Lazuli Bunting, Lawrence's Goldfinch. **Remarks:** The 31 species on 168 territories was down slightly from 2000 (170 territories). This year was the third year of drought since the El Niño year of 1997–98. Fifteen species decreased and eight species increased compared to last year. **Other Observers:** Dori Myers, Alice Ashbaugh, and Dee Zeller. **Acknowledgments:** San Bernardino County Museum, San Bernardino Valley Audubon Society, and Bureau of Land Management.

27. SHRUBBY SWAMP AND SEDGE HUMMOCKS

PANTANO ARBUSTIVO–MOGOTE

DAVID ROSGEN
White Memorial Conservation Center
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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; 35 yr. **Size:** 8.1 ha. **Description of Plot:** See Aud. Field Notes 19:625–627 (1965). Succession is continuing in this plot despite several recent flooding events. Now, roughly one-third of the plot can be classified as a shrubby, young, mixed hardwood (mostly red maple) poletimber swamp. The middle third is shrub swamp (with an increasing amount of winterberry). The one-third closest to Bantam Lake is still a mixed shrub and sedge marsh. It is this last portion that is most often inundated in flooding events. The entire marsh was at least partially flooded from 21 May through 9 June this year. By mid-July, conditions had reversed to a near-drought situation. **Weather:** Mean start temp., 22.7°C (range 13–30°C). Temperatures were close to average in May (13.8°C vs. 14.2°C) and June (18.9°C vs. 18.5°C). They were below normal in July (18.7°C vs. 21.2°C). May was a little wetter than normal, June was much wetter than normal, and July was much drier than normal. May's rainfall total was 11.3 cm, compared to an average of 10.6 cm. Ten days experienced at least some precipitation in May. June's rainfall total was 19.3 cm, compared to an average of 9.9 cm. Eight days experienced at least some rainfall in June. July had showers on 12 days, but only 3.8 cm of rain fell, compared to an average of 13.2 cm. Source: White Memorial Foundation weather station. **Coverage:** 21.0 h; 11 visits (1 sunrise, 4 sunset); 1, 8, 15, 21, 31 May; 7, 9, 18, 26 Jun; 3, 9 Jul. Maximum number of observers/visit, 3. **Census:** Red-winged Blackbird, 33.0 (163; 12N,126FL); Swamp Sparrow, 32.0 (158; 10N,111FL); Yellow Warbler, 27.0 (133; 12N,107FL); Common Yellowthroat, 14.5 (72; 3N,35FL); Gray Catbird, 14.0 (69; 4N,39FL); Song Sparrow, 7.0 (35; 4N,31FL); Common Grackle, 6.5 (32; 3N,21FL); Willow Flycatcher, 4.0 (20); Least Flycatcher, 4.0 (1N,8FL); Eastern Kingbird, 3.5 (17; 2N,13FL); American Goldfinch, 3.5 (6FL); Tree Swallow, 3.0 (15; 2N,17FL); Cedar Waxwing, 3.0 (7FL); Chestnut-sided Warbler, 3.0; Veery, 2.0 (3FL); Black-and-white Warbler, 2.0 (6FL); Northern Waterthrush, 2.0; Baltimore Oriole, 2.0 (1N,5FL); Mallard, 1.5 (1N,7FL); Virginia Rail, 1.5; Mourning Dove, 1.5; Downy Woodpecker, 1.5 (1N,4FL); Northern Flicker, 1.5; Alder Flycatcher, 1.5; Great Crested Flycatcher, 1.5 (4FL); Warbling Vireo, 1.5 (1N,5FL); Black-capped Chickadee, 1.5 (10FL); Blue-gray Gnatcatcher, 1.5; American Robin, 1.5 (7FL); American Redstart, 1.5 (4FL); Spotted Sandpiper, 1.0; Hairy Woodpecker, 1.0 (1N,4FL); Yellow-throated Vireo, 1.0 (3FL); Mute Swan, 0.5; Wood Duck, 0.5 (1N,10FL); Great Blue Heron, 0.5; American Woodcock, 0.5 (1N,3FL); Blue Jay, 0.5; Tufted Titmouse, 0.5; Northern Cardinal, 0.5 (2FL); Brown-headed Cowbird, 0.5; Brown Creeper, +; Marsh Wren, +. **Total:** 43 species; 191.0 territories (943/40 ha). **Visitors:** Red-eyed Vireo, American Crow, European Starling. **Remarks:** Continued vegetation succession in this plot is probably the reason why a record-high number of species was found this year. The previous record of 40 species was set last year. The number of species has been climbing steadily since 1997. The 10-year average for 1991–2000 is 35.7, so this is a significant increase in diversity. Woodland species, such as Veery and Black-and-white Warbler, are noticeably increasing. Mourning Dove, Blue Jay, and Tufted Titmouse are now establishing themselves in this plot, too. The number of territorial males decreased slightly this year (probably due to the flooding) to 191.0. Though 5.0 fewer than last year, this is still well above the 1991–2000 average of 162.2. Since Swamp Sparrow decreased by five territories from last year, while Red-winged Blackbird decreased by only one, the latter is now the most common species in the plot. Swamp

Sparrow dropped to the number two spot, while Yellow Warbler remained in third place with stable numbers. **Other Observers:** Eric Adam, John Eykelhoff, Ray Packard, and Bruce Sebastian.

28. COASTAL SCRUB
MATORRAL COSTANERO

ANTHONY DOTOLO
PRBO Conservation Science
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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; 27 yr. **Size:** 8.1 ha. **Description of Plot:** See Am. Birds 25:1003–1004 (1971). **Weather:** Mean start temp., 11°C (range 3–21°C). **Coverage:** 178.2 h; 68 visits (44 sunrise, 0 sunset). **Census:** Wrentit, 9.0 (44; 6N,14FL); Spotted Towhee, 4.0 (20; 1N); Bewick's Wren, 2.5 (2N); Purple Finch, 2.5; Chestnut-backed Chickadee, 2.0; Wilson's Warbler, 2.0; Song Sparrow, 2.0; White-crowned Sparrow, 2.0; Bushtit, 1.5; Allen's Hummingbird, 1.0; Band-tailed Pigeon, 0.5 (1N); Golden-crowned Kinglet, 0.5; Orange-crowned Warbler, 0.5; Red-tailed Hawk, +; Northern Flicker, +; Steller's Jay, +; Western Scrub-Jay, +; American Robin, +. **Total:** 18 species; 30.0 territories (148/40 ha). **Visitors:** None reported. **Remarks:** Wrentit territories declined by 38% compared to last year, with only 9.0 recorded this year. This was the lowest number of Wrentit territories since 1979. Spotted Towhee and White-crowned Sparrow territories decreased by 43% compared to last year, and 22% and 29%, respectively, compared to the average of the past five years. Bewick's Wren territories decreased from 3.5 in 2000 to 2.5 in 2001. Song Sparrow territories increased from 1.0 to 2.0 in 2001, falling in line with the average number of territories from the past five years. **Other Observers:** Grant Ballard and Roy Churchwell. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1530.

29. 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; 27 yr. **Size:** 4.7 ha. **Description of Plot:** See Am. Birds 26:987–988 (1972). **Weather:** Mean start temp., 11°C (range 3–21°C). **Coverage:** 164 h; 67 visits (27 sunrise, 0 sunset); 22, 27, 28, 29, 30 Mar; 2, 3, 4, 8–11, 16–18, 23–27 Apr; 2, 3, 5, 11, 13–17, 20, 21, 23–26, 28–30 May; 1–15, 17, 19, 22, 24–26, 28-30 Jun; 6, 9, 12–15, 17, 19 Jul. Maximum number of observers/visit, 3. **Census:** Song Sparrow, 5.5 (47; 5N,7FL); Wrentit, 4.0 (34; 5N,14FL); Spotted Towhee, 2.5 (3N,5FL); American Goldfinch, 2.0; California Quail, 1.0; Anna's Hummingbird, 1.0; Bewick's Wren, 1.0; Orange-crowned Warbler, 1.0; Allen's Hummingbird, 0.5; Western Scrub-Jay, 0.5; Bushtit, 0.5; American Robin, 0.5; Brown-headed Cowbird, 0.5; Northern Flicker, +; Chestnut-backed Chickadee, +; Western Bluebird, +; Swainson's Thrush, +; Wilson's Warbler, +; California Towhee, +; White-crowned Sparrow, +; Purple Finch, +. **Total:** 21 species; 20.5 territories (174/40 ha). **Visitors:** None reported. **Remarks:** Territory densities decreased 31% from 2000. This comes after a 33% increase in overall density from 1999 to 2000. Wrentit density fell 47% from 2000. Song Sparrow density fell 21% to its lowest level since 1995; Song Sparrow density had remained relatively stable since 1996. Spotted Towhee density dropped 44% following a generally increasing trend since 1996. Other species showing declines since 2000 include Bewick's Wren, Allen's Hummingbird, and Red-tailed Hawk. Species showing increases over last year include White-crowned Sparrow, Western Scrub-Jay, American Robin, Western Bluebird, and Brown-headed Cowbird. **Other Observers:** Geoff Geupel, Quresh Latif, Grant Ballard, and Anthony Dotolo. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1531.

30. 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; 27 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., 11°C (range 3–21°C). **Coverage:** 369.1 h; 86 visits (53 sunrise, 1 sunset). **Census:** Song Sparrow, 13.0 (64; 10N); Wrentit, 11.0 (54; 3N); Spotted Towhee, 5.0 (25; 2N); American Goldfinch, 3.5 (17); Bewick's Wren, 3.0 (15); Chestnut-backed Chickadee, 2.0; Anna's Hummingbird, 1.5; Western Scrub-Jay, 1.5; Swainson's Thrush, 1.5; Allen's Hummingbird, 1.0; Mourning Dove, 0.5; American Robin, 0.5; White-crowned Sparrow, 0.5; Brown-headed Cowbird, 0.5; California Quail, +; Northern Flicker, +; Hutton's Vireo, +; Orange-crowned Warbler, +; Wilson's

Warbler, +; California Towhee, +; Purple Finch, +. **Total:** 21 species; 45.0 territories (222/40 ha). **Visitors:** None reported. **Remarks:** Territory densities decreased by 8.5 territories relative to 2000; 1995 was the last year that so few territories (45.0) were reported. The number of Wrentit territories declined by 18.5% compared to last year. This was the lowest number of Wrentit territories since 1993. Spotted Towhee territories increased from 3.5 to 5.0. American Goldfinch territories decreased from 2000 (8.0 to 3.5). White-crowned Sparrow territories also decreased from last year, setting a record low since the census began. Song Sparrow territories increased this year (13.0) compared to the 2000 season (11.5); 1993 was the last time this many Song Sparrow territories were reported. Bewick's Wren lost a territory from the 2000 season. **Other Observers:** Grant Ballard, Geoff Geupel, Sacha Heath, Moe Flannery, and Quresh Latif. **Acknowledgments:** We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1532.

31. GRAZED COASTAL SCRUB
MATORRAL COSTANERO PASTOREADO

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Location: California; Marin Co.; Bolinas; Palomarin Field Station; 37°55'N, 122°45'W; Bolinas Quadrangle, USGS. **Continuity:** Established 1995; 7 yr. **Size:** 45.0 ha. **Description of Plot:** See J. Field Ornithol. 67(Suppl.):79 (1996). Active cattle grazing has occurred on this plot since at least 1994. There were short breaks in 1995 and 2001. The absence of cattle caused habitat changes mainly to the ground cover. Rush and grass height increased dramatically, averaging approximately 50 cm throughout many areas. In the flatter meadows, bull thistle and other forbs dominated the ground cover. **Weather:** Mean start temp., 11°C (range 3–21°C). **Coverage:** 429.8 h; 91 visits (70 sunrise, 0 sunset). **Census:** Song Sparrow, 21.0 (19; 12N,>9FL); Wrentit, 18.5 (16; 3N,>1FL); White-crowned Sparrow, 12.5 (11; 4N,>1FL); Grasshopper Sparrow, 9.0 (8; 4N,11FL); California Quail, 8.0 (7); Savannah Sparrow, 7.5 (7; 3N,1FL); Bewick's Wren, 7.0 (6); Western Scrub-Jay, 6.0 (5; 1N); Chestnut-backed Chickadee, 5.0 (4); Bushtit, 5.0 (2N); Wilson's Warbler, 5.0; Purple Finch, 5.0; Spotted Towhee, 4.0 (4; 1N); Brown-headed Cowbird, 3.5 (3); American Goldfinch, 3.5 (1N); Anna's Hummingbird, 3.0 (3); Allen's Hummingbird, 3.0; Olive-sided Flycatcher, 3.0; Swainson's Thrush, 3.0; Orange-crowned Warbler, 3.0; Steller's Jay, 2.0; California Towhee, 1.5; Brewer's Blackbird, 1.5 (1N,1FL); Northern Flicker, 1.0; Red-breasted Nuthatch, 1.0; American Robin, 0.5; Red-tailed Hawk, +. **Total:** 27 species; 143.0 territories (127/40 ha). **Visitors:** Turkey Vulture, Osprey, Mourning Dove, Downy Woodpecker, Hutton's Vireo, American Crow, Common Raven, Violet-green Swallow, Cliff Swallow, Barn Swallow, Western Bluebird, Hermit Thrush, European Starling, Dark-eyed Junco, Red-winged Blackbird. **Remarks:** Territory densities decreased from 153.0 territories last year to 143.0 this year. The number of species decreased the past two years from an average of 31.7 species (1997–99) to 27 species in both 2000 and 2001. White-crowned Sparrow density continued to drop with a 51% decrease from its peak density in 1995 and a 22% decrease from last year. Spotted Towhee density decreased by 47% from 2000 to its lowest level ever. Bewick's Wren density decreased as well, to more than half its peak density in 1999 but within the same range of densities noted in 1995, 1996, and 1998. Song Sparrow territories were down 26% from 1996–99. Grasshopper Sparrow density increased greatly with 9.0 territories. Brown-headed Cowbirds parasitized 24% of the nests found on the plot. **Other Observers:** Moe Flannery, Dale Feiss, Regan Brooks, Diana Humple, Sacha Heath, Roy Churchwell, Grant Ballard, Diana Stralberg, Anthony Dotolo, Dennis Jongsomjit, and Peter Erwin. **Acknowledgments:** We thank the Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1533.

32. ABANDONED UPLAND PASTURE
PASTIZAL DE ALTURAS ABANDONADO

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Location: New York; Allegany Co.; Scio; Saunders Plot; 42°13′N, 77°59′W; Wellsville North Quadrangle, USGS. **Continuity:** Established 1984; 18 yr. **Size:** 8.0 ha. **Description of Plot:** See Am. Birds 39:112 (1985) and J. Field Ornithol. 63 (Suppl.):109–110 (1992). **Weather:** Mean start temperature: 12.3°C (range 7–19°C). Deviations from the long-term averages: temperature, +1.4°C; precipitation, -1.3 cm. Source: Wellsville Water Treatment Plant. The warm, dry spring advanced the nesting season about two weeks. The intermittent stream was flowing throughout the study. **Coverage:** 6.8 h; 7 visits (0 sunrise, 0 sunset, 1 after sunset); 1 Apr; 4, 10, 23(2) May; 7, 22 Jun. The first visit was brief and in the evening to listen for American Woodcock. **Census:** Alder Flycatcher, 10.0 (50, 1N); Song Sparrow, 10.0 (2N); Yellow Warbler, 9.0 (45); American Goldfinch, 7.0 (35; 4N); Common Yellowthroat, 6.0 (30); Field Sparrow, 6.0; American Woodcock, 4.0 (20); Blue-winged Warbler, 4.0; Eastern Towhee, 4.0; Indigo Bunting, 4.0; Wood Thrush, 3.0 (15); Chestnut-sided Warbler, 3.0; Northern Flicker, 2.0;

Red-eyed Vireo, 2.0; Blue Jay, 2.0; Tree Swallow, 2.0 (2N,4FL); Black-capped Chickadee, 2.0; House Wren, 2.0 (2N,5FL); American Robin, 2.0 (1N,1FL); Gray Catbird, 2.0 (1N); Magnolia Warbler, 2.0; Prairie Warbler, 2.0 (1N); American Redstart, 2.0; Ovenbird, 2.0; Northern Cardinal, 2.0; Rose-breasted Grosbeak, 2.0 (1N); Tufted Titmouse, 1.0; Eastern Bluebird, 1.0 (2N,6FL); Veery, 1.0; Brown Thrasher, 1.0; Cedar Waxwing, 1.0 (1N); Yellow-rumped Warbler, 1.0; Scarlet Tanager, 1.0; Chipping Sparrow, 1.0; Baltimore Oriole, 1.0; Purple Finch, 1.0; Red-tailed Hawk, +; Ruffed Grouse, +; Yellow-bellied Sapsucker, +; American Crow +; Common Raven, +. **Total:** 41 species; 108 territories (540/40 ha). **Visitors:** Downy Woodpecker, Eastern Wood-Pewee, Least Flycatcher, Nashville Warbler, Red-winged Blackbird. **Remarks:** The first three visits were short and in the evening to listen for American Woodcock. Variation from the 17-year norm for number of species was +33% and for number of territories, -23%. The number of species was one less than last year which was the highest ever, but the population of territorial males was the lowest since the inception of the study in 1984. Great Blue Heron and Belted Kingfisher flew over the plot. Good nesting success was a reflection of the warm, dry season. Chief predators were American Crow, opossum, and raccoon. Abundant wild foods included rabbits, voles, weed seeds, hickory nuts, wild grapes, and fruit of gray-barked dogwood, buckthorn and honeysuckle. **Acknowledgments:** Sincere appreciation to Dana Harris for weather data and to Victor and Gail Funk for permission to use their property.

33. CLEAR-CUT–LONGLEAF PINE REGENERATION

REGENERACION DE FORMACION TALADA DE PIÑO DE HOJA-LARGA

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Site Number: SC0495053. **Location:** South Carolina; Barnwell Co.; Martin; Savannah River Site; 33°9'N, 81°32'W; Girard NE Quadrangle, USGS. **Continuity:** Established 1995; 7 yr. **Size:** 12.5 ha. **Description of Plot:** See J. Field Ornithol. 64(Suppl.):111 (1993) and 67(Suppl.):89–90 (1996). Because the site was initially clear-cut and replanted, the vegetation demonstrates growth and infilling each year. Planted longleaf pines are now approximately 4–10 m tall. Over most of the plot, the ground cover is sparse. Blackberry is common throughout the plot. There are also isolated clumps of dense vegetation (sweetgum, privet, and other shrubs); the largest of these is approximately 0.25 ha. The plot was burned since the 2000 census, reducing the amount of shrub and ground cover compared to 1999 and 2000. **Weather:** Mean start temp., 20.8°C (range 14–34°C). The mean high temperature for May was 30°C (38-yr average is 29°C); mean low temperature was 17°C (38-yr average is 16°C). The range of temperatures for May was 11–36°C; mean daily temperature was 23°C. The mean high temperature for June was 30°C (38-yr average is 32°C); mean low temperature was 21°C (38-yr average is 16°C). The range of temperatures for June was 17–34°C; mean daily temperature was 25°C. Precipitation for January–June was 4.88 cm below the 50-yr average. The total rainfall in May and June was 3.59 cm above average. May precipitation was 12.17 cm. June precipitation was 12.37 cm. Measurable precipitation was recorded on eight days in May and 15 days in June. Source: Westinghouse Savannah River Co., Savannah River Technology Center, Nonproliferation Technologies Section. **Coverage:** 15.5 h; 10 visits (8 sunrise, 2 sunset); 8, 15, 18, 21, 24, 28 May; 4, 11, 19, 22 Jun. **Census:** Indigo Bunting, 4.0 (13); Northern Cardinal, 2.5; White-eyed Vireo, 2.0; Yellow-breasted Chat, 2.0; Eastern Towhee, 2.0; Blue Grosbeak, 2.0; Carolina Wren, 1.5; Brown Thrasher, 1.5; Pine Warbler, 1.5 (1N,2FL); Mourning Dove, 1.0; Carolina Chickadee, 1.0; Prairie Warbler, 1.0; Brown-headed Cowbird, 1.0; Blue Jay, 0.5. **Total:** 14 species; 23.5 territories (75/40 ha). **Visitors:** Common Ground-Dove, Common Nighthawk, Chuck-will's-widow, Whip-poor-will, Ruby-throated Hummingbird, Hairy Woodpecker, Pileated Woodpecker, Eastern Wood-Pewee, Great Crested Flycatcher, American Crow, Barn Swallow, Brown-headed Nuthatch, Blue-gray Gnatcatcher, Eastern Bluebird, Gray Catbird, Cedar Waxwing, Summer Tanager, Field Sparrow. **Acknowledgments:** We thank the Department of Energy and the Savannah River Forest Station of the U.S. Forest Service for financial support and access to the area.

34. CONVENTIONAL DAIRY FARM

GANADERIAS CONVENCIONALES

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Location: Pennsylvania; Berks Co.; Kempton; Terry Kunkel's farm; 40°37'N, 75°53'W; Hamburg Quadrangle, USGS. **Continuity:** Established 1989; 11 yr. **Size:** 23.1 ha. **Description of Plot:** See J. Field Ornithol. 61 (Suppl.):82–83 (1990), 66 (Suppl.):117 (1995), and 67 (Suppl.):90 (1996). Corn and alfalfa were the only planted crops this year, with approximately 70% of the total cropland in corn. Crops were more diversified in past years. With cattle permanently confined, there was no grazing in the permanent pasture this year during the census period. This

provided continuous cover of tall grasses and forbs (approximately 1 m). Shrubs and seedling trees have expanded outward from hedgerows, providing more brushy edge habitat. **Weather:** Mean start temp., 16.9°C (range 13–24°C). **Coverage:** 18.3 h; 8 visits (8 sunrise); 28 May; 7, 16, 24, 30 Jun; 6, 14, 21 Jul. **Census:** House Sparrow, 15.0 (26; 15N); Song Sparrow, 7.0 (12; 11FL); Indigo Bunting, 7.0 (4FL); Gray Catbird, 6.0 (10; 8FL); European Starling, 6.0 (10FL); Barn Swallow, 4.0 (7; 4N); Chipping Sparrow, 4.0 (4FL); House Wren, 3.0 (5; 6FL); Field Sparrow, 3.0 (7FL); Red-winged Blackbird, 3.0 (4FL); Willow Flycatcher, 2.0 (1FL); American Robin, 2.0; Common Yellowthroat, 2.0 (2FL); Northern Cardinal, 2.0 (2FL); American Goldfinch, 2.0; Mourning Dove, 1.0 (1FL); Belted Kingfisher, 1.0 (1N,1FL); Downy Woodpecker, 1.0 (1FL); Eastern Phoebe, 1.0 (1FL); Eastern Kingbird, 1.0; American Crow, 1.0 (2FL); Northern Rough-winged Swallow, 1.0 (2FL); Eastern Bluebird, 1.0 (1FL); Yellow Warbler, 1.0 (2FL); Brown-headed Cowbird, 1.0 (1FL); Baltimore Oriole, 1.0 (1FL); Red-tailed Hawk, + (2FL); Northern Flicker, + (2FL); Great Crested Flycatcher, + (2FL); Blue Jay, + (2FL); Tufted Titmouse, + (2FL); Vesper Sparrow, +. **Total:** 32 species; 79.0 territories (137/40 ha). **Visitors:** Killdeer, Rock Dove, Ruby-throated Hummingbird, Red-bellied Woodpecker, Fish Crow, Black-capped Chickadee, Carolina Wren, Northern Mockingbird, Brown Thrasher, Cedar Waxwing, Blue-winged Warbler, Eastern Towhee, Common Grackle, Orchard Oriole, House Finch. **Remarks:** All 15 House Sparrow nests were found in buildings. Large flocks of European Starlings and Common Grackles that nested off the plot foraged on silage, waste grain, and in the manure storage basin during every visit (maximum of approximately 200 birds). American Robins again hunted for worms in the manure storage basin and flew off plot with their prey. Belted Kingfishers nested in the same road-bank burrow as last year, apparently fishing mostly off plot. A Song Sparrow pair raised a Brown-headed Cowbird fledgling. **Acknowledgments:** I would like to thank Terry Kunkel for permission to use his farm for this study.

Bird Populations 7:114-127

BREEDING BIRD CENSUS: 2002

1. IRRIGATED MIXED WILLOW RIPARIAN
BOSQUE RIBEREÑO DE SAUCE, IRRIGADO

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Location: California; Mono Co.; Mono City; Wilson Creek; 38°03'N, 119°09'W; Lundy & Negit Island Quadrangles, USGS. **Continuity:** Established 2000; 3 yr. **Size:** 15 ha. **Description of Plot:** See 2001 report (this volume). **Weather:** Mean temp., 16°C (range -6–37°C). Mean monthly (May–August) high and low temperatures (derived on site for June–August and from http://www.monobasinresearch.org/ for May) were respectively higher and lower than long-term averages (1950–1988, NOAA Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation was above average in May, just below average in June, just above average in July, and well below average in August. **Coverage:** 370.6 h; 70 visits (64 sunrise, 6 sunset). **Census:** Spotted Towhee, 17.5 (47); Song Sparrow, 15.0 (40; 25N,27FL); Yellow Warbler, 7.0 (19; 7N,6FL); Green-tailed Towhee, 5.0 (13; 1N); Northern Flicker, 2.5 (3N); Brewer's Sparrow, 2.5 (3N,5FL); American Kestrel, 2.0 (1N,3FL); American Robin, 2.0 (2N); Bewick's Wren, 1.5; Bushtit, 1.0; Blue-gray Gnatcatcher, 1.0; Vesper Sparrow, 1.0 (1N,2FL); Belted Kingfisher, 0.5; Sage Thrasher, 0.5; Northern Rough-winged Swallow, col; Cliff Swallow, col. (3N,1FL); Red-winged Blackbird, col. (7N,8FL); Mallard, unk. (1N); Green-winged Teal, unk. (2N,3FL); Mourning Dove, unk. (1N,2FL); Long-eared Owl, unk. (1N); Black-billed Magpie, unk. (13N,12FL); Savannah Sparrow, unk. (2N,3FL); Western Meadowlark, unk. (3N,3FL); Brown-headed Cowbird, unk. (23N,6FL). **Total:** 25 species; 59.0 territories (157/40ha). **Visitors:** Greater Sage-Grouse, Killdeer, Wilson's Snipe, Wilson's Phalarope, Common Nighthawk, Gray Flycatcher, Dusky Flycatcher, Western Kingbird, Loggerhead Shrike, Warbling Vireo, Sage Thrasher, European Starling, MacGillivray's Warbler, Common Yellowthroat, Black-headed Grosbeak, Brewer's Blackbird, Bullock's Oriole. **Remarks:** Common Yellowthroat now absent as a nester (single pair in 2001). A single Long-eared Owl pair nested atop an old magpie nest; fledglings were observed in previous years. Greater Sage-Grouse females and broods were observed in late July; likely dispersing from nearby upland breeding areas to consume forbs and grasses found in wetter areas. Cowbirds parasitized 61% of host species' (Green-tailed Towhee, Yellow Warbler, Song Sparrow, and Red-winged Blackbird) nests. Predation accounted for 60% of all nest failures. The magpie colony (at least 13 pairs) likely contributes to nest predation; individuals were observed harassing birds whose nests then failed. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. We also did not map species that primarily used the irrigated pasture next to our study plots (Savannah Sparrow, Western Meadowlark), though their territories encompassed the riparian somewhat. These species' territories are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management, United States Forest Service Partners in Flight – Region 5, Inyo National Forest, California Department of Fish and Game, Mono Lake Tufa State Reserve, Eastern Sierra Audubon Society, White Mountain Research Station – Eastern Sierra Institute for Collaborative Education, Mono Lake Committee, Cornell University – Golondrinas de Las Americas project, Sierra Nevada Aquatic Research Lab, Joel Ellis, and Jan Simis. This is PRBO contribution # 1529.

2. RECOVERING MIXED WILLOW–BLACK COTTONWOOD RIPARIAN I
BOSQUE RIBEREÑO DE ÁLAMO Y SAUCES, EN RECUPERACIÓN I

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Location: California; Mono Co.; Lee Vining; Rush Creek; 37°56'N, 119°04'W; Lee Vining Quadrangle, USGS. **Continuity:** Established 2000; 3 yr. **Size:** 39 ha. **Description of Plot:** See Western Birds 35:197–209 (2004). **Weather:** Mean temp., 18°C (range -5°–36°C).

Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term averages (1950–1988, NOAA Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation (www.monolake.org) was above average in May, just below average in June, just above average in July, and well below average in August. **Coverage:** 521 h; 82 visits (77 sunrise, 5 sunset). **Census:** Yellow Warbler, 93.5 (96; 93N,91FL); Song Sparrow, 22.5 (23; 11N,2FL); Spotted Towhee, 21.0 (22; 7N,7FL); Bewick's Wren, 9.0 (9); Green-tailed Towhee, 7.0 (7); American Robin, 5.0 (5; 3N,4FL); Black-headed Grosbeak, 5.0 (3N,3FL); Bushtit, 4.0 (4; 4N); Brewer's Sparrow, 3.5 (4; 1N,2FL); Northern Flicker, 3.0 (3; 3N,13FL); Willow Flycatcher, 3.0 (4N,2FL); MacGillivray's Warbler, 3.0; Savannah Sparrow, 2.0; Warbling Vireo, 1.0 (1N); American Kestrel, 0.5 (1N,2FL); Black-billed Magpie, col. (2N); Violet-green Swallow, col.; Northern Rough-winged Swallow, col. (2N); Red-winged Blackbird, col. (4N,2FL); Brewer's Blackbird, col. (11N); Gadwall, unk. (1N,12FL); Mallard, unk. (1N); Green-winged Teal, unk. (1N); Killdeer, unk. (1N); Spotted Sandpiper, unk. (3N,10FL); Mourning Dove, unk. (8N,8FL); Brown-headed Cowbird, unk. (63N,27FL). **Total:** 27 species; 183.0 territories (188/40ha). **Visitors:** California Quail, Black-crowned Night-Heron, Northern Harrier, Red-tailed Hawk, Wilson's Snipe, Great Horned Owl, Common Nighthawk, Belted Kingfisher, Hairy Woodpecker, Western Wood-Pewee, Gray Flycatcher, Dusky Flycatcher, Loggerhead Shrike, Western Scrub-Jay, Pinyon Jay, Common Raven, Cliff Swallow, Blue-gray Gnatcatcher, Sage Thrasher, European Starling, Orange-crowned Warbler, Common Yellowthroat, Western Tanager, Brewer's Sparrow, Black-throated Sparrow, Sage Sparrow, Yellow-headed Blackbird, Bullock's Oriole, Cassin's Finch, House Finch. **Remarks:** Warbling Vireo and Bushtit were new to the plot this year, potentially responding to vegetation growth in this recovering system. Yellow Warblers and Black-headed Grosbeaks increased slightly. Cowbirds parasitized 51% of host species' (Warbling Vireo, Willow Flycatcher, Yellow Warbler, Song Sparrow, Spotted Towhee, Brewer's Blackbird, and Red-winged Blackbird) nests. Predation accounted for 57% of all nest failures. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management, United States Forest Service Partners in Flight – Region 5, Inyo National Forest, California Department of Fish and Game, Mono Lake Tufa State Reserve, Eastern Sierra Audubon Society, White Mountain Research Station – Eastern Sierra Institute for Collaborative Education, Mono Lake Committee, Cornell University – Golondrinas de Las Americas project, Sierra Nevada Aquatic Research Lab, Joel Ellis, and Jan Simis. This is PRBO contribution No. 1526.

3. RECOVERING MIXED WILLOW–BLACK COTTONWOOD RIPARIAN II

BOSQUE RIBEREÑO DE ÁLAMO Y SAUCES, EN RECUPERACIÓN II

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Location: California; Mono Co.; Lee Vining; Lee Vining Creek; 37°58'N, 119°06'W; Lee Vining Quadrangle, USGS. **Continuity:** Established 2000; 3 yr. **Size:** 29.5 ha. **Description of Plot:** Added since 2001: 0.5 ha of mature aspen stand and 4.5 ha of deltic shrub willow on Mono Lake's edge; otherwise unchanged from 2001 report (this volume). **Weather:** Mean temp., 17°C (range -3°–33°C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term averages (1950–1988, NOAA Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation (www.monolake.org) was above average in May, just below average in June, just above average in July, and well below average in August. **Coverage:** 483.2 h; 91 visits (89 sunrise, 2 sunset). **Census:** Yellow Warbler, 41.0 (56; 75N,60FL); Song Sparrow, 29.0 (39; 40N,54FL); Spotted Towhee, 22.5 (31; 5N,10FL); Green-tailed Towhee, 14.0 (19; 3N,3FL); American Robin, 6.0 (8; 9N,6FL); Lazuli Bunting, 6.0 (2N,2FL); Western Wood-Pewee, 4.0 (5; 3N,3FL); European Starling, 4.0 (4N); Brewer's Sparrow, 3.5 (5); American Kestrel, 3.0 (4; 1N,3FL); Bullock's Oriole, 3.0 (3N); Northern Flicker, 2.5 (3N,2FL); Steller's Jay, 2.0 (1N); Bushtit, 2.0 (3N,4FL); Bewick's Wren, 2.0 (2N); House Wren, 2.0 (3N,3FL); Belted Kingfisher, 1.0; Red-breasted/Red-naped Sapsucker hybrid, 1.0 (1N,3FL); Warbling Vireo, 1.0 (2N); American Dipper, 1.0 (1N,3FL); Lesser Goldfinch, 1.0 (1N); Black-billed Magpie, col. (2N); Violet-green Swallow, col. (1N); Northern Rough-winged Swallow, col.; Red-winged Blackbird, col. (78N,38FL); Brewer's Blackbird, col.; Mallard, unk. (5N,9FL); Green-winged Teal, unk. (1N); California Quail, unk.; Killdeer, unk. (4N,8FL); Spotted Sandpiper, unk. (11N,38FL); Brown-headed Cowbird, unk. (42N,16FL). **Total:** 32 species; 151.5 territories (205/40ha). **Visitors:** Black-crowned Night-Heron, Mourning Dove, Common Nighthawk, Hairy Woodpecker, Gray Flycatcher, Dusky Flycatcher,

Western Scrub-Jay, Clark's Nutcracker, Common Raven, Cliff Swallow, Mountain Chickadee, Blue-gray Gnatcatcher, Orange-crowned Warbler, Western Tanager, Black-throated Sparrow, Sage Sparrow, Black-headed Grosbeak, Cassin's Finch. **Remarks:** Changes unrelated to the plot additions include the following: Warbling Vireo, Bushtit, and Western Wood-Pewee were new to the plot this year. The later species is potentially responding to vegetation growth in this recovering system, the former nested in a patch of remnant exotic white poplars. Lesser Goldfinch was also a new breeder this year, and Lazuli Buntings increased. Cowbirds parasitized 24% of host species' (Lazuli Bunting, Warbling Vireo, Yellow Warbler, Song Sparrow, and Red-winged Blackbird) nests. Predation accounted for 64% of all nest failures. Infrared video cameras recorded a garter snake devouring a cowbird nestling and a Bewick's Wren puncturing a Lazuli Bunting egg. We often observed Steller's Jays harassing other birds and nest failures within jay territories were high. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management, United States Forest Service Partners in Flight – Region 5, Inyo National Forest, California Department of Fish and Game, Mono Lake Tufa State Reserve, Eastern Sierra Audubon Society, White Mountain Research Station – Eastern Sierra Institute for Collaborative Education, Mono Lake Committee, Cornell University – Golondrinas de Las Americas project, Sierra Nevada Aquatic Research Lab, Joel Ellis, and Jan Simis. This is PRBO contribution No. 1527.

4. REMNANT BLACK COTTONWOOD RIPARIAN FOREST

REMANENTES DE BOSQUE RIBEREÑO DE ÁLAMO

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Location: California; Mono Co.; Mono City; Mill Creek; 38°03'N, 119°08'W; Lundy Quadrangle, USGS. **Continuity:** Established 2000; 3 yr. **Size:** 15 ha. **Description of Plot:** See 2001 report (this volume). **Weather:** Mean temp., 19°C (range -5°–36°C). Mean monthly (May–August) high and low temperatures were respectively higher and lower than long-term averages (1950–1988, NOAA Western Regional Climate Center data for Lee Vining, CA). Mean monthly precipitation (www.monolake.org) was above average in May, just below average in June, just above average in July, and well below average in August. **Coverage:** 426.5 h; 73 visits (70 sunrise, 3 sunset). **Census:** Spotted Towhee, 21.5 (57; 7N,7FL); Yellow Warbler, 10.0 (27; 8N,16FL); Green-tailed Towhee, 9.0 (24; 2N); Song Sparrow, 8.0 (21; 8N,9FL); Northern Flicker, 7.0 (19; 7N,4FL); Bewick's Wren, 7.0 (2N); Bushtit, 6.0 (16; 8N,5FL); American Robin, 6.0 (6N,2FL); House Wren, 5.0 (13; 6N,2FL); Brewer's Sparrow, 5.0; American Kestrel, 4.0 (11; 4N,8FL); Bullock's Oriole, 4.0 (2N); Western Wood-Pewee, 3.0 (8; 1N); Juniper Titmouse, 3.0 (3N,4FL); Hairy Woodpecker, 2.0; Belted Kingfisher, 1.0 (1N); Steller's Jay, 1.0; American Dipper, 1.0; Blue-gray Gnatcatcher, 1.0 (1N); European Starling, 1.0 (1N); Lazuli Bunting, 1.0; Black-billed Magpie, col. (4N,3FL); Violet-green Swallow, col.; Northern Rough-winged Swallow, col.; Brewer's Blackbird, col. (22N,33FL); Mallard, unk. (1N,3FL); California Quail, unk.; Killdeer, unk.; Brown-headed Cowbird, unk. (14N,6FL). **Total:** 29 species; 106.5 territories (284/40ha). **Visitors:** Green Heron, Black-crowned Night-Heron, Red-tailed Hawk, Wilson's Snipe, Barn Owl, Great Horned Owl, Common Nighthawk, Anna's Hummingbird, Calliope Hummingbird, Red-breasted Sapsucker, Willow Flycatcher, Gray Flycatcher, Dusky Flycatcher, Say's Phoebe, Loggerhead Shrike, Warbling Vireo, Pinyon Jay, Clark's Nutcracker, Common Raven, Mountain Chickadee, White-breasted Nuthatch, Sage Thrasher, Orange-crowned Warbler, MacGillivray's Warbler, Common Yellowthroat, Western Tanager, Chipping Sparrow, Black-throated Sparrow, Sage Sparrow, Savannah Sparrow, Dark-eyed Junco, Black-headed Grosbeak, Red-winged Blackbird, Yellow-headed Blackbird, Cassin's Finch, House Finch. **Remarks:** Yellow Warblers expanded into the lower half of the plot and occupied 3 territories there. Cassin's Finches did not hold territories as in previous years. Screens were placed over holes in the adjacent subdivision, likely responsible for fewer European Starling territories along Mill Creek. Cowbirds parasitized 58% of host species' (Green-tailed Towhee, Spotted Towhee, Yellow Warbler, and Song Sparrow) nests. Predation accounted for 58% of all nest failures. We did not determine territorial densities for colonial species, nor for species difficult to document with the spot-mapping method due to their lack of vocalization or loosely held territory boundaries. These species' are indicated as "col" (colonial) or "unk." (unknown) above; nest numbers provide some indication of their prevalence. **Acknowledgements:** Financial and logistical support was provided by the National Fish and Wildlife Foundation, Bureau of Land Management, United States Forest Service Partners in Flight – Region 5, Inyo National Forest, California

Department of Fish and Game, Mono Lake Tufa State Reserve, Eastern Sierra Audubon Society, White Mountain Research Station – Eastern Sierra Institute for Collaborative Education, Mono Lake Committee, Cornell University – Golondrinas de Las Americas project, Sierra Nevada Aquatic Research Lab, Joel Ellis, and Jan Simis. This is PRBO contribution # 1528.

5. 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; 36 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 shrub layer is continuing to thicken and expand, especially on the east side of the plot. **Weather:** Mean start temp., 21.7°C (range 17–26°C). May was much colder and wetter than normal, including some snow that fell but did not stick on the 18th and seven nights with temperatures below 0°C. These conditions proved disastrous for most early-nesting birds. May had a total of 15.4 cm of rainfall, which is 4.7 cm above average. Nineteen days were wet this month. May's average temperature was 12°C, which is 2.2°C below normal. June's weather was much better for birds. Rainfall totaled 12.1 cm spread out over 12 days. This is about 2 cm more than average. June's mean temperature was 17.9°C, which is very close to average (18.5°C). July's total rainfall measured 10.7 cm, which is somewhat less than the average of 13 cm. Only six days had any rainfall. It was a hot month, with a mean temperature of 21.3°C, which is normal. Source: White Memorial Foundation weather station. **Coverage:** 17.5 h; 9 visits (1 sunrise, 2 sunset); 7, 16, 23, 30 May; 7, 17, 24 Jun; 5, 13 Jul. **Census:** Ovenbird, 13.5 (64; 16FL); Red-eyed Vireo, 12.0 (56; 13FL); Veery, 10.0 (47; 1N,17FL); Eastern Towhee, 9.0 (42; 1N,17FL); Gray Catbird, 8.0 (38; 3N,17FL); Northern Cardinal, 6.5 (31; 1N,14FL); Wood Thrush, 6.0 (28; 1N,8FL); Chestnut-sided Warbler, 6.0 (1N,11FL); American Redstart, 6.0 (11FL); Black-capped Chickadee, 4.5 (21; 1N,21FL); American Robin, 4.5 (3N,13FL); Black-and-white Warbler, 4.5 (11FL); Tufted Titmouse, 4.0 (19; 1N,22FL); Common Yellowthroat, 4.0 (10FL); Blue Jay, 3.0 (14; 8FL); Scarlet Tanager, 3.0 (5FL); American Crow, 2.0 (2N,7FL); Blue-winged Warbler, 2.0 (3FL); Yellow Warbler, 2.0 (3FL); Baltimore Oriole, 2.0 (1N,5FL); Wild Turkey, 1.5 (5FL); Mourning Dove, 1.5 (1N,2FL); Downy Woodpecker, 1.5 (5FL); Northern Flicker, 1.5 (2FL); Eastern Wood-Pewee, 1.5; Eastern Phoebe, 1.5 (2N,8FL); Great Crested Flycatcher, 1.5; White-breasted Nuthatch, 1.5 (4FL); Blue-gray Gnatcatcher, 1.5 (2FL); Rose-breasted Grosbeak, 1.5 (2FL); Barred Owl, 1.0 (2FL); Red-bellied Woodpecker, 1.0 (2FL); Cedar Waxwing, 1.0; Chipping Sparrow, 1.0 (3FL); Song Sparrow, 1.0 (3FL); Brown-headed Cowbird, 1.0 (2FL); House Finch, 1.0 (1N,3FL); American Goldfinch, 1.0 (3FL); Cooper's Hawk, 0.5 (2FL); Broad-winged Hawk, 0.5 (2FL); Red-tailed Hawk, 0.5 (2FL); Hairy Woodpecker, 0.5; Yellow-throated Vireo, 0.5; Warbling Vireo, 0.5; House Wren, 0.5; Common Grackle, 0.5; Ruffed Grouse, +; Pileated Woodpecker, +; Hermit Thrush, +; Black-throated Green Warbler, +. **Total:** 50 species; 139.5 territories (656/40 ha). **Visitors:** Least Flycatcher, Fish Crow, Brown Creeper, Carolina Wren. **Remarks:** Birds were abundant this year. So much so that new record highs were established for numbers of species and territorial males. The total of 50 species was one more than the previous record set in 2000 and 2001. Species composition was similar to that of the past four years, except for the addition of Red-tailed Hawk, Ruffed Grouse, and Black-throated Green Warbler. Red-winged Blackbird and Purple Finch did not breed in the plot this year. The total of 139.5 territories shattered the previous record-high of 120.5 set in 1983. It also far surpassed the 1992–2001 average of 97.0 territories. Why? It is probably a combination of improved habitat conditions (thicker shrub layer), an abundant food supply, and a loss of suitable nesting habitat due to land development in the nearby village of Bantam. **Other Observers:** John Eykelhoff, Janet Amalavage, John Grabowski, and Paul Fusco.

6. 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; 36 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). **Weather:** Mean start temp., 21.4°C (range 12–29°C). May was much colder and wetter than normal, including some snow that fell but did not stick on the 18th and seven nights with temperatures below 0°C. These conditions proved disastrous for most early-nesting birds. May had a total of 15.4 cm of rainfall, which is 4.7 cm above average. Nineteen days were wet this month. May's average temperature was 12°C, which is 2.2°C below normal. June's weather was much better for

birds. Rainfall totaled 12.1 cm spread out over 12 days. This is about 2 cm more than average. June's mean temperature was 17.9°C, which is very close to average (18.6°C). July's total rainfall measured 10.7 cm, which is somewhat less than the average of 13 cm. Only six days had any rainfall. It was a hot month, with a mean temperature of 21.3°C, which is normal. Source: White Memorial Foundation weather station. **Coverage:** 16.5 h; 9 visits (1 sunrise, 5 sunset); 7, 16, 23, 30 May; 8, 21, 28 Jun; 11, 16 Jul. Maximum number of observers/visit, 4. **Census:** Red-eyed Vireo, 14.0 (55; 21FL); Ovenbird, 13.0 (51; 2N,29FL); Veery, 11.0 (44; 1N,13FL); American Robin, 4.5 (18; 2N,16FL); American Redstart, 4.0 (16; 2N,14FL); Scarlet Tanager, 4.0 (7FL); Yellow-bellied Sapsucker, 3.5 (14; 2N,12FL); Eastern Wood-Pewee, 3.5; Great Crested Flycatcher, 3.0 (12); Wood Thrush, 3.0 (2N,5FL); Gray Catbird, 3.0 (1N,6FL); Tufted Titmouse, 2.5 (1N,13FL); Common Yellowthroat, 2.5 (3FL); Black-capped Chickadee, 2.0 (9FL); Black-and-white Warbler, 2.0 (7FL); Wild Turkey, 1.5 (7FL); Red-bellied Woodpecker, 1.5 (1N,3FL); Downy Woodpecker, 1.5 (1N,5FL); American Crow, 1.5 (1N,7FL); Chestnut-sided Warbler, 1.5 (3FL); Barred Owl, 1.0 (1N,4FL); Hairy Woodpecker, 1.0 (1N,3FL); Eastern Phoebe, 1.0 (4FL); Yellow-throated Vireo, 1.0; Blue Jay, 1.0 (3FL); White-breasted Nuthatch, 1.0 (1N,5FL); Louisiana Waterthrush, 1.0 (3FL); Eastern Towhee, 1.0; Chipping Sparrow, 1.0 (3FL); Northern Cardinal, 1.0 (2FL); Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0 (2FL); American Goldfinch, 1.0; Northern Flicker, 0.5; Blue-gray Gnatcatcher, 0.5 (2FL); Cedar Waxwing, 0.5; Blue-winged Warbler, 0.5; Black-throated Green Warbler, 0.5; Baltimore Oriole, 0.5; Cooper's Hawk, +; Red-tailed Hawk, +; Mourning Dove, +; Eastern Kingbird, +; Blue-headed Vireo, +; Hermit Thrush, +; Song Sparrow, +. **Total:** 46 species; 99.0 territories (392/40 ha). **Visitors:** Black-throated Blue Warbler, Blackburnian Warbler. **Remarks:** The number of breeding species increased to 46 this year, which is four more than last year and two more than the previous 10-year average. Species found this year but not last year included Barred Owl, Blue-winged Warbler, and Chipping Sparrow. Species found last year but missed this year included Broad-winged Hawk and Pileated Woodpecker. The number of territorial males found this year declined by only 1.0 from last year. This is very close to the 10-year average of 101.5. For the past 13 years, there hasn't been much deviation in this figure here. As usual, Red-eyed Vireo was the most abundant species, with Ovenbird a close second, and Veery in third place. With 13.0 territorial males, Ovenbird established a new record high for the species in this plot. American Robin, American Redstart, Scarlet Tanager, Yellow-bellied Sapsucker, Great Crested Flycatcher, and Gray Catbird also increased in number this year. **Other Observers:** John Eykelhoff, Kathleen Hall, Janet Amalavage, Perry Stafford, and B.K. Stafford.

7. CENTRAL HARDWOOD FOREST WITH SCATTERED PINE

BOSQUE CENTRAL DE MADERAS DURAS CON PIÑOS DISPERSOS

MARY E. D'IMPERIO
4000 Cathedral Ave. NW, #106
Washington DC 20016

Location: District of Columbia; Washington; Rock Creek Park; 38°57'N, 77°3'W; Washington West Quadrangle, USGS. **Continuity:** Established 1948; 53 yr. **Size:** 26.3 ha. **Description of Plot:** See Aud. Field Notes 2:153–154 (1948). **Weather:** Mean start temp., 13.8°C (range -1–23°C). Five days were clear, four were partly cloudy, and three were cloudy. There was drizzle during one visit. **Coverage:** 25.4 h; 12 visits (12 sunrise); 23, 30 Mar; 13, 27 Apr; 4, 11, 19, 25 May; 15, 29 Jun; plus two unidentified dates. **Census:** Red-eyed Vireo, 14.5 (22); Acadian Flycatcher, 14.0 (21); Ovenbird, 13.5 (21); Tufted Titmouse, 13.0 (20; 2+FL); Wood Thrush, 11.0 (17); Red-bellied Woodpecker, 8.0 (12); Carolina Wren, 4.5 (7); Northern Cardinal, 3.5 (5); Downy Woodpecker, 3.0 (5; 1FL); Eastern Wood-Pewee, 3.0; Eastern Towhee, 2.5; Brown-headed Cowbird, 2.5; Hairy Woodpecker, 2.0; Northern Flicker, 2.0; Scarlet Tanager, 2.0; Eastern Phoebe, 1.0 (1N,1+FL); White-breasted Nuthatch, 1.0; American Robin, 1.0; Song Sparrow, 1.0. **Total:** 19 species; 103.0 territories (157/40 ha). **Visitors:** Red-shouldered Hawk, Red-tailed Hawk, Mourning Dove, Pileated Woodpecker, Great Crested Flycatcher, Yellow-throated Vireo, Blue Jay, American Crow, Blue-gray Gnatcatcher, Veery, Gray Catbird, European Starling, Black-and-white Warbler, Common Yellowthroat, Common Grackle. **Remarks:** Data were sparse, and I don't feel that they fully represent the activity in the census plot. We needed more maps.

8. MIXED UPLAND BROADLEAF FOREST

BOSQUE MIXTO DE HOJA ANCHA DE ALTURAS

MARY E. D'IMPERIO
4000 Cathedral Ave. NW, #106
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; 44 yr. **Size:** 14.2 ha. **Description of Plot:** See Aud. Field Notes 14:502–503 (1960). Construction of the Field School in the SW corner outside the plot was completed. So far, there is no major impact on the plot other than the

clearing of bordering trees and the partial destruction of the trail at the edge of the plot there. **Weather:** Mean start temp., 14.5°C (range 2–24°C). Fifteen days were clear, three were partly cloudy, and five were cloudy. There was occasional rain or drizzle during three visits. **Coverage:** 45.0 h; 23 visits (0 sunrise, 0 sunset); 28, 30 Mar; 4, 6, 10, 12, 18, 21, 24, 26 Apr; 2, 4, 7, 10, 12, 14, 16 May; 10, 16, 19, 26 Jun; 2, 9 Jul. **Census:** Carolina Wren, 30.0 (85; 5FL); Northern Cardinal, 18.0 (51; 1FL); Red-bellied Woodpecker, 12.0 (34; 1N); Gray Catbird, 12.0 (1FL); Red-eyed Vireo, 11.0 (31); Carolina Chickadee, 11.0; White-breasted Nuthatch, 11.0 (1N); Veery, 8.0 (23); Downy Woodpecker, 7.0 (20; 1N); American Crow, 7.0 (2N,12FL); Tufted Titmouse, 6.0 (17; 7FL); Wood Thrush, 6.0; Northern Flicker, 5.0 (14; 1N,6FL); Eastern Wood-Pewee, 5.0; American Robin, 4.5 (13; 10FL); Acadian Flycatcher, 4.0 (11); Hairy Woodpecker, 3.0 (8); Blue Jay, 3.0 (5FL); Blue-gray Gnatcatcher, 3.0; Eastern Towhee, 3.0 (2FL); Common Grackle, 3.0 (3FL); Pileated Woodpecker, 2.0 (1N); Song Sparrow, 2.0; Mourning Dove, 1.0; House Wren, 1.0; European Starling, 1.0 (1N,4FL); House Finch, 1.0; House Sparrow, 1.0 (1N,4FL); Red-shouldered Hawk, 0.5; Chimney Swift, 0.5. **Total:** 30 species; 182.5 territories (514/40 ha). **Visitors:** Turkey Vulture, Ring-billed Gull, Great Crested Flycatcher, Yellow Warbler, American Redstart, Ovenbird, Common Yellowthroat, Scarlet Tanager, American Goldfinch. **Remarks:** The number of deer continues very high with heavily used deer trails. There are occasional large horse parties (10 riders at one sighting), apparently park police training classes, on trails not intended for riding. Lots of trail bikes and dogs off leash. The woods and trails take a very heavy beating in this dense urban area.

9. WHITE OAK SAVANNAH
SAVANA DE ROBLE BLANCO

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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; 8 yr. **Size:** 10.4 ha. **Description of Plot:** See J. Field Ornithol. 65 (Suppl.):60–61 (1994). Large numbers of dead white oaks (the plot's dominant species) and smaller trees and shrubs may have significantly reduced the plot's attractiveness to breeding birds. Severe dryness in late spring and early summer affected much of the plot's ground cover. **Weather:** Mean start temp., 20.4°C (range 10–33°C). Temperatures were 3°C below the 30-year (1971-2000) norm in May but at the norm overall for the three-month study period. Precipitation was 29% above the norm in May and 44% below the norm for June and July combined. Source: Environment Canada. **Coverage:** 16.5 h; 8 visits (4 sunset); 18 May; 3, 6, 17, 18 Jun; 2, 5, 16 Jul. **Census:** Chestnut-sided Warbler, 7.0 (27); Chipping Sparrow, 7.0; Field Sparrow, 6.0 (23); Red-eyed Vireo, 5.0 (19); American Robin, 5.0; Common Yellowthroat, 5.0; Eastern Towhee, 5.0; Brown Thrasher, 3.0; Hermit Thrush, 2.0; Yellow-rumped Warbler, 2.0; Song Sparrow, 2.0; Black-billed Cuckoo, 1.0; Least Flycatcher, 1.0; Great Crested Flycatcher, 1.0; Eastern Bluebird, 1.0; Black-and-white Warbler, 1.0; American Redstart, 1.0; Ovenbird, 1.0; Vesper Sparrow, 1.0. **Total:** 19 species; 57.0 territories (219/40 ha). **Visitors:** Turkey Vulture, Great Horned Owl, Common Nighthawk, Yellow-bellied Sapsucker, Hairy Woodpecker, Northern Flicker, Eastern Kingbird, Blue Jay, Black-capped Chickadee, Red-breasted Nuthatch, Veery, Gray Catbird, Cedar Waxwing, Yellow Warbler, Pine Warbler, Red-winged Blackbird, Baltimore Oriole, American Goldfinch. **Remarks:** A very wet and somewhat cool early-to-mid spring, similar to the last study year (2000), led to near identical results. Much of the habitat is pioneer (lichen, mosses, and grasses) and fragile; unfriendly weather in recent years may have reduced the plot to a low level of resource production for breeding birds. Particularly worrisome on this and other plots is the recent sharp decline in breeding flycatchers. Other serious declines were found in Song Sparrow (down from 14.0 breeding pairs in 1993 to 2.0 pairs this year), Field Sparrow (down from 12.0 to 6.0), and Vesper Sparrow (down from 4.0 to 1.0). Upon visual inspection, a singing apparent Yellow-billed Cuckoo was found to be a Black-billed Cuckoo, a phenomenon not uncommon in this and other parts of Ontario in recent years.

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

LINDA INGRAM
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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; 10 yr. **Size:** 11.3 ha. **Description of Plot:** See J. Field Ornithol. 65 (Suppl.):61 (1994). **Weather:** Mean start temp., 15.2°C (range 4–28°C). There was some precipitation during one visit. It was very dry with winds calm to variable. Normal May temperatures: mean 16.7°C, minimum 11.1°C, maximum 22.2°C. Source: National Climatic Data Center, Asheville, NC (2000). **Coverage:** 25.7 h; 13 visits (13 sunrise, 0 sunset); 1, 7, 8, 19, 20, 26, 28, 29 May; 2, 8, 11, 13, 20 Jun. **Census:** Wood Thrush, 9.0

(32); Ovenbird, 5.5 (19); Red-eyed Vireo, 5.0 (18); Blue Jay, 5.0 (1FL); Veery, 5.0; Red-bellied Woodpecker, 2.0; Eastern Wood-Pewee, 2.0; Tufted Titmouse, 2.0; Chipping Sparrow, 2.0; Northern Cardinal, 2.0; Hairy Woodpecker, 1.0; Pileated Woodpecker, 1.0; Great Crested Flycatcher, 1.0; Scarlet Tanager, 1.0; Rose-breasted Grosbeak, 1.0. **Total:** 15 species; 44.5 territories (158/40 ha). **Visitors:** Downy Woodpecker, White-breasted Nuthatch, Carolina Wren, Winter Wren, American Robin, Gray Catbird. **Remarks:** There is a crow roost outside the census area to the southwest. **Other Observers:** Richard Bonnett, Patricia Mangas, Barry Pounder, Phyllis Reynolds, David Reynolds, and Florence Fink. Acknowledgments: Edward Barrell.

11. HARDWOOD SWAMP FOREST
BOSQUE DE MADERAS DURAS PANTANOSO

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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; 12 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 brushiness is thinning slowly as understory trees grow up and shade the forest floor. Coarse woody debris is breaking down and rotting away, further opening up the forest floor. Plot vegetation was resurveyed in the summer of 1996 (unpublished). **Weather:** Mean start temp., 12.8°C (range 6–18°C). Temperatures were normal. This was the fourth year of an ongoing drought, and water levels were very low. **Coverage:** 13.0 h; 10 visits (10 sunrise); 30 Mar; 5, 13, 21, 26 Apr; 2, 10, 17, 18, 24 May. **Census:** Blue-gray Gnatcatcher, 25.0 (123); Northern Parula, 13.5 (67); Red-eyed Vireo, 10.0 (49); Tufted Titmouse, 8.5 (42); White-eyed Vireo, 6.5 (32); Acadian Flycatcher, 6.0 (30); Carolina Wren, 5.5 (27); Northern Cardinal, 5.5; Red-bellied Woodpecker, 3.5 (17); Hooded Warbler, 2.5; Yellow-billed Cuckoo, 2.0; Pileated Woodpecker, 2.0; Great Crested Flycatcher, 2.0; Prothonotary Warbler, 2.0; Downy Woodpecker, 1.0; Yellow-throated Warbler, 1.0; American Crow, 0.5; Swainson's Warbler, 0.5. **Total:** 18 species; 97.5 territories (481/40 ha). **Visitors:** Red-shouldered Hawk, Blue Jay, Fish Crow, Carolina Chickadee, White-breasted Nuthatch, Wood Thrush, Kentucky Warbler, Summer Tanager, Brown-headed Cowbird. Other Observer: Norman Brunswig.

12. UPLAND CHRISTMAS TREE FARM
FINCAS DE ARBOLES DE NAVIDAD DE ALTURAS

ELIZABETH W. BROOKS
1435 Waterwells Road
Alfred Station, NY 14803

Site Number: NY2483108. **Location:** New York, Allegany Co., Andover; Kent Christmas Tree Farm; 42°10'N, 77°50'W; Andover Quadrangle, USGS. **Continuity:** Established 1983; 20 consecutive years. **Size:** 10.7 ha. **Description of Plot:** See Am. Birds 38:91 (1984). **Weather:** Mean start temp., 19.1°C (range 11.1–27.8°C). June was hot and wet; July was hot and dry. Data collected at the Alfred Cooperative Weather Station indicated that average daily temperatures in June (15.9°C) and July (20.2°C) were both above average. The June precipitation total (9.53 cm) was about average, but July (5.6 cm) was below the 57-year mean. **Coverage:** 12.5 h; 11 visits (0 sunrise, 3 sunset); 8 Apr; 3, 12, 19, 27 Jun; 4, 11, 19, 27 Jul; 2, 9 Aug. **Census:** Chipping Sparrow, 21.5 (80; 2N,5FL); Song Sparrow, 20.0 (75; 3N,3FL); Cedar Waxwing, 10.0 (37; 1N); American Robin, 8.5 (32); Yellow-rumped Warbler, 5.0 (19; 1N); Purple Finch, 4.0 (15); Field Sparrow, 3.5 (13; 3N,6FL); American Woodcock, 2.0; Mourning Dove, 2.0; Magnolia Warbler, 2.0; Prairie Warbler, 2.0; American Goldfinch, 2.0; Brown Thrasher, 1.0; Common Yellowthroat, 1.0; Eastern Towhee, 1.0 (1N,3FL); Red-winged Blackbird, 1.0; Brown-headed Cowbird, 1.0; Vesper Sparrow, 0.5; Savannah Sparrow, 0.5; Bobolink, 0.5. **Total:** 20 species; 89.0 territories (333/40 ha). **Visitors:** Black-billed Cuckoo, Yellow-bellied Sapsucker, Black-capped Chickadee, Indigo Bunting, and Common Grackle. **Remarks:** The number of territories (89.0) was well above the mean (62.9). Magnolia Warbler was new to the study. Song Sparrow and American Robin were at the highest levels ever. Indigo Bunting was missing after being present in the previous seven years; Grasshopper Sparrow was missing after having been recorded in 15 of the past 18 years. No nests were found parasitized by cowbirds. Acknowledgments: Appreciation to Rick Walker for weather data and to Tom and Kathy Kent for their continued interest and permission to conduct the study on their land.

13. UPLAND SCOTCH PINE PLANTATION
PLANTACION DE PIÑO ESCOCES EN ALTURAS

ELIZABETH W. BROOKS
1435 Waterwells Road
Alfred Station, NY 14803

Site Number: NY2470024. **Location:** New York; Allegany Co., Alfred; Foster Plantation; 42°7'N, 77°45'W; Andover Quadrangle, USGS. **Continuity:** Established 1969; 34 consecutive years. **Size:** 9.3 ha.

Description of Plot: See Aud. Field Notes 23:743–744 (1969), Am. Birds 38:38 (1984), J. Field. Ornithol. 66 (Suppl.):69 (1995), and 1998 Upland Scotch Pine Plantation BBC (unpublished). **Weather:** Mean start temp., 19.6°C (range 11.1–26.7°C). For additional weather comments, see Upland Christmas Tree Farm BBC. **Coverage:** 8.4 h; 8 visits (1 sunrise, 4 sunset); 8 Apr; 4, 10, 17, 25 Jun; 9, 13, 20 Jul. **Census:** Yellow-rumped Warbler, 6.0 (26); Cedar Waxwing, 6.0; Common Yellowthroat, 5.0 (22); American Robin, 4.0 (17); Magnolia Warbler, 4.0; Golden-crowned Kinglet, 3.0 (13); White-throated Sparrow, 3.0; Blue-headed Vireo, 2.0; Blue Jay, 2.0; Black-capped Chickadee, 2.0; Black-throated Green Warbler, 2.0; Dark-eyed Junco, 2.0; Chestnut-sided Warbler, 1.5; Chipping Sparrow, 1.5; Ruffed Grouse, 1.0; Mourning Dove, 1.0; Red-breasted Nuthatch, 1.0; Veery, 1.0; Wood Thrush, 1.0; Gray Catbird, 1.0; Ovenbird, 1.0; Canada Warbler, 1.0; Eastern Towhee, 1.0; Song Sparrow, 1.0; Brown-headed Cowbird, 1.0; Purple Finch, 1.0; American Goldfinch, 1.0; House Wren, 0.5; Blue-winged Warbler, 0.5; Blackburnian Warbler, 0.5. **Total:** 30 species; 58.5 territories (252/40 ha). **Visitors:** Yellow-bellied Sapsucker, Northern Flicker, Pileated Woodpecker, Brown Thrasher, Field Sparrow, and Indigo Bunting. **Remarks:** Veery and Canada Warbler were new species. Indigo Bunting was missing for the first time since 1976; Nashville Warbler was missing again after being reported for 18 of the past 22 years. White-throated Sparrow numbers were the highest ever. Acknowledgments: Appreciation to Cynthia Clements and Phil Foster for permission to conduct the study on their land and to Rick Walker for weather data.

14. HIGH ALTITUDE RED SPRUCE FOREST
BOSQUE DE ABETOS ROJOS DE ALTURAS

ALLAN TRENTLY
6319 Kingsport Highway, Apt. 88
Johnson City TN 37615

Site Number: TN2392093. **Location:** Tennessee; Unicoi Co.; Unicoi; Unaka Mountain; 36°8'N, 82°18'W; Unicoi Quadrangle, USGS. **Continuity:** Established 1992; 10 yr. **Size:** 9.9 ha. **Description of Plot:** See J. Field Ornithol. 64 (Suppl.):69–70 (1993). **Weather:** Mean start temp., 21.3°C (range 20–22°C). No visits were impaired by weather conditions. **Coverage:** 25.8 h; 9 visits (9 sunrise); 29 May; 4, 10, 18, 19, 25, 26, 30 Jun; 4 Jul. **Census:** Golden-crowned Kinglet, 13.0 (53); Dark-eyed Junco, 3.5 (14; 8FL); Blue-headed Vireo, 3.0 (12); Magnolia Warbler, 3.0; Red-breasted Nuthatch, 1.0; Veery, 1.0; American Robin, 1.0; Cedar Waxwing, 1.0; Yellow-rumped Warbler, 1.0 (1N); Eastern Towhee, 1.0. **Total:** 10 species; 28.5 territories (115/40 ha). **Visitors:** Hairy Woodpecker, Canada Warbler, Rose-breasted Grosbeak, Red Crossbill, Pine Siskin, American Goldfinch. **Remarks:** The first Yellow-rumped Warbler nest for Tennessee was found on 18 June. A pair of Yellow-rumped Warblers scolded me as I walked around the nest area on 18 June. The male and female were obviously agitated as I walked by their nest and through their territory. The female was constantly chipping and flying within five feet of me. The nest was placed about 7 m up in a red spruce tree on a horizontal branch. I climbed an adjacent tree on 4 July to check the contents of the nest; the nest was empty. The Yellow-rumped Warblers were still in the territory on this day, but no fledglings were ever found. Acknowledgments: I wish to acknowledge the USDA–Forest Service, Cherokee National Forest for their financial support.

15. CLIMAX HEMLOCK–WHITE PINE FOREST WITH TRANSITION HARDWOODS
BOSQUE CLIMAX DE PICEA–PIÑO 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; 36 yr. **Size:** 10.5 ha. **Description of Plot:** See Aud. Field Notes 19:594–595 (1965) and J. Field Ornithol. 67 (Suppl.):60 (1996). Regeneration and succession are occurring at a rapid pace in the blow-down areas. At least ten more mature trees have fallen down since August 2001. Hemlock wooly adelgid is now solidly established in the hemlock trees along Webster Road, and they are showing ill-effects. This bug could drastically change this forest. **Weather:** Mean start temp., 20.5°C (range 10–28°C). May was much colder and wetter than normal, including some snow that fell but did not stick on the 18th and seven nights with temperatures below 0°C. These conditions proved disastrous for most early-nesting birds. May had a total of 15.4 cm of rainfall, which is 4.7 cm above average. Nineteen days were wet this month. May's average temperature was 12°C, which is 2.2°C below normal. June's weather was much better for birds. Rainfall totaled 12.1 cm spread out over 12 days. This is about 2 cm more than average. June's mean temperature was 17.9°C, which is very close to average (18.5°C). July's total rainfall measured 10.7 cm, which is somewhat less than the average of 13 cm. Only six days had any rainfall. It was a hot month, with a mean temperature of 21.3°C, which is normal. Source: White Memorial Foundation weather station. **Coverage:** 23.0 h; 11 visits (1 sunrise, 2 sunset); 10, 17, 24 May; 3, 9, 18, 27 Jun; 1, 12, 22, 29 Jul. Maximum number of observers/visit, 3. **Census:** Black-throated Green Warbler, 16.5 (63; 4N,38FL); Ovenbird, 13.5 (51; 1N,24FL); Red-eyed Vireo, 13.0 (50; 20FL); Veery, 12.5

(48; 1N,21FL); Blackburnian Warbler, 11.5 (44; 2N,22FL); Hermit Thrush, 6.5 (25; 3N,18FL); Pine Warbler, 6.5 (3N,17FL); Black-capped Chickadee, 5.0 (19; 30FL); Black-and-white Warbler, 4.0 (15; 1N,9FL); Scarlet Tanager, 4.0 (7FL); Brown Creeper, 3.5 (13; 1N,8FL); Great Crested Flycatcher, 3.0 (11; 4FL); Wood Thrush, 3.0 (6FL); Yellow-rumped Warbler, 3.0 (1N,7FL); Eastern Wood-Pewee, 2.5 (4FL); Blue-headed Vireo, 2.5 (6FL); Tufted Titmouse, 2.5 (13FL); American Robin, 2.5 (1N,10FL); Blue Jay, 2.0 (2FL); Canada Warbler, 2.0; Yellow-bellied Sapsucker, 1.5 (1FL); Hairy Woodpecker, 1.5 (3FL); Pileated Woodpecker, 1.5 (1N,4FL); Purple Finch, 1.5; Wild Turkey, 1.0 (8FL); Mourning Dove, 1.0 (2FL); Red-breasted Nuthatch, 1.0 (3FL); Gray Catbird, 1.0 (2FL); Magnolia Warbler, 1.0; Brown-headed Cowbird, 1.0 (2FL); American Goldfinch, 1.0 (3FL); Broad-winged Hawk, 0.5 (3FL); Great Horned Owl, 0.5; Downy Woodpecker, 0.5; Eastern Phoebe, 0.5 (4FL); American Crow, 0.5 (3FL); White-breasted Nuthatch, 0.5 (4FL); Cedar Waxwing, 0.5 (3FL); American Redstart, 0.5; Northern Cardinal, 0.5; Barred Owl, +; Northern Flicker, +; Eastern Kingbird, +; Yellow-throated Vireo, +; Chipping Sparrow, +; Song Sparrow, +. **Total:** 46 species; 137.0 territories (522/40 ha). **Visitors:** Ruffed Grouse, Black-throated Blue Warbler, Rose-breasted Grosbeak. **Remarks:** The total of 46 species found this year was the second highest ever. The record high was 48, set in 1994. Species found on territory this year but not last year included Cedar Waxwing, Eastern Kingbird, Yellow-throated Vireo, Chipping Sparrow, and Song Sparrow. All of these were taking advantage of increased edge habitat created by blow-downs. Species found last year but not this year included Winter Wren, Common Grackle, Dark-eyed Junco, Blue-gray Gnatcatcher, and eastern Towhee. The number of territorial males found this year (137.0) was slightly less than the record-high of 141.0 found last year, but still far above the 10-year average of 120.0 territories. Improved habitat diversity and an abundant food supply continue to be the most likely reasons for this increased abundance of birds. Species which increased in number this year included Black-throated Green Warbler, Red-eyed Vireo, Blackburnian Warbler, Black-capped Chickadee, Black-and-white Warbler, Brown Creeper, and Tufted Titmouse. **Other Observers:** Eric Adam, John Eykelhoff, Kathy Hall, and Russ Naylor.

16. 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; 25 yr. **Size:** 8.5 ha. **Description of Plot:** See Am. Birds 33:72 (1979). **Weather:** Mean start temp., 19.9°C (range 9–26°C). May was much colder and wetter than normal, including some snow that fell but did not stick on the 18th and seven nights with temperatures below 0°C. These conditions proved disastrous for most early-nesting birds. May had a total of 15.4 cm of rainfall, which is 4.7 cm above average. Nineteen days were wet this month. May's average temperature was 12°C, which is 2.2°C below normal. June's weather was much better for birds. Rainfall totaled 12.1 cm spread out over 12 days. This is about 2 cm more than average. June's mean temperature was 17.9°C, which is very close to average (18.5°C). July's total rainfall measured 10.7 cm, which is somewhat less than the average of 13 cm. Only six days had any rainfall. It was a hot month, with a mean temperature of 21.3°C, which is normal. Source: White Memorial Foundation weather station. **Coverage:** 16.0 h; 9 visits (1 sunrise, 4 sunset); 10, 18, 30 May; 8, 20 Jun; 1, 12, 16, 25 Jul. **Census:** Ovenbird, 10.0 (47; 1N,16FL); Veery, 9.5 (45; 1N,15FL); Red-eyed Vireo, 9.0 (42; 10FL); Scarlet Tanager, 5.0 (24; 8FL); Wood Thrush, 4.5 (21; 1N,9FL); Hermit Thrush, 4.0 (19; 1N,11FL); American Robin, 3.5 (16; 1N,9FL); Black-capped Chickadee, 3.0 (14; 2N,15FL); American Redstart, 3.0 (8FL); Eastern Wood-Pewee, 2.5; Tufted Titmouse, 2.5 (15FL); Gray Catbird, 2.5 (3FL); Yellow-bellied Sapsucker, 2.0 (1N,4FL); Great Crested Flycatcher, 2.0 (3FL); Black-and-white Warbler, 2.0 (1N,3FL); Common Yellowthroat, 2.0 (4FL); Northern Cardinal, 2.0 (4FL); American Crow, 1.5 (1N,4FL); White-breasted Nuthatch, 1.5 (8FL); Blue-gray Gnatcatcher, 1.5 (2FL); Louisiana Waterthrush, 1.5 (3FL); Eastern Towhee, 1.5 (2FL); Wild Turkey, 1.0 (5FL); Barred Owl, 1.0 (3FL); Northern Flicker, 1.0; Eastern Phoebe, 1.0 (1N,4FL); Blue Jay, 1.0; Chestnut-sided Warbler, 1.0; Black-throated Blue Warbler, 1.0; American Goldfinch, 1.0; Ruffed Grouse, 0.5; Mourning Dove, 0.5; Ruby-throated Hummingbird, 0.5; Red-bellied Woodpecker, 0.5; Downy Woodpecker, 0.5; Hairy Woodpecker, 0.5; Pileated Woodpecker, 0.5; Eastern Kingbird, 0.5 (2FL); Blue-headed Vireo, 0.5; Cedar Waxwing, 0.5; Blue-winged Warbler, 0.5; Black-throated Green Warbler, 0.5; Rose-breasted Grosbeak, 0.5; Brown-headed Cowbird, 0.5 (1FL); Baltimore Oriole, 0.5; Purple Finch, 0.5; American Woodcock, +; Yellow-rumped Warbler, +; Blackburnian Warbler, +; Pine Warbler, +. **Total:** 50 species; 92.5 territories (435/40 ha). **Visitors:** Cooper's Hawk. **Remarks:** The number of breeding species reached a new record high this year. The previous record was 49 in 1992. Species found this year but not last year included Ruffed Grouse, Ruby-throated Hummingbird, Red-bellied Woodpecker, Eastern Kingbird, Cedar Waxwing, and Blue-winged Warbler. Species found last year but not

this year included Brown Creeper, Magnolia Warbler, Worm-eating warbler, and Chipping Sparrow. The number of territorial males found this year was 92.5. That's 1.5 more than were found last year, equal to the number found in 2000, and only 0.5 above the 10-year average. The most abundant species this year was Ovenbird. Veery was number one last year but dropped back to second place due to a decrease of 1.0 territory. The third most abundant species was Red-eyed Vireo, which held that position last year, too. In 1999 and 2000, Red-eyed Vireo was in the number one spot. This plot does have problems with trespassing by dirt bikers and ATV users. **Other Observers:** Elisa Schoelsohn, Russ Naylor, and Lukas Hyder.

17. 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; 6 yr. **Size:** 8.9 ha. **Description of Plot:** See 1997 BBC report (unpublished) and 2001 report (this volume). Blackwell Island has been scheduled for development into a day-use recreation area with boat launch, picnic area, and boardwalk for birdwatchers. Construction began this year with ground disturbance in anticipation of laying asphalt before next breeding season. **Weather:** Mean start temp., 8.8°C (range -2–14°C). The eight sunrise visits explain the lower starting temperatures than in past years. This was the third year out of the past six that the plot was flooded. The mosquito hatch after the water receded (by 18 June) provided a good food source for bird chicks. **Coverage:** 13.5 h; 8 visits (8 sunrise); 8, 14, 22, 29 May; 4, 11, 18, 24 Jun. **Census:** Tree Swallow, 6.0 (27; 6N); American Robin, 5.5 (25); Yellow Warbler, 4.5 (20); Song Sparrow, 4.5; Red-winged Blackbird, 4.0 (18); Cedar Waxwing, 3.0 (13); Canada Goose, 2.0 (2N,10FL); Mallard, 2.0 (2N,6FL); Spotted Sandpiper, 2.0 (1N,1FL); Calliope Hummingbird, 2.0; Gray Catbird, 2.0; European Starling, 2.0; California Quail, 1.0; Killdeer, 1.0 (1N); Hairy Woodpecker, 1.0; Northern Flicker, 1.0 (1N); Willow Flycatcher, 1.0; Violet-green Swallow, 1.0; Black-capped Chickadee, 1.0; Yellow-rumped Warbler, 1.0; Chipping Sparrow, 1.0; Black-headed Grosbeak, 1.0; Brown-headed Cowbird, 1.0; Bullock's Oriole, 1.0; House Finch, 1.0. **Total:** 25 species; 52.5 territories (236/40 ha). **Visitors:** Wood Duck, Blue-winged Teal, Bufflehead, Ruffed Grouse, Great Blue Heron, Osprey, Bald Eagle, Ring-billed Gull, Warbling Vireo, American Crow, Common Raven, Red-breasted Nuthatch, Pygmy Nuthatch, American Redstart, Spotted Towhee, White-crowned Sparrow, Dark-eyed Junco, Brewer's Blackbird, Pine Siskin, American Goldfinch. **Remarks:** Artificial nest boxes were established years ago. Tree Swallows, European Starlings, and Northern Flickers have continually occupied these nest boxes in place of Wood Ducks.

18. UPLAND MIXED PINE–SPRUCE–HARDWOOD PLANTATION
PLANTACION MIXTA DE PIÑO–ABETO–MADERAS DURAS EN ALTURAS

ELIZABETH W. BROOKS
1435 Waterwells Road
Alfred Station, NY 14803

Site Number: NY2474107. **Location:** New York; Allegany Co., Ward; Phillips Creek State Reforestation Tract; 42°8'N, 77°45'W; Andover Quadrangle, USGS. **Continuity:** Established 1974; 29 consecutive years. **Size:** 16.6 ha. **Description of Plot:** See Am. Birds 28:699–700 (1974), J. Field Ornithol. 63 (Suppl.):79–80 (1992), and 66 (Suppl.):79–80 (1995). **Weather:** Mean start temp., 20.8°C (range 14.4–26.7°C). See Upland Christmas Tree Farm BBC for additional weather comments. **Coverage:** 10.9 h; 9 visits (1 sunrise, 3 sunset); 24 Apr; 26 May; 2, 9, 16, 23, 30 Jun; 7, 13 Jul. **Census:** Magnolia Warbler, 12.0 (29); Blackburnian Warbler, 9.0 (22); Golden-crowned Kinglet, 8.0 (19); Dark-eyed Junco, 8.0; Yellow-rumped Warbler, 6.0 (14); Black-throated Green Warbler, 5.0 (12); Blue-headed Vireo, 3.0 (7); Black-capped Chickadee, 3.0; Red-breasted Nuthatch, 3.0; Brown Creeper, 3.0; American Robin, 3.0; Ovenbird, 2.5; Chipping Sparrow, 2.5; Blue Jay, 2.0; Mourning Warbler, 2.0; Common Yellowthroat, 2.0; Purple Finch, 2.0; Wild Turkey, 1.0; Mourning Dove, 1.0; Downy Woodpecker, 1.0; Great Crested Flycatcher, 1.0; Winter Wren, 1.0; Hermit Thrush, 1.0; Wood Thrush. 1.0; Cedar Waxwing, 1.0; Song Sparrow, 1.0; White-throated Sparrow, 1.0; Hairy Woodpecker, 0.5; Red-eyed Vireo, 0.5; American Crow, 0.5; Common Raven, 0.5; Chestnut-sided Warbler, 0.5. **Total:** 32 species; 88.5 territories (213/40 ha). **Visitors:** Broad-winged Hawk, Belted Kingfisher, Eastern Wood-Pewee, Canada Warbler, and Indigo Bunting. **Remarks:** Total territories (88.5) was slightly above the 28-year average (85.1). Broad-winged Hawk was missing after being recorded on 12 of the past 15 counts. Brown-headed Cowbird was missing for only the sixth time since 1974, and Indigo Bunting was missing for only the third time. Selective harvesting of red pine in a 4.9 ha section of the plot during the breeding season has created a large opening of briars and downed treetops. Black-throated Green Warbler totals continue to decline. Acknowledgments: Appreciation to Rick Walker and Dennis Smith for weather data.

19. PITCH PINE–SLABROCK
AREA DE PIÑO RESINA

LYNN BOWDERY, LIN FAGAN, TOM SARRO AND ALLAN BOWDERY
Daniel Smiley Research Center
Mohonk Lake, 1000 Mountain Rest Road
New Paltz NY 12561

Site Number: NY1392063. **Location:** New York; Ulster Co.; Gardiner; The Near Trapps; 41°44'N, 74°12'W; Gardiner Quadrangle, USGS. **Continuity:** Established 1992; 3 yr. **Size:** 15.8 ha. **Description of Plot:** See J. Field Ornithol. 64 (Suppl.):86–87 (1993). The canopy height range is now 3–12 m, and huckleberry is now one of the dominant ground cover plants. **Weather:** Mean start temp., 15.1°C (range 3–25°C). The average temperature for May was 13.8°C (0.7°C below the long-term average), and the precipitation was 12.1 cm (1.3 cm above the long-term average). The average temperature for June was 20.6°C (1.7°C above the long-term average), and the precipitation was 15.8 cm (5.8 cm above the long-term average). Source: Mohonk Lake Cooperative Weather Station. **Coverage:** 27.6 h; 13 visits (12 sunrise, 1 sunset); 16, 20, 23, 27, 30 May; 3, 10, 13, 18, 20, 24, 27 Jun; 1 Jul. Maximum number of observers/visit, 6. **Census:** Chipping Sparrow, 10.0 (25; 1N,3FL); Eastern Towhee, 6.0 (15); Indigo Bunting, 6.0; Black-and-white Warbler, 5.5 (14); Prairie Warbler, 4.0 (10); Mourning Dove, 2.0; Great Crested Flycatcher, 2.0; Black-capped Chickadee, 2.0; American Robin, 2.0; Cedar Waxwing, 2.0; Pine Warbler, 2.0; American Goldfinch, 2.0; Red-eyed Vireo, 1.5; Scarlet Tanager, 1.5; Eastern Phoebe, 1.0; Blue Jay, 1.0 (3FL); American Redstart, 1.0; Dark-eyed Junco, 1.0; Tufted Titmouse, 0.5; Common Yellowthroat, 0.5; Northern Cardinal, 0.5; Downy Woodpecker, +; Northern Flicker, +; Eastern Wood-Pewee, +; Blue-headed Vireo, +; Eastern Bluebird, +; Wood Thrush, +; Ovenbird, +. **Total:** 28 species; 54.0 territories (137/40 ha). **Visitors:** Yellow-billed Cuckoo, Ruby-throated Hummingbird, Red-bellied Woodpecker, Hairy Woodpecker, Pileated Woodpecker, Yellow-throated Vireo, White-breasted Nuthatch, Winter Wren, Gray Catbird, Chestnut-sided Warbler, Yellow-rumped Warbler, Black-throated Green Warbler, Worm-eating Warbler, Rose-breasted Grosbeak, Red-winged Blackbird, Baltimore Oriole. **Remarks:** Territorial species present in 1997 (last census) but missing this year: Hermit Thrush, Brown-headed Cowbird, Purple Finch, and Black-throated Blue Warbler. Territorial species present this year but missing in 1997: Northern Cardinal and Eastern Bluebird. **Other Observers:** Ruth Elwell, Barbara Rubin, John Thompson, Jill Crispell, and Mary Edwards-Ransom. Acknowledgments: Thanks for the cooperation of the Mohonk Preserve.

20. FIELD, RIDGE, SHRUBBY TREES, AND WOODS
CAMPOS, COLINAS, ARBUSTOS Y BOSQUES

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101 Governor's Road, #708
Dundas ON L9H 6L7

Location: Ontario; Municipality of Hamilton-Wentworth; Dundas; Dundas Valley Plot #1; 43°15'N, 79°54'W. **Continuity:** Established 1994; 9 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 10.0–24.0°C). Temperatures were 3° below the 30-yr norm (1971–2000) in May and at the norm in June. Precipitation levels were 9% below the norm for May and June combined. Source: Environment Canada. **Coverage:** 13.5 h; 8 visits (0 sunrise, 3 sunset); 1, 15, 25, 28 May; 13, 23, 24, 28 Jun. **Census:** Yellow Warbler, 34.0 (234); Gray Catbird, 28.0 (193); Northern Cardinal, 8.0 (55); Song Sparrow, 7.0 (48); Field Sparrow, 6.0 (41); Blue-winged Warbler, 5.0 (34); Indigo Bunting, 4.0 (28); Baltimore Oriole, 4.0; American Goldfinch, 4.0; American Robin, 3.0 (21); Blue Jay, 2.0; Black-capped Chickadee, 2.0; Common Grackle, 2.0; Northern Flicker, 1.0; House Wren, 1.0; Cedar Waxwing, 1.0; Eastern Towhee, 1.0; Rose-breasted Grosbeak, 1.0; Brown-headed Cowbird, 1.0. **Total:** 19 species; 115.0 territories (793/40 ha). **Visitors:** Ruby-throated Hummingbird, Hairy Woodpecker, Great Crested Flycatcher, Warbling Vireo, American Crow, Brown Thrasher, Common Yellowthroat. **Remarks:** Total breeding territories (115.0: 10% below the 9-yr average) was the second lowest noted on this revised plot. The 19 breeding species was at the mean. Below normal spring temperatures and rainfall and a late May full leafing-out (last two years were early May) likely contributed to the low breeding numbers. The top three breeding species over nine years (Yellow Warbler, Gray Catbird, and Song Sparrow) accounted for 60% of the total, although the 7.0 territorial Song Sparrows was 5.0 below average, possibly owing to vegetative succession. Succession and weather factors may have favored the larger species. Mimids and thrushes held their own, while the 7.0 icterid territories was the most in six years. No flycatchers have bred for the past two years.

21. DESERT RIPARIAN–FRESHWATER MARSH
DESIERTO RIVEREÑO–PANTANO

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Location: California; San Bernardino Co.; Morongo Valley; Big Morongo Wildlife Reserve; 34°3'N,

116°35'W; Morongo Valley Quadrangle, USGS. **Continuity:** Established 1977; 25 yr. **Size:** 15.4 ha. **Description of Plot:** See J. Field Ornithol. 62 (Suppl.):76 (1991), 64 (Suppl.):92–93 (1993), and 65 (Suppl.):106–107 (1994). **Weather:** Mean start temp., 12.8°C (range 8–18°C). **Coverage:** 25.5 h; 8 visits (8 sunrise); 15, 23, 30 Apr; 6, 14, 21, 30 May; 6 Jun. **Census:** Bewick's Wren, 16.0 (42; 2FL); House Finch, 11.0 (29; 4N); House Wren, 10.0 (26; 2N); Song Sparrow, 9.0 (23); Lesser Goldfinch, 8.0 (21); Spotted Towhee, 7.0 (18); Common Yellowthroat, 6.0 (16; 1N); Brown-headed Cowbird, 6.0; Nuttall's Woodpecker, 3.0 (8; 1N,1FL); Brown-crested Flycatcher, 3.0 (1N); Verdin, 3.0; Yellow-breasted Chat, 3.0; Virginia Rail, 2.0; Mourning Dove, 2.0; Anna's Hummingbird, 2.0 (1N); Bushtit, 2.0; California Towhee, 2.0 (1N); Gambel's Quail, 1.0; Ladder-backed Woodpecker, 1.0; Black Phoebe, 1.0 (1N); Ash-throated Flycatcher, 1.0; Western Scrub-Jay, 1.0; Western Bluebird, 1.0 (1N); California Thrasher, 1.0; Phainopepla, 1.0 (1N); Yellow Warbler, 1.0; Summer Tanager, 1.0; Blue Grosbeak, 1.0; Hooded Oriole, 1.0. **Total:** 29 species; 107.0 territories (278/40 ha). **Visitors:** American Kestrel, White-winged Dove, Black-chinned Hummingbird, Costa's Hummingbird, Say's Phoebe, Cassin's Kingbird, Western Kingbird, Bell's Vireo, Hutton's Vireo, Common Raven, Cactus Wren, European Starling, Black-headed Grosbeak, Scott's Oriole, Lawrence's Goldfinch. **Remarks:** The 29 species on 107 territories was down from 31 species and 168 territories last year. The 107 territories was the lowest since the fire of 1992 (79 territories). This was the driest year on record in southern California during the past 100 years of record keeping. In most areas (other bird surveys), very few birds fledged young. There was very little evidence that breeding pairs on this plot fledged young this year. Brown-crested Flycatchers were observed feeding on hummingbirds at feeders, and Summer Tanagers were feeding at suet feeders, indicating a scarcity of natural food. House Finches and other species spent much time at feeders. The pair of Cooper's Hawks failed to fledge young. **Other Observers:** Dori Myers, Alice Ashbaugh, and Dee Zeller. Acknowledgments: San Bernardino County Museum, San Bernardino Valley Audubon Society, and Bureau of Land Management.

22. 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; 36 yr. **Size:** 8.1 ha. **Description of Plot:** See Aud. Field Notes 19:625–627 (1965). Succession is continuing at a rapid pace despite frequent flooding events. Shrubs now dominate this entire wetland, and pole-size red maple trees dominate the northern one-third of the plot. The amount of sedge hummocks and other herbaceous vegetation is now greatly reduced. Most of the large black willow trees near the mouth of the Bantam River have enough dead sections that they now are providing an excellent microhabitat for cavity nesters. **Weather:** Mean start temp., 22.5°C (range 9–30°C). May was much colder and wetter than normal, including some snow that fell but did not stick on the 18th and seven nights with temperatures below 0°C. These conditions proved disastrous for most early-nesting birds. May had a total of 15.4 cm of rainfall, which is 4.7 cm above average. Nineteen days were wet this month. May's average temperature was 12°C, which is 2.2°C below normal. June's weather was much better for birds. Rainfall totaled 12.1 cm spread out over 12 days. This is about 2 cm more than average. June's mean temperature was 17.9°C, which is very close to average (18.5°C). July's total rainfall measured 10.7 cm, which is somewhat less than the average of 13 cm. Only six days had any rainfall. It was a hot month, with a mean temperature of 21.3°C, which is normal. Source: White Memorial Foundation weather station. **Coverage:** 25.0 h; 12 visits (1 sunrise, 3 sunset); 5, 14, 20, 31 May; 4, 10, 17, 24 Jun; 2, 8, 15, 22 Jul. **Census:** Red-winged Blackbird, 38.0 (188; 3N,87FL); Swamp Sparrow, 35.0 (173; 64FL); Yellow Warbler, 31.0 (153; 6N,61FL); Common Yellowthroat, 21.0 (104; 3N,35FL); Gray Catbird, 16.0 (79; 4N,36FL); Common Grackle, 8.5 (42; 5N,20FL); Song Sparrow, 8.0 (40; 2N,20FL); American Goldfinch, 6.0 (30; 3N,10FL); Cedar Waxwing, 3.5 (17; 8FL); Willow Flycatcher, 3.0 (15; 1N,5FL); Least Flycatcher, 3.0 (1N,6FL); Eastern Kingbird, 3.0 (2N,8FL); Warbling Vireo, 3.0 (2N,8FL); Tree Swallow, 3.0 (2N,11FL); Alder Flycatcher, 2.5 (1N,5FL); Black-capped Chickadee, 2.5 (2N,13FL); Veery, 2.5 (4FL); Chestnut-sided Warbler, 2.5 (1N,5FL); Baltimore Oriole, 2.5 (1N,5FL); American Robin, 2.0 (2N,8FL); Northern Waterthrush, 2.0; Mallard, 1.5 (1N,8FL); Downy Woodpecker, 1.5 (1N,3FL); Northern Flicker, 1.5 (1N,3FL); Great Crested Flycatcher, 1.5 (1N,3FL); Blue-gray Gnatcatcher, 1.5 (2FL); Black-and-white Warbler, 1.5 (1N,5FL); Northern Cardinal, 1.5 (4FL); Great Blue Heron, 1.0; Spotted Sandpiper, 1.0; Mourning Dove, 1.0; Hairy Woodpecker, 1.0 (1N,3FL); Tufted Titmouse, 1.0 (7FL); Marsh Wren, 1.0; American Redstart, 1.0; Canada Goose, 0.5; Mute Swan, 0.5; Wood Duck, 0.5 (3FL); Red-bellied Woodpecker, 0.5; Yellow-throated Vireo, 0.5; Red-eyed Vireo, 0.5; White-breasted Nuthatch, 0.5; Brown-headed Cowbird, 0.5; Common Merganser, +; Virginia Rail, +; American Woodcock, +. **Total:** 46 species; 220.0 territories

(1086/40 ha). **Visitors:** Pileated Woodpecker. **Remarks:** Continued vegetational succession has created enough habitat diversity in this plot to make 2002 another record-breaking year for both number of species and territories. This year, 46 species were found, compared to 43 last year, 40 in 2000, and a 10-year average of 33.6. This is a continuation of a significant, steady increase which began in 1997. The 220.0 territorial males found this year shattered the old record of 196, set in 1981 and again in 2000. Last year, 191.0 were found, and the 10-year average was 167. Most of the increases this year occurred among shrub-nesting species (or among species that might ordinarily nest on the ground or among herbaceous vegetation but have switched to shrubs for nest sites). Species increasing the most included Red-winged Blackbird, Swamp Sparrow, Yellow Warbler, Common Yellowthroat, and American Goldfinch. Only ten species declined in number. **Other Observers:** Eric Adam and John Eykelhoff.

23. 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; 28 yr. **Size:** 8.1 ha. **Description of Plot:** See Am. Birds 25:1003–1004 (1971). **Weather:** Mean start temp., 13°C (range 4–26°C). **Coverage:** 203.7 h; 70 visits (36 sunrise, 20 sunset). **Census:** Bewick's Wren, 8.0 (40); Wrentit, 8.0; Spotted Towhee, 8.0; Orange-crowned Warbler, 4.5 (22); Wilson's Warbler, 4.0 (20); Purple Finch, 3.0 (15); Allen's Hummingbird, 2.0; Bushtit, 2.0; White-crowned Sparrow, 2.0; Anna's Hummingbird, 1.5; Song Sparrow, 1.5; California Quail, 1.0; Western Scrub-Jay, 1.0; Chestnut-backed Chickadee, 1.0; Northern Flicker, 0.5; Red-tailed Hawk, +; Mourning Dove, +; Hutton's Vireo, +; Steller's Jay, +; Swainson's Thrush, +; American Robin, +; California Towhee, +. **Total:** 22 species; 48.0 territories (237/40 ha). **Visitors:** None reported. **Remarks:** Species holding at least a partial territory on the plot that were not recorded last year include Hutton's Vireo, Swainson's Thrush, Anna's Hummingbird, and California Towhee. Species showing a marked increase include Bewick's Wren (from 2.5 to 8.0 territories) and Orange-crowned Warbler (from 0.5 to 4.5). Cover of trees (firs) and shrubs continues to increase and is likely responsible for some changes in bird numbers and community composition. **Other Observers:** Geoff Geupel, Grant Ballard, Roy Churchwell, Tom Gardali, Mary Chase, and Blaine MacDonald. Acknowledgments: We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1520.

24. 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; 28 yr. **Size:** 4.7 ha. **Description of Plot:** See Am. Birds 26:987–988 (1972). **Weather:** Mean start temp., 13°C (range 4–26°C). **Coverage:** 176.9 h; 70 visits (43 sunrise, 0 sunset). **Census:** Wrentit, 4.5 (38; 6N,11FL); Song Sparrow, 3.0 (26; 3N,6FL); Anna's Hummingbird, 2.5; Bushtit, 2.5 (1N); Bewick's Wren, 2.5; Orange-crowned Warbler, 2.0; Spotted Towhee, 2.0 (2N,2FL); California Quail, 1.0 (1N,>4FL); Allen's Hummingbird, 1.0; Wilson's Warbler, 1.0 (1N); Brown-headed Cowbird, 1.0; American Goldfinch, 1.0 (1N,4FL); Mourning Dove, 0.5; Western Scrub-Jay, 0.5; American Robin, 0.5 (1N,2FL); Purple Finch, 0.5; Red-tailed Hawk, +; Northern Flicker, +; Pacific-slope Flycatcher, +; Hutton's Vireo, +; Chestnut-backed Chickadee, +; Golden-crowned Kinglet, +; Swainson's Thrush, +; California Towhee, +; White-crowned Sparrow, +. **Total:** 25 species; 26.0 territories (221/40 ha). **Visitors:** Sharp-shinned Hawk, Cooper's Hawk, American Kestrel, Downy Woodpecker, Olive-sided Flycatcher, Steller's Jay, Red-breasted Nuthatch, Winter Wren, Hermit Thrush, European Starling, Dark-eyed Junco, Black-headed Grosbeak, Red-winged Blackbird, Brewer's Blackbird, Pine Siskin. **Remarks:** Cover of trees (firs) and shrubs continues to increase. **Other Observers:** Geoff Geupel, Grant Ballard, Roy Churchwell, Emily Morrison, Christopher Berner, and Mary Chase. Acknowledgments: We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1519.

25. 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; 28 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., 13°C (range 4–26°C). **Coverage:**

265.2 h; 93 visits (67 sunrise, 0 sunset). **Census:** Wrentit, 11.0 (54); Song Sparrow, 9.0 (44); American Goldfinch, 6.0 (30); Orange-crowned Warbler, 4.0 (20); Anna's Hummingbird, 3.0 (15); Chestnut-backed Chickadee, 3.0; Bushtit, 3.0; Swainson's Thrush, 3.0; Allen's Hummingbird, 2.5; Bewick's Wren, 2.5; Spotted Towhee, 2.5; Purple Finch, 2.5; Wilson's Warbler, 2.0; Western Scrub-Jay, 1.5; American Robin, 1.5; Brown-headed Cowbird, 1.5; White-crowned Sparrow, 1.0; Mourning Dove, 0.5; Northern Flicker, 0.5; Red-tailed Hawk, +; Hutton's Vireo, +. **Total:** 21 species; 60.5 territories (299/40 ha). **Visitors:** None reported. **Remarks:** Cover of trees (firs) and shrubs continues to increase. **Other Observers:** Geoff Geupel, Mary Chase, Grant Ballard, Sacha Heath, Roy Churchwell, and Tom Gardali. Acknowledgments: We thank Point Reyes National Seashore for their cooperation. This is PRBO contribution No. 1521.

Bird Populations 7:128-135

AN ANNOTATED BIBLIOGRAPHY OF BREEDING BIRD CENSUS PUBLICATIONS[1]

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Abstract. Listed here are nearly 200 publications relating to the Breeding Bird Census (BBC) program started by the National Audubon Society in 1937 and administered by various organizations over the years following. It is as complete as possible; any omissions are by mistake. The author requests that such omissions be brought to his attention for future updates to this document.

UNA BIBLIOGRAFÍA ANOTADA DE PUBLICACIONES DEL CENSO DE AVES REPRODUCTORAS

Resumen. Se enlistan casi 200 publicaciones relacionadas con el programa de Censos de Aves Reproductoras" (BBC por sus siglas en inglés), el cual fue iniciado por la Sociedad Nacional de Audubon de los Estados Unidos en 1937 y administrado por varias organizaciones a través los años subsiguientes. Es lo más completa posible; cualquier omisión es por error. El autor solicita que tales omisiones le sean reportadas para una futura actualización del documento.

INTRODUCTION

A multitude of studies have used the spot-mapping census method employed by the BBC program. They are not all listed here. Rather, only those publications that relate directly to the BBC program are included, except for a rare few like Williams (1936). The publications listed here include instructions and methodologies, raw data reports, summaries and analyses of the data, reviews and critiques of the program, and popular articles about conducting BBCs. Reflected in this bibliography is the rich history of the BBC program.

ACKNOWLEDGEMENTS

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PUBLICATIONS

ALDRICH, J. W., AND R. W. COFFIN. 1980. Breeding bird populations from forest to suburbia after thirty-seven years. American Birds 34:3-7. [Comparison of 1942 and 1979 data from one plot in Virginia.]

ANDERSON, S. H. 1979. Habitat assessment for breeding bird populations. Transactions of the 44th North American Wildlife and Natural Resources Conference. Pp. 431-445. [Review of various studies including the BBC and the James and Shugart (1970) method.]

ANONYMOUS. 1937. Bird-Lore's first Breeding-Bird Census. Bird Lore 39(2):147-150. [Original announcement of the BBC program with instructions.]

[1]Received: 23 November 2006. Revision accepted: 24 November 2006.

ARBIB, JR., R. S. 1970. Editorial note. Audubon Field Notes 24(6):736. [Call for participation in the BBC program.]

ASKINS, R. A., J. F. LYNCH, AND R. GREENBERG. 1990. Population declines in migratory birds in eastern North America. Pages 1-57 *in* Current Ornithology, vol. 7. (D. M. Power, Ed.). Plenum, New York. [Analysis of data from many long-term BBCs.]

BARBER, D. 2004. Breeding Bird Census. Hawk Mountain Sanctuary web site. http://www.Hawkmountain.Org/sanctuary/images/Breeding%20Bird%20Census.Pdf [BBC report from Hawk Mountain Sanctuary.]

BERTIN, R. I. 1977. Breeding habitats of the Wood Thrush and Veery. The Condor 79:303-311. [One of two study sites was a BBC plot.]

BOND, G. M. 1952. Sixteenth Breeding-Bird Census. Audubon Field Notes 6(6):303-324. [Data from 38 BBCs.]

BOND, G. M. 1953. Seventeenth Breeding-Bird Census. Audubon Field Notes 7(6):335-360. [Data from 44 BBCs.]

BOND, G. M. 1954. Eighteenth Breeding-Bird Census. Audubon Field Notes 8(6):363-384. [Data from 40 BBCs.]

BOND, G. M. 1955. Nineteenth Breeding-Bird Census. Audubon Field Notes 9(6):407-432. [Data from 39 BBCs.]

BOND, G. M. 1956. Twentieth Breeding-Bird Census. Audubon Field Notes 10(6):415-436. [Data from 40 BBCs.]

BOND, G. M. 1957. Twenty-first Breeding-Bird Census. Audubon Field Notes 11(6):435-458. [Data from 35 BBCs.]

BOND, G. M. 1958. Twenty-second Breeding-Bird Census. Audubon Field Notes 12(6):443-461. [Data from 34 BBCs.]

BOND, G. M. 1959. Twenty-third Breeding-Bird Census. Audubon Field Notes 13(6):459-480. [Data from 38 BBCs.]

BOTTORFF, R. L. 1974. Cottonwood habitat for birds in Colorado. American Birds 28(6):975-979. [Review and synthesis of eight BBCs.]

BRECKENRIDGE, W. J. 1955. Comparison of the breeding-bird populations of two neighboring but distinct forest habitats. Audubon Field Notes 9(6):408-412. [Analysis of four and six years of data from two BBC plots.]

BREWER, R. 1963. Ecological and reproductive relationships of Black-capped and Carolina Chickadees. Auk 80:9-47. [Used published BBC data to compare densities in different forest types.]

BREWER, R. 1963. Stability in bird populations. Occasional Papers of the C. C. Adams Center for Ecological Studies, No. 7. Western Michigan University, Kalamazoo. [Analysis of seven to 18 years of data from five BBC plots.]

BREWER, R., G. A. McPeek, and R. J. Adams, Jr. 1991. The atlas of breeding birds of Michigan. East Lansing, Michigan State University Press. [Analysis of breeding densities in various habitats based on Michigan BBCs.]

BRIDGE, D., and M. Bridge. 1964. Twenty-eighth Breeding-Bird Census. Audubon Field Notes 18(6):539-576. [Data from 50 BBCs.]

BRIDGE, D., and M. Bridge. 1965. Twenty-ninth Breeding-Bird Census. Audubon Field Notes 19(6):582-630. [Data from 70 BBCs.]

BRIGGS, S. A. 1967. 1967 Breeding Bird Population Studies. Atlantic Naturalist 22(4):227–228. [Data from one BBC.]

BRIGGS, S. A. 1986. Results of recent winter and breeding bird censuses in long-term study areas. Atlantic Naturalist 36:15-22. [Data from eight BBCs.]

BRIGGS, S. A., AND J. CRISWELL. 1979. Gradual silencing of spring in Washington. Atlantic Naturalist 32:19-26. [Analysis of long-term BBCs in Washington D. C.]

BUTCHER, G. S. 1986. Breeding Bird Censuses and Winter Bird-Population Studies: an update. American Birds 40(1):67-68. [Status of the program when publication of raw data ended and the computerized database began.]

BUTCHER, G. S., W. A. NIERING, W. J. BARRY, AND R. H. GOODWIN. 1981. Equilibrium biogeography and the size of nature preserves: an avian case study. Oecologia 49:29-37. [Analysis of seven years of data from one BBC plot.]

CADE, B. S. 1986. Habitat suitability index models: Brown Thrasher. U. S. Fish and Wildlife Service, Biological Report 82(10.118). 14 pp. [Includes data from 11 BBCs.]

CANTERBURY, G. E., AND D. E. BLOCKSTEIN. 1997. Local changes in a breeding bird community following forest disturbance. Journal of Field Ornithology 68:537-546. [Analysis of six years of data from one BBC plot.]

CHILDS, H. E. 1964. Marsh, swamp, and forest during 45 years of human disturbance. Audubon Field Notes 18(6):541-545. [Analysis of nine years of data (from 1919 to 1964) from one BBC plot.]

CODY, M. L. 1985. Habitat selection in grassland and open-country birds. Pages 191-226 *in* Habitat selection in birds (M. L. Cody, Ed.). Academic Press, San Diego, CA. [Analysis of data from 14 BBC plots.]

CONNER, R. N., J. G. DICKSON, AND J. H. WILLIAMSON. 1983. A comparison of breeding bird census techniques with mist netting results. Wilson Bulletin 95:276-280. [A comparison of strip transect sampling, spot-mapping, and mist-net captures.]

CRISWELL, J. H. 1967. 1966 Breeding Bird Population Studies. Atlantic Naturalist 22(1):32-34. [Data from two BBCs.]

CRISWELL, J. H. 1968. 1968 Breeding Bird Population Studies. Atlantic Naturalist 23(4):219-222. [Data from three BBCs.]

CRISWELL, J. H. 1969. 1969 Breeding Bird Population Studies. Atlantic Naturalist 24(4):209-211. [Data from three BBCs.]

CRISWELL, J. H. 1972. Breeding Bird Population Studies 1972. Atlantic Naturalist 27(4):180-185. [Data from five BBCs.]

CRISWELL, J. H. 1973. Breeding Bird Population Studies 1973. Atlantic Naturalist 28(4):160-164. [Data from five BBCs.]

CRISWELL, J. H. 1974. Breeding Bird Population Studies 1974. Atlantic Naturalist 29(4):165-171. [Data from seven BBCs.]

CRISWELL, J. H. 1975. Breeding Bird Population Studies 1975. Atlantic Naturalist 30(4):175-180. [Data from six BBCs.]

CRISWELL, J. H. 1976. Breeding Bird Population Studies 1976. Atlantic Naturalist 31(4):167-173. [Data from six BBCs.]

CRISWELL, J. H., AND S. A. BRIGGS. 1964. 1963 Breeding Bird Population Studies. Atlantic Naturalist 19(1):51-55. [Data from three BBCs.]

CRISWELL, J. H., AND S. A. BRIGGS. 1965. 1964 Breeding Bird Population Studies. Atlantic Naturalist 20(1):44-48. [Data from three BBCs.]

CRISWELL, J. H., AND S. A. BRIGGS. 1965. 1965 Breeding Bird Population Studies. Atlantic Naturalist 20(4):225-228. [Data from two BBCs.]

CRISWELL, J., AND S. BRIGGS. 1965. Wood Thrush and Veery populations in three census areas. Audubon Field Notes 19(6):587-589. [Analysis of 1948–1965 data from three BBC plots.]

CRISWELL, J. H., S. A. BRIGGS, AND V. C. JONES. 1970. 1970 Breeding Bird Population Studies. Atlantic Naturalist 25(4):172-175. [Data from three BBCs.]

CRISWELL, J. H., S. A. BRIGGS, AND V. C. JONES. 1971. Breeding Bird Population Studies 1971. Atlantic Naturalist 26(4):168-171. [Data from three BBCs.]

CROWELL, K. 1962. Reduced interspecific competition among the birds of Bermuda. Ecology 43:75-88. [Analysis of 13 years of BBC data for three species.]

DEGARMO, W. R. 1948. Breeding-bird population studies in Pocahontas and Randolph counties, West Virginia. Audubon Field Notes 2(6):219-222. [Data from five BBCs including two-year comparisons from three of the plots.]

DICKSON, J. G. 1978. Comparison of breeding bird census techniques. American Birds 32(1):10-13. [A comparison of three census methods including spot-mapping.]

DOWD, C. 1992. Effect of development on bird species composition of two urban forested wetlands in Staten Island, New York. Journal of Field Ornithology 63:455-461. [Data from two study areas, one of which later became a BBC plot.]

DUNNING, JR., J. B. 1986. Shrub-steppe bird assemblages revisited: implications for community theory. American Naturalist 128:82-98. [Analysis of data from 24 BBC plots.]

EAGLES, P. F. J. 1981. Breeding bird censuses using spot-mapping techniques upon samples of homogeneous habitats. Studies in Avian Biology No. 6:455-460. [Critique of the spot-mapping technique.]

EAGLES, P. F. J., AND T. N. TOBIAS. 1978. A replication of a Breeding Bird Census. American Birds 32(1):14-17. [Data from one BBC plus a comparison of two independent censuses in the same plot in the same year.]

ELLISON, W. G. 1992. Blue-gray Gnatcatcher (*Polioptila caerulea*). *in* The Birds of North America, No. 23 (A. Poole, P. Stettenheim, and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union. [Used BBC data for breeding densities in different areas.]

ENGSTROM, R. T. 1988. The Breeding Bird Census: a half century in review. BirdScope 2(1):1-3. [History of the program and a review of the methodology and uses of data.]

ENGSTROM, R. T. 1989. Breeding Bird Census: 1988. Journal of Field Ornithology 60(supplement):22-72. [Data from 87 BBCs.]

ENGSTROM, R. T. 1990. Breeding Bird Census: 1989. Journal of Field Ornithology 61(supplement):23-85. [Data from 96 BBCs.]

ENGSTROM, R. T. 1993. Avian communities in Florida habitats: analysis and review. Florida Game and Fresh Water Fish Commission Nongame Wildlife Program Final Report 46 pp. + v. Tallahassee, FL. [A review of all Florida BBCs with estimates of species richness in different habitats.]

ENGSTROM, T. 1981. The species-area relationship in spot-map censusing. Studies in Avian Biology No. 6:421-425. [A study of how plot size affects results using two BBCs]

ENGSTROM, R. T., R. L. CRAWFORD, AND W. W. BAKER. 1984. Breeding bird populations in relation to changing forest structure following fire exclusion: a 15-year study. Wilson Bulletin 96:437-450. [Compares results from two BBCs with this long-term study.]

ENGSTROM, R. T., AND F. C. JAMES. 1984. An evaluation of methods used in the Breeding Bird Census. American Birds 38:19-23. [Evaluation of BBC methods with special attention to census duration and vegetation sampling.]

ERKSINE, A. J. 1977. Birds in boreal Canada: communities, densities and adaptations. Canadian Wildlife Service Report Series No. 41, Ottawa, Ontario. [Includes data from Canadian census plots, many of which are BBC plots.]

Ewert, D. 1982. Birds in isolated bogs in central Michigan. American Midland Naturalist 108:41-50. [Cites three BBCs.]

Faanes, C. A., and J. M. Andrew. 1983. Avian use of forest habitats in the Pembina Hills of northeastern North Dakota. U. S. Fish and Wildlife Service, Resource Publication 151. Washington, D. C. [Analysis of one year of data from 11 BBCs]

Fowler, L. J., and D.K. Fowler. 1985. Breeding birds and vegetation along the Duck River in middle Tennessee. Journal of the Tennessee Academy of Science 60(2):48–51. [Compared their results to data from seven nearby BBCs.]

Franzreb, K. E. 1981. A comparative analysis of territorial mapping and variable-strip transect censusing methods. Studies in Avian Biology No. 6:164-169. [A comparison of two census methods including spot-mapping.]

Gaines, D. 1974. A new look at the nesting riparian avifauna of the Sacramento Valley, California. Western Birds 5:61-80. [Compares Sacramento Valley BBCs with 29 other BBC plots in California.]

Gale, G. A., J. A. DeCecco, M. R. Marshall, W. R. McClain, and R. J. Cooper. 2001. Effects of gypsy moth defoliation on forest birds: an assessment using breeding bird census data. Journal of Field Ornithology 72:291-304. [Analysis of data from six BBC plots monitored at least three years before and five years after a moth outbreak.]

Goodrich, L. J., C. Viverette, S. E. Senner, and K. L. Bildstein. 1998. Long-term use of Breeding Bird Census plots to monitor populations of Neotropical migrants breeding in deciduous forest in eastern Pennsylvania, USA. Pages 151-166 in Measuring and monitoring forest biodiversity. Smithsonian Institution Press, Washington, D. C.

Gross, D. A., and P. E. Lowther. 2001. Yellow-bellied Flycatcher (*Empidonax flaviventris*). *in* The Birds of North America, No. 566 (A. Poole and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia, PA. [Used BBC data for breeding densities in different areas.]

Hall, G. A. 1961. Twenty-fifth Breeding-Bird Census. Audubon Field Notes 15(6):499-524. [Data from 43 BBCs.]

Hall, G. A. 1962. Twenty-sixth Breeding-Bird Census. Audubon Field Notes 16(6):517-540. [Data from 39 BBCs.]

Hall, G. A. 1963. Twenty-seventh Breeding-Bird Census. Audubon Field Notes 17(6):491-512. [Data from 39 BBCs.]

Hall, G. A. 1964. Breeding-Bird Censuses–why and how. Audubon Field Notes 18(3):413-416. [Updated instructions for conducting BBCs.]

Hall, G. A. 1984. Population decline of neotropical migrants in an Appalachian forest. American Birds 38:14-18. [Analysis of data from one BBC plot from 1947–1983.]

Hall, G. A. 1984. A long-term bird population study in an Appalachian spruce forest. Wilson Bulletin 96:228-240. [Analysis of data from one BBC plot from 1947–1983.]

Hallock, D. 1984. Status and avifauna of willow carrs in Boulder County. Colorado Field Ornithologists' Journal 18:100-105. [Analysis of data from four BBC plots.]

Hallock, D., N. Leder, and M. Figgs. 1986. Ecology, status and avifauna of willow carrs in Boulder County. Boulder County Nature Association Publication No. 4, 37 pp.

Hamel, P. B. 1992. Land manager's guide to the birds of the South. The Nature Conservancy, Southeastern Region, Chapel Hill, NC. 437 pp. [Summary of BBCs in the Southeast from 1947-1979.]

Hamel, P. B. 2000. Cerulean Warbler status assessment. U. S. Fish and Wildlife Service. Fort Snelling, MN. [Analysis of breeding densities from 133 BBC plots.]

Haney, J. C. 1999. Hierarchical comparisons of breeding birds in old-growth conifer-hardwood forest on the Appalachian Plateau. Wilson Bulletin 111:89-99. [Comparison of birds found in 11 BBC plots to those in surrounding landscape.]

Hickey, J. J. 1937. Bird-Lore's first Breeding-Bird Census. Bird Lore 39(5):373-386. [Data from 31 BBCs.]

Hickey, J. J. 1938. Bird-Lore's second Breeding-Bird Census. Bird Lore 40(5):350-365. [Data from 30 BBCs.]

Hickey, J. J. 1939. Bird-Lore's third Breeding-Bird Census. Bird Lore 41(supplement):13-31. [Data from 32 BBCs.]

Hickey, J. J. 1940. Bird-Lore's fourth Breeding-Bird Census. Bird Lore 42(supplement):474-492. [Data from 35 BBCs.]

Hickey, J. J. 1941. Audubon magazine's fifth Breeding-Bird Census. Audubon 43(section II):480-500. [Data from 40 BBCs.]

Hickey, M. B. 1942. Audubon magazine's sixth Breeding-Bird Census. Audubon 44(section II):16-32. [Data from 30 BBCs.]

Hickey, M. B. 1943. Audubon magazine's seventh Breeding-Bird Census. Audubon 45(section II):17-24. [Data from 20 BBCs.]

Hickey, M. B. 1944. Audubon magazine's eighth Breeding-Bird Census. Audubon 46(section II):14-24. [Data from 28 BBCs.]

Hickey, M. B. 1945. Ninth Breeding-Bird Census. Audubon 47(section II):57-67. [Data from 24 BBCs.]

Hickey, M. B. 1946. Tenth Breeding-Bird Census. Audubon 48(section II):131-146. [Data from 33 BBCs.]

INTERNATIONAL BIRD CENSUS COMMITTEE (with notes by C. S. Robbins). 1970. An international standard for a mapping method in bird census work recommended by the International Bird Census Committee. Audubon Field Notes 24(6):722-726. [A standardized method for mapping bird territories.]

JAMES, F. C. 1978. On understanding quantitative surveys of vegetation. American Birds 32(1):18-21. [Analysis of vegetation data from two BBC plots.]

JAMES, F. C., AND W. J. BOECKLEN. 1984. Interspecific morphological relationships and the densities of birds. Pages 458-477 *in* Ecological communities: conceptual issues and the evidence (D. R. Strong, L. G. Abele, D. Simberloff, and A. B. Thistle, Eds.). Princeton University Press, Princeton, N. J. [Analysis of seven years of data from one BBC plot.]

JAMES, F. C., AND S. RATHBUN. 1981. Rarefaction, relative abundance, and diversity of avian communities. Auk 98:785-800. [Used 37 BBCs to compare different statistical methods.]

JAMES, F. C., AND H. H. SHUGART, JR. 1970. A quantitative method of habitat description. Audubon Field Notes 24(6):727-736. [A simple and regular method of collecting vegetation data for BBC plots.]

JAMES, F. C., AND N. O. WAMER. 1982. Relationships between temperate forest bird communities and vegetation structure. Ecology 63:159-171. [Analysis of 1973-1977 data from 56 BBC plots.]

JAMES, F. C., R. F. JOHNSTON, N. O. WAMER, G. J. NIEMI, AND W. J. BOECKLEN. 1984. The Grinnellian niche of the Wood Thrush. American Naturalist 124:17-30. [Analysis of 1978-1980 data from 47 BBC plots.]

JOHNSTON, D. W. 1990. Descriptions of surveys: Breeding Bird Censuses. Pages 33-36 *in* Survey designs and statistical methods for the estimation of avian population trends (J. R. Sauer and S. Droege, Eds.). U. S. Fish and Wildlife Service, Biological Report 90(1). [Review of 15 long-term BBCs.]

JOHNSTON, D. W., AND J. M. HAGAN III. 1992. An analysis of long-term breeding bird censuses from eastern deciduous forests. Pages 75-84 in Ecology and conservation of neotropical migrant landbirds (J. M. Hagan III and D. W. Johnston, Eds.). Smithsonian Institution Press, Washington, D. C. [Analysis of 13 long-term studies including eight BBC plots.]

JOHNSTON, D. W. AND E. P. ODUM. 1956. Breeding bird populations in relation to plant succession on the Piedmont of Georgia. Ecology 37:50-62. [Data from two BBC plots included in analysis.]

KENDEIGH, S. C. 1971. A population collapse in the House Wren – or is there one? American Birds 25(6):951. [Analysis of 32 years of data from one BBC plot.]

KENDEIGH, S. C, AND B. J. FAWVER. 1981. Breeding bird populations in the Great Smoky Mountains, Tennessee and North Carolina. Wilson Bulletin 93:218-242. [Data from several BBCs used in the discussion.]

KENNEDY, J. A., P. DILWORTH-CHRISTIE, AND A. J. ERSKINE. 1999. The Canadian breeding bird (mapping) census database. Technical Report Series No. 342, Canadian Wildlife Service, Ottawa, Ontario. [Description of the database of all known Canadian spot-mapping censuses including BBCs done in Canada.]

KROODSMA, D. E. 1977. Correlates of song organization among North American wrens. American Naturalist 111:995-1008. [Analysis of BBCs from 1947–1973.]

LEE, P-Y., AND J. T. ROTENBERRY. 2005. Relationships between bird species and tree species assemblages in forested habitats of eastern North America. Journal of Biogeography 32:1139-1150. [Analysis of one year of data (1981) from 47 BBC plots.]

LINEHAN, J. T. 1968. Thirty-second Breeding-Bird Census. Audubon Field Notes 22(6):654-726. [Data from 78 BBCs.]

LINEHAN, J. T., R. E. JONES, AND J. R. LONGCORE. 1967. Breeding-bird populations in Delaware's urban woodlots. Audubon Field Notes 21:641-646. [Analysis of two years of data from nine BBC plots.]

LOERY, G. 1966. Thirtieth Breeding-Bird Census. Audubon Field Notes 20(6):604-672. [Data from 86 BBCs.]

LOERY, G. 1967. Thirty-first Breeding-Bird Census. Audubon Field Notes 21(6):610-675. [Data from 97 BBCs.]

LOERY, G. 1969. Thirty-third Breeding Bird Census. Audubon Field Notes 23(6):700-756. [Data from 78 BBCs.]

LOERY, G. 1970. Thirty-fourth Breeding-Bird Census. Audubon Field Notes 24(6):737-781. [Data from 57 BBCs.]

LOWE, J. D. 1993. Breeding Bird Census: 1992. Journal of Field Ornithology 64(supplement):27-114. [Data from 132 BBCs.]

LOWE, J. D. 1994. Breeding Bird Census: 1993. Journal of Field Ornithology 65(supplement):38-127. [Data from 140 BBCs.]

LOWE, J. D. 1995. Breeding Bird Census: 1994. Journal of Field Ornithology 66(supplement):33-117. [Data from 139 BBCs.]

LOWE, J. D. 1996. Breeding Bird Census: 1995. Journal of Field Ornithology 67(supplement):24-90. [Data from 113 BBCs.]

LOWN, B. A. 1980. Reproductive success of the Brown-headed Cowbird: a prognosis based on Breeding Bird Census data. American Birds 34:15-17. [Analysis of data from 25–50 BBCs from each decade (1930s through 1970s).]

LOWTHER, P. 1984. Catalog of Brown-headed Cowbird hosts in Kansas. Kansas Ornithological Society Bulletin 35:25-33. [Cites five BBCs.]

LOWTHER, P. 1985. Catalog of Brown-headed Cowbird hosts in Iowa. Proceedings of the Iowa Academy of Science 92:95-99.

LYNCH, J. R., AND R. F. WHITCOMB. 1977. Effects of the insularization of the eastern deciduous forest on avifaunal diversity and turnover. Pages 461-490 *in* Classification, inventory, and analysis of fish and wildlife habitat (A. Marmelstein, Ed.). U. S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS 78/76. 604 pp.

MACARTHUR, R. H., AND J. W. MACARTHUR. 1961. On bird species diversity. Ecology 42:594-598. [Used data from two BBC plots.]

MacClintock, L., R. F. Whitcomb, and B. L. Whitcomb. 1977. Island biogeography and "habitat islands" of eastern forest. II. Evidence for the value of corridors and minimization of isolation in preservation of biotic diversity. American Birds 31:6-16. [Comparison of results from this study with previously published BBCs.]

MARSHALL, R. M. 1991. Breeding Bird Census: 1990. Journal of Field Ornithology 62(supplement):27-88. [Data from 98 BBCs.]

MARSHALL, R. M. 1992. Breeding Bird Census: 1991. Journal of Field Ornithology 63(supplement):29-110. [Data from 126 BBCs.]

MARTIN, J. W., AND B. A. CARLSON. 1998. Sage Sparrow (*Amphispiza belli*). in The Birds of North America, No. 326 (A. Poole and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia, PA. [Used BBC data for breeding densities.]

MAY, P. G. 1982. Secondary succession and breeding bird community structure: patterns of resource utilization. Oecologia 55:208-216. [Analysis of data from 40 BBCs.]

MCNAIR, D. B. 1987. Recent breeding information on birds in a portion of the southern Appalachian Mountains. The Migrant 58:109-134. [Used data from 14 BBCs.]

MITCHELL, M. J. 1960. A resurvey of the breeding-bird population in an upland oak forest on the Anoka Sand Plain. Audubon Field Notes 14(6):488-489. [Analysis of two years of data (eleven years apart) from one BBC plot.]

NIERING, W. A. 1958. Breeding bird studies in Connecticut Arboretum Natural Area. Connecticut Arboretum Bulletin 10:14-22. [Information about BBCs conducted in the arboretum.]

NOON, B. R., V. P. BINGMAN, AND J. P. NOON. 1979. The effects of changes in habitat on northern hardwood forest bird communities. USDA Forest Service General Technical Report NC-51, pp. 33–48. [Used many BBCs to look at correlation between habitat structure and species composition.]

NOON, B. R., D.K. DAWSON, D. B. INKLEY, C. S. ROBBINS, AND S. H. ANDERSON. 1980. Consistency in habitat preference of forest bird species. Transactions of the 45th North American Wildlife and Natural Resources Conference. Pp. 226-244. [Analysis of 1971–1979 data from 144 BBC plots.]

NOON, B. R., D.K. DAWSON, AND J. P. KELLY. 1985. A search for stability gradients in North American breeding bird communities. Auk 102:64-81. [Analysis of data from 174 BBC plots censused over 3–22 years.]

NORRIS, R. A. 1960. Twenty-fourth Breeding-Bird Census. Audubon Field Notes 14(6):483-507. [Data from 36 BBCs.]

O'CONNOR, R. J. 1991. Fading melody: migrant songbirds are dying off with breakup of woodlands. The Sciences 31(1):36-41. [Review of some published studies that used long-term BBC data.]

PAUL, JR., J. T., AND R. R. ROTH. 1983. Accuracy of a version of the spot-mapping census method. Journal of Field Ornithology 54:42-49. [Test of the spot-mapping method on a banded population.]

PETERJOHN, B. G., J. R. SAUER, AND C. S. ROBBINS. 1995. Population trends from the North American Breeding Bird Survey. Pages 3-39 *in* Ecology and management of neotropical migratory birds (T. E. Martin and D. M. Finch, Eds.). Oxford University Press, New York. [Comparison of BBS and BBC data for Wood Thrush and Red-eyed Vireo.]

PLATT, D. R. 1975. Breeding birds of Sand Prairie Natural History Reservation, Harvey County, Kansas. American Birds 29:1146-1151. [Analysis of seven years of data from one BBC plot.]

RABENOLD, K. N. 1979. A reversed latitudinal diversity gradient in avian communities of eastern deciduous forests. The American Naturalist 114:275-286. [Analysis of BBCs from 1940–1974.]

RABENOLD, K. N. 1993. Latitudinal gradients in avian species diversity and the role of long-distance migration. Pages 247–274 *in* Current Ornithology, vol. 10 (D. M. Power, Ed.). Plenum, New York. [Analysis of hundreds of BBCs from 1975-1984.]

RALPH, C. J., G. R. GEUPEL, P. PYLE, T. E. MARTIN, AND D. F. DESANTE. 1993. Handbook of field methods for monitoring landbirds. General Technical Report PSW-GTR-144, Albany, CA: Pacific Southwest Research Station, Forest Service, U. S. Department of Agriculture: 35-37. [Summary of BBC methods.]

ROBBINS, C. S. 1950. Ecological distribution of the breeding Parulidae of Maryland. Thesis (Master of Arts), George Washington University, vii, 145 pp.

ROBBINS, C. S. 1977. Data bank of North American Breeding Bird Censuses. Polish Ecological Studies

3:95-98. [Description of the first version of the BBC database.]

ROBBINS, C. S. 1978. Determining habitat requirements of nongame species. Transactions of the 43rd North American Wildlife and Natural Resources Conference. Pp. 57-68. [Analysis of data from 80 BBC plots.]

ROBBINS, C. S. 1979. Effect of forest fragmentation on bird populations. USDA Forest Service General Technical Report NC-51, pp. 198-212. [Analysis of six long-term study plots including four BBC plots.]

ROBBINS, C. S. 1980. Effect of forest fragmentation on breeding bird populations in the Piedmont of the Mid-Atlantic region. Atlantic Naturalist 33:31-36. [Analysis of six long-term study plots including four BBC plots.]

ROSENBERG, K. V., R. W. ROHRBAUGH, JR., S. E. BARKER, R. S. HAMES, J. D. LOWE, AND A. A. DHONDT. 1999. A land manager's guide to improving habitat for Scarlet Tanagers and other forest-interior birds. Cornell Laboratory of Ornithology, Ithaca, NY. [Lists species associated with Scarlet Tanagers based on BBCs.]

SAUNDERS, L. P., C. W. SAUNDERS, D. STYER, AND S. PELIKAN. 2005. Bird population changes in a Hamilton County, Ohio, forest. Ohio Journal of Science 105(3):43-45. [Analysis of nine years of data from one BBC plot.]

SCHROEDER, R. L. 1987. Community models for wildlife impact assessment: a review of concepts and approaches. U. S. Fish and Wildlife Service, Biological Report 87(2). 41 pp.

SEDGWICK, J. A. 1993. Dusky Flycatcher (*Empidonax oberholseri*). *in* The Birds of North America, No. 78 (A. Poole and F. Gill, Eds.). Philadelphia: The Academy of Natural Sciences; Washington, D. C.: The American Ornithologists' Union. [Used BBC data for breeding densities in different areas.]

SERRAO, J. 1985. Decline of forest songbirds. Records of New Jersey Birds. 11(1):5-9. [Comparison of 1957 and 1983 data from one BBC plot.]

SHORT, J. J. 1979. Patterns of alpha-diversity and abundance in breeding bird communities across North America. The Condor 81:21-27. [Analysis of data from 445 BBCs from 1936–1973.]

STEWART, R. E. 1947. Eleventh Breeding-Bird Census. Audubon Field Notes 1(6):194-224. [Data from 38 BBCs.]

STEWART, R. E. 1948. Twelfth Breeding-Bird Census. Audubon Field Notes 2(6):218-244. [Data from 29 BBCs.]

STEWART, R. E. 1949. Thirteenth Breeding-Bird Census. Audubon Field Notes 3(6):254-272. [Data from 31 BBCs.]

STEWART, R. E. 1950. Fourteenth Breeding-Bird Census. Audubon Field Notes 4(6):294-306. [Data from 23 BBCs.]

STEWART, R. E. 1951. Fifteenth Breeding Bird Census. Audubon Field Notes 5(6):313-330. [Data from 36 BBCs.]

STEWART, R. E., AND C. S. ROBBINS. 1958. Birds of Maryland and the District of Columbia. North American Fauna 62. [Used BBCs for habitat density data.]

STEWART, R. M. 1972. A summary of bird surveys in California 1947-1971. Point Reyes Bird Observatory Newsletter 21:2-3. [Summary data from 32 BBC plots.]

STILES-WAINWRIGHT, H. J. 1985. Conducting a Breeding Bird Census. Bird Watcher's Digest 7(5):21–24. [Article about the experience of conducting a BBC.]

SWANSON, R. A walk through a flood of song. Mississippi Monitor 5(5):9-10. [Essay about the experience of conducting a BBC.]

TAUB, S. R. 1990. Smoothed scatterplot analysis of long-term Breeding Bird Census data. Pages 80-83 *in* Survey designs and statistical methods for the estimation of avian population trends (J. R. Sauer and S. Droege, Eds.). U. S. Fish and Wildlife Service, Biological Report 90(1). [Technique for summarizing BBC data.]

TRAMER, E. J. 1969. Bird species diversity: components of Shannon's formula. Ecology 50:927-929. [Analysis of 267 censuses, most of which were from the BBC program.]

TRAMER, E. J. 1974. On latitudinal gradients in avian diversity. The Condor 76:123-130. [Analysis of many censuses, most of which were from the BBC program.]

TWEIT, R. C., AND J. C. TWEIT. 2000. Cassin's Kingbird (*Tyrannus vociferans*). *in* The Birds of North America, No. 534 (A. Poole and F. Gill, Eds.). The Birds of North America, Inc., Philadelphia, PA. [Used BBC data for breeding densities.]

VAN VELZEN, W. T. 1971. Thirty-fifth Breeding-Bird Census. American Birds 25(6):960-1022. [Data from 74 BBCs.]

VAN VELZEN, W. T. 1972. Thirty-sixth Breeding-Bird Census. American Birds 26(6):937-1006. [Data from 99 BBCs.]

VAN VELZEN, W. T. 1972. Breeding-Bird Census instructions. American Birds 26(6):1007-1010. [Instructions for submitting BBC reports.]

VAN VELZEN, W. T. 1973. Thirty-seventh Breeding-Bird Census. American Birds 27(6):955-1019. [Data from 125 BBCs.]

VAN VELZEN, W. T. 1974. Thirty-eighth Breeding Bird Census. American Birds 28(6):987-1054. [Data from 152 BBCs.]

VAN VELZEN, W. T. 1975. Thirty-ninth Breeding Bird Census. American Birds 29(6):1080-1145. [Data

from 165 BBCs.]

VAN VELZEN, W. T. 1977. Fortieth Breeding Bird Census. American Birds 31(1):24-93. [Data from 170 BBCs from 1976.]

VAN VELZEN, W. T. 1978. Forty-first Breeding Bird Census. American Birds 32(1):49-125. [Data from 181 BBCs from 1977.]

VAN VELZEN, W. T. 1979. Forty-second Breeding Bird Census. American Birds 33(1):54-114. [Data from 199 BBCs from 1978.]

VAN VELZEN, W. T. 1980. Forty-third Breeding Bird Census. American Birds 34(1):41-106. [Data from 219 BBCs from 1979.]

VAN VELZEN, W. T. 1981. Forty-fourth Breeding Bird Census. American Birds 35(1):46-112. [Data from 228 BBCs from 1980 plus a few from 1979.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1982. Forty-fifth Breeding Bird Census. American Birds 36(1):49-106. [Data from 209 BBCs from 1981.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1983. Forty-sixth Breeding Bird Census. American Birds 37(1):49-108. [Data from 214 BBCs from 1982 plus a few from earlier years.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1984. Forty-seventh Breeding Bird Census. American Birds 38(1):64-138. [Data from 194 BBCs from 1983 plus many from earlier years.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1985. Forty-eighth Breeding Bird Census. American Birds 39(1):109-114. [Summary table for 127 BBCs from 1984 plus two from 1983.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1986. Forty-ninth Breeding Bird Census. American Birds 40(1):69-72. [Summary table for 103 BBCs from 1985 plus a few from 1984.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1987. Fiftieth Breeding Bird Census. American Birds 41(1):153-155. [Summary table for 39 BBCs from 1986 plus one from 1985.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1988. Fifty-first Breeding Bird Census. American Birds 42(1):145-148. [Summary table for 70 BBCs from 1987 plus many from earlier years.]

VAN VELZEN, W. T., AND A. C. VAN VELZEN. 1989. Fifty-second Breeding Bird Census. American Birds 43(1):184-186. [Summary table for 79 BBCs from 1988. Does not include eight late reports (see Engstrom 1989).]

VERNER, J., AND K. A. MILNE. 1990. Analyst and observer variability in density estimates from spot mapping. The Condor 92:313-325. [Test of spot-mapping method and recommendations for using BBC data.]

WEISER, C., AND D. J. HLAVINI. 1956. Comparison of breeding-bird populations of three deciduous shelterbelts. Audubon Field Notes 10(6):416-419. [Analysis of one year of data from three BBC plots.]

WHITCOMB, R. F. 1977. Island biogeography and "habitat islands" of eastern forest. I. Introduction. American Birds 31:3-5. [Part of a detailed study of BBCs in Maryland.]

WHITCOMB, R. F., J. F. LYNCH, P. A. OPLER, AND C. S. ROBBINS. 1976. Island biogeography and conservation: strategy and limitations. Science 193:1030-1032. [Analysis of data from one long-term BBC plot in Illinois.]

WHITCOMB, R. F., C. S. ROBBINS, J. F. LYNCH, B. L. WHITCOMB, M. K. KLIMKIEWICZ, AND D. BYSTRAK. 1981. Effects of forest fragmentation on avifauna of the eastern deciduous forest. Pages 125–205 *in* Forest island dynamics in man-dominated landscapes (R. L. Burgess and D. M. Sharpe, Eds.). Springer-Verlag, New York. 310 pp. [Used BBC data to estimate territory sizes from densities for many species.]

WHITCOMB, B. L., R. F. WHITCOMB, AND D. BYSTRAK. 1977. Island biogeography and "habitat islands" of eastern forest. III. Long-term turnover and effects of selective logging on the avifauna of forest fragments. American Birds 31:17-23. [Detailed study of two BBC plots.]

WIENS, J. A. 1975. Avian communities, energetics, and functions in coniferous forest habitats. Pages 226-265 *in* The management of forest and range habitats for nongame birds symposium proceedings. USDA Forest Service, General Technical Report WO-1.

WILLIAMS, A. B. 1936. The composition and dynamics of a beech-maple climax community. Ecological Monographs 6(3):317-408. [Early use of spot-mapping method.]

WOOLFENDEN, G. E., AND S. A. ROHWER. 1969. Breeding birds in a Florida suburb. Bulletin of the Florida State Museum 13:1-83. [Analysis of two years of data from three plots. Compares these data to averages from many other BBCs.]

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ACCELERATING DECLINES REVEALED BY NEW BTO REPORT

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The latest report of bird population trends from the BTO's monitoring schemes has just been published — but this time on the World Wide Web. It brings together information from BBS, CBC, WBS, NRS and CES to provide a detailed picture for over 100 species of landbirds. *Humphrey Crick, John Marchant, David Noble* and *Stephen Baillie* describe the report and its latest results. Susan Waghorn has been designing and putting together the report's web site (which can be found on http://www.bto.org).

NUEVO INFORME DEL BTO REVELA UNA ACELERACIÓN EN LOS DECLIVES
El último informe sobre tendencias poblacionales de aves de los programas de seguimiento del BTO acaba de ser publicado, pero esta vez en Internet. Recoge información del BBS, CBC, WBS, NRS y CES para aportar una detallada descripción de más de 100 especies de aves terrestres. Humphrey Crick, John Marchant, David Noble y Stephen Baillie describen el informe y sus últimos resultados. Susan Waghorn ha diseñado el sitio del informe en internet (en http://www.bto.org).

The reports entitled *"Breeding Birds in the Wider Countryside,"* produced by the BTO/JNCC Partnership in 1996 and 1997, had a great impact, not only in the press, but also because they became a bible for conservationists. These reports were essentially "one-stop-shops" for information about the population status of our common terrestrial birds and they brought into widespread use all the valuable information that BTO members contribute each year, in a way that had never been achieved before.

Now, a new step has been taken that should ensure even wider circulation of the BTO's information on bird trends: the development of a web-based report. This allows ready access by all those concerned about bird populations, whether at home, in the office, in schools or universities, as well as by those in professional conservation. We are no longer restricted by the space afforded by an A4 sheet of paper and by reproduction charges and can make much greater levels of detail available than ever before. For those that do not have access to the web, a summary printed version will also be available.

An example of a typical web page is shown on p139. New for this report are trends from the BTO/JNCC/RSPB Breeding Bird Survey (BBS), not only for the UK but also for each of its constituent countries (England, Scotland, Wales and Northern Ireland) when data are sufficient.

A new system of Alerts has also been introduced, to highlight where population declines of greater than 25% or greater than 50% have occurred over the past 5, 10, 25 and 30 years. This is the new standard system that has been widely discussed with those concerned with bird population monitoring and that we hope will be extended to other bird monitoring schemes in due course. It should be emphasised that these Alerts do not result in any immediate

changes to existing lists, such as the Biodiversity Steering Group and Birds of Conservation Concern lists, but they flag up those species that are most in trouble and that may warrant redesignation at the next revision.

WINNERS AND LOSERS

While many species show relatively small long-term trends or may vary up-and-down with changes in the weather, for example, there are a substantial proportion that have shown large long-term trends (Table 1). Thus 12 species have more than doubled in population size over the past 25 years, while 22 have halved. The "winners" include species such as the raptors, which have benefited from conservation action to curb the use of damaging pesticides. Mute Swan has benefited substantially from banning the use of lead weights by fishermen. The pigeons appear to have taken advantage of various changes in agricultural practice, including the increase in *brassicas* such as oilseed rape and may be benefiting from climate warming through increased breeding season length and perhaps decreases in over-wintering mortality. The reasons for increases in the warblers, Redstart and Nuthatch are currently unknown, but the last has been spreading northwards into Scotland at a remarkable rate.

The species that have declined by greater than 50% or 25% over the past 25 years are largely unchanged since the last report. The only differences are that Yellow Wagtail, Marsh Tit, Starling and Linnet have now moved onto the higher level of decline, and the declines for Kestrel and Cuckoo are now greater than 25%. Little Grebe is a new species to the list of declining species and needs further investigation. Although winter surveys show no trend over the past 15 years, the decline measured by the Waterways Bird Survey (WBS) occurred mainly before this period and represents changes only in birds using rivers and canals, not lakes, gravel pits or reservoirs.

TABLE 1. Species showing substantial population changes over the past 25 years (1973–1998).

Greater than 50% decline		25 – 50% decline		Greater than 100% increases	
Little Grebe W	(51%)	Kestrel	(26%)	Mute Swan U	(165%)
Grey Partridge	(83%)	Lapwing U	(40%)	Mallard W	(190%)
Woodcock U	(72%)	Cuckoo	(29%)	Tufted Duck U	(645%)
Turtle Dove	(69%)	Meadow Pipit U	(43%)	Sparrowhawk	(149%)
Lesser-spotted Woodpecker	(72%)	Grey Wagtail W	(48%)	Buzzard U	(290%)
Skylark	(54%)	Pied Wagtail W	(49%)	Oystercatcher W	(109%)
Tree Pipit U	(77%)	Dunnock	(46%)	Woodpigeon	(101%)
Yellow Wagtail W	(81%)	Blackbird	(25%)	Collared Dove	(216%)
Song Thrush	(57%)	Mistle Thrush	(43%)	Nuthatch	(114%)
Goldcrest	(57%)	Willow Warbler	(31%)	Redstart U	(109%)
Spotted Flycatcher	(77%)			Reed Warbler U	(122%)
Marsh Tit	(52%)			Blackcap	(100%)
Willow Tit	(75%)				
Starling	(61%)				
House Sparrow	(51%)				
Tree Sparrow	(94%)				
Linnet	(55%)				
Lesser Redpoll U	(94%)				
Bullfinch	(56%)				
Yellowhammer	(56%)				
Reed Bunting	(61%)				
Corn Bunting	(86%)				

The percentage changes for each species is given in parentheses, each decline is statistically significant. Please note that although we use data from the most recently processed year, 1999, in the analysis, statistical considerations require the changes to be measured only up to 1998.

Notes: W means that the information comes from the WBS over the past 23 years (1975-1998); U means that a major part of a species' distribution is not covered by the CBC, (see example web page on pg__no).

DECLINING FASTER AND FASTER

What is most worrying about the new figures is that eight of the species in Table 1 appear to have declined faster than ever over the last five years on Common Birds Census CBC plots. They show declines greater than 25% between just 1993 and 1998: Grey Partridge, Lesser Spotted Woodpecker, Tree Pipit, Yellow Wagtail, Willow Tit, Starling, Tree Sparrow and Lesser Redpoll. The quality of information for some of these species is often unsatisfactory because they now occur on very few CBC plots, although the recent declines are confirmed by significant BBS results for Grey Partridge, Yellow Wagtail and Willow Tit and for Tree Pipit in England. The general lack of information on these species combined with evidence of rapid declines means that they surely warrant urgent conservation attention. For two other species in Table 1, Bullfinch and Corn Bunting, BBS shows significant declines of greater than 25% between 1994 and 1999 – see *BTO News* 230: 12–14.

CONSERVATION PLANNING

BTO data have been very important in helping government draw up lists of priority species needing conservation action. Under the International Convention on Biodiversity, the government has produced a series of Biodiversity Action Plans for individual species and habitats. These plans list the main factors that may be causing population declines in each species, suggest policies to halt and reverse declines and outline what further research is still required. Following their publication, there has been much new action at national and local levels to conserve the UK's biodiversity.

Grey Partridge was one of the first species with an Action Plan and has been the subject of intensive research work for many years by the Game Conservancy Trust (GCT). Based on all available evidence, GCT has made strong recommendations about how the species' fortunes can be turned around, principally to do with the provision of chick food – insect larvae – that have all but disappeared with the use of insecticides and of herbicides that kill the weeds the insects feed on. However, it looks as though there is still a great deal of work to do to achieve the stated aim of halting its population decline by 2005.

Tree Sparrow, Bullfinch and Corn Bunting are also the subjects of Biodiversity Action Plans as well as of a number of research projects and conservation initiatives by BTO, RSPB, GCT and others. These have highlighted the potential importance of investigating the impact of providing extra seed in winter, to make up for the loss of natural food supplies due to widespread changes in farming practice. All three Action Plans aim to achieve at least a 50% increase in the BBS index of each species between 1996 and 2008.

The UK government, through the Department of the Environment, Transport & the Regions, has recently funded a consortium led by the BTO (including Central Science Laboratory, RSPB and Wildwings Bird Management) to investigate the causes of the long-term declines of Starling (and House Sparrow). Also the BTO, through its Nightingale Appeal and with support under the BTO/JNCC Partnership has funded an investigation of the BTO's data on Willow and Marsh Tits.

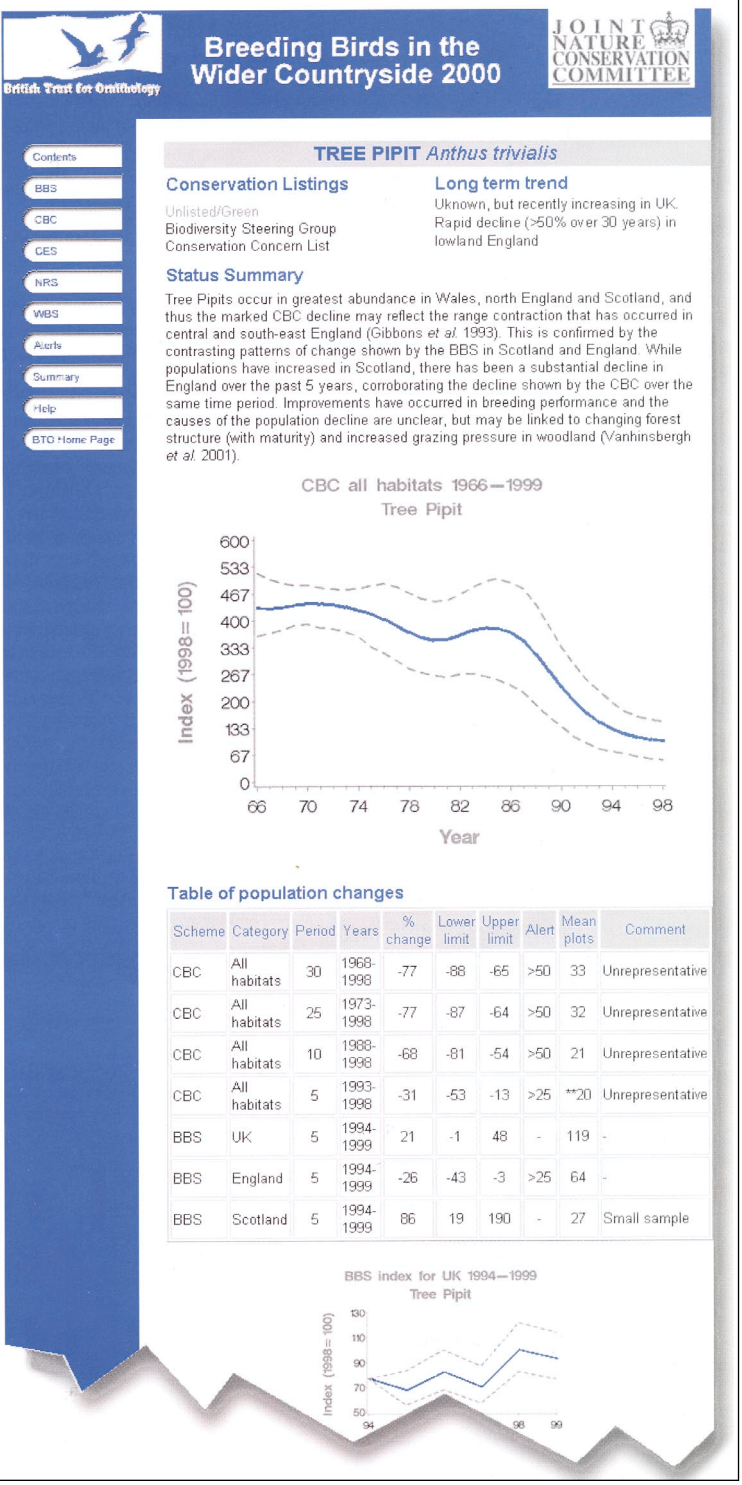
However, there is now an obvious need for research to begin on the declines of Lesser Spotted Woodpecker, Tree Pipit, Yellow Wagtail and Lesser Redpoll before they disappear from large parts of the country.

ACKNOWLEDGMENTS

Thank you to the sustained long-term efforts of many thousands of the BTO's volunteer supporters, for both undertaking the fieldwork and for generously donating funds towards the Trust's operations. This report would not have been possible without them. The report is produced under the work programme funded by the BTO/JNCC Partnership (on behalf of English Nature, Scottish Natural Heritage, Countryside Council for Wales and the Environment & Heritage Service of Northern Ireland). We are grateful to the many staff at the BTO who have helped in the organisation and curation of the datasets used in the report. Thanks are also due to Mr and Mrs J.A. Pye's Charitable Settlement, which provided additional support towards the development of the website.

THE NEW WEB REPORT

An example of a typical page from the new web report. Please note that where the CBC is noted as unrepresentative, this refers to the fact that the strongholds for Tree Pipits occur (upland Scotland and Wales) outside the main geographic range covered by the CBC (generally lowland England). For the majority of species, the CBC adequately monitors the main distributional strongholds.



British Trust for Ornithology

Breeding Birds in the Wider Countryside 2000

JOINT NATURE CONSERVATION COMMITTEE

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TREE PIPIT *Anthus trivialis*

Conservation Listings

Unlisted/Green
Biodiversity Steering Group
Conservation Concern List

Long term trend

Uknown, but recently increasing in UK. Rapid decline (>50% over 30 years) in lowland England

Status Summary

Tree Pipits occur in greatest abundance in Wales, north England and Scotland, and thus the marked CBC decline may reflect the range contraction that has occurred in central and south-east England (Gibbons *et al.* 1993). This is confirmed by the contrasting patterns of change shown by the BBS in Scotland and England. While populations have increased in Scotland, there has been a substantial decline in England over the past 5 years, corroborating the decline shown by the CBC over the same time period. Improvements have occurred in breeding performance and the causes of the population decline are unclear, but may be linked to changing forest structure (with maturity) and increased grazing pressure in woodland (Vanhinsbergh *et al.* 2001).

CBC all habitats 1966—1999
Tree Pipit

Table of population changes

Scheme	Category	Period	Years	% change	Lower limit	Upper limit	Alert	Mean plots	Comment
CBC	All habitats	30	1968-1998	-77	-88	-65	>50	33	Unrepresentative
CBC	All habitats	25	1973-1998	-77	-87	-64	>50	32	Unrepresentative
CBC	All habitats	10	1988-1998	-68	-81	-54	>50	21	Unrepresentative
CBC	All habitats	5	1993-1998	-31	-53	-13	>25	**20	Unrepresentative
BBS	UK	5	1994-1999	21	-1	48	-	119	-
BBS	England	5	1994-1999	-26	-43	-3	>25	64	-
BBS	Scotland	5	1994-1999	86	19	190	-	27	Small sample

BBS index for UK 1994—1999
Tree Pipit

Bird Populations 7:140-142
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BTO News 246:8-9

ENSURING CONTINUITY — LINKING CBC AND BBS

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How do the results of these two major surveys compare? *Steve Freeman, David Noble, Stuart Newson* and *Stephen Baillie* discuss recent analyses.

ASEGURANDO LA CONTINUIDAD – VINCULACIÓN DEL CBC Y EL BBS

¿Qué diferencias hay entre los resultados de estos dos censos? Steve Freeman, David Noble, Stuart Newson y Stephen Baillie analizan resultados recientes.

Over the last four decades most of the data available on the trends in common terrestrial birds have come from the Common Birds Census (CBC). Many BTO volunteers have painstakingly recorded the locations of all birds on their CBC site from around 10 survey visits per summer. The results have regularly appeared in *BTO News*, furnished the BTO website www.bto.org/birdtrends and formed a basis for many scientific publications. Indeed, much of our knowledge of the decline in farmland birds over this period has come from the CBC.

BBS — A DIFFERENT APPROACH

For all the enormous influence of the CBC, however, the future will see an alternative approach to monitoring common birds. The CBC was concentrated largely in southeastern Britain, and the sites were selected by the observers themselves. Because of this, although the annual changes and population trends derived are believed representative of this region, it is less clear how well they reflect what is happening to the birds in the UK as a whole. This is particularly important for species such as Meadow Pipit and Pied Flycatcher, which are most common in north and west Britain. Since 1994, the BTO has been running a parallel monitoring scheme, the BTO/JNCC/RSPB Breeding Bird Survey (BBS), which will also be familiar to *BTO News* readers.

The BBS field protocol differs from that of the CBC in several details. Rather than rigorously identifying and recording breeding territories, simple counts of birds seen along two 1-km transects are recorded twice a year. This is less onerous and means that we have been able to recruit greater numbers of surveyors. Some 1,800 people now undertake this important work every summer, covering over 2,100 BBS sites. This has increased the coverage of squares throughout the country, especially in the less populated areas. BBS sites are based on 1-km grid squares, and are allocated at random. This makes the survey more representative of the range of habitats found in Britain, each of which supports a different range of species and numbers. In future research, the BTO will now use data from the BBS to assess national population changes.

THE NEED FOR CBC–BBS LINK

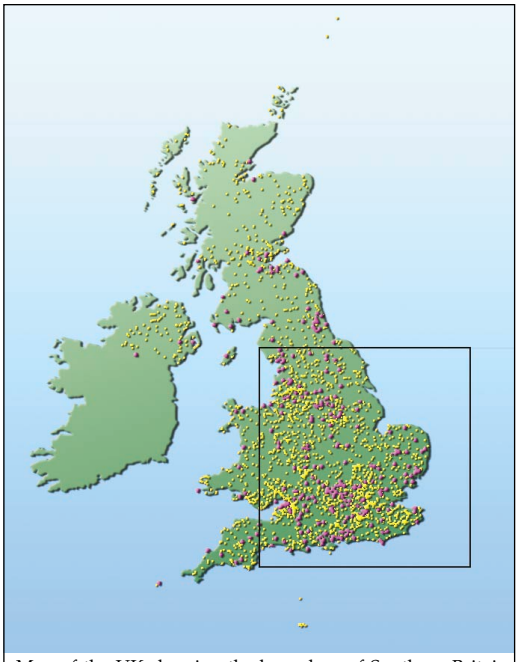
In order to interpret population trends fully, we will still require a longer-term perspective. This means that continuing comparisons will have to

be made with past results of the CBC. Such comparisons are only valid if the trends in numbers recorded by the two surveys are indeed consistent. We have recently completed an analysis of the two surveys in their years of overlap, to examine the validity of this comparison. These results will underpin future analyses of population levels with respect to those of the 1960s and 1970s.

PROMISING RESULTS

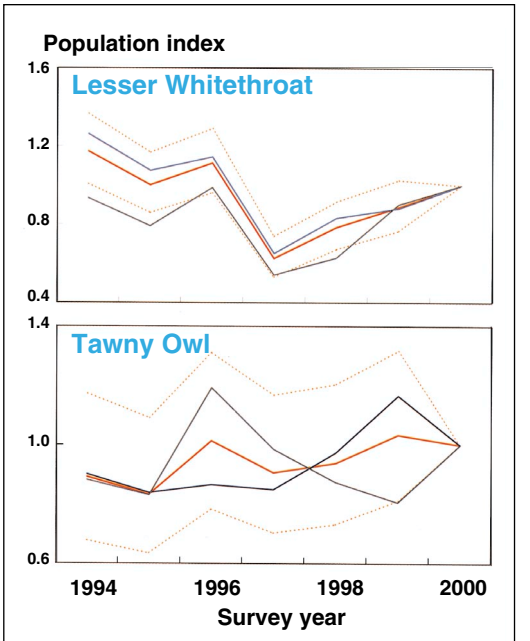
Gratifyingly, we found that for the vast majority of species, population trends calculated from CBC and BBS in southern Britain (within the boundaries shown in Figure 1) have been consistent since 1994. Marked and statistically significant differences were only revealed for Pheasant, Chiffchaff, Stock Dove and Coal Tit. For example, Pheasant shows a marked increase on BBS squares, while numbers on CBC plots have remained steady. Stock Dove, in contrast, remained steady on BBS squares but increased on CBC plots. For species other than these four, the consistency suggests that it is reasonable to produce population indices based upon both BBS and CBC data together.

The ultimate aim is to use both surveys to produce unbroken trends from when CBC started through to the 21st century, at least for the part of the country indicated in Figure 1. Two such trends (here just for the years 1994–2000) are shown in Figure 2, in comparison with those from the two surveys in isolation. Note that the combined trend for Lesser Whitethroat (and indeed almost all species) falls much closer to that obtained from the BBS alone. This reflects the far greater amount of information available from the larger number of BBS surveyors. Tawny Owl represents a rare exception; yet upon consideration this too is sensible. Although it is common, because it is a nocturnal species it will often be missed on the two early morning walks that make up an annual BBS survey. More



Map of the UK showing the boundary of Southern Britain used in the analyses presented in this report and the location of BBS squares (yellow) and CBC plots (purple) in 2000. The boundary of Southern Britain is defined by an easting of 3000 and northing of 5000 of the National Grid (after Fuller et al. 1985).

FIGURE 1. BBS squares and CBC plots used in analyses.



Comparison between BBS indices (blue) and CBC indices (green) within Southern Britain, with joint BBS/CBC indices (red) for the period 1994 to 2000 for Lesser Whitethroat and Tawny Owl. Indices are set to 1.0 for 2000. The dashed lines represent 95% confidence limits of the joint indices.

FIGURE 2. Comparison between CBC and BBS indices within Southern Britain.

information for this species actually comes from the smaller, yet more concentrated, territory-mapping study that is the CBC, and the jointly derived population index reflects this.

So can these joint indices be produced for the whole of the UK? This will require an assessment of population trends for the region indicated in Figure 1, the area where most CBC sites were concentrated, and areas outside. Should there be marked differences between these two regions, the combination of long-term data across the UK would be invalid, because substantial information for Scotland and the West has only been available since BBS has been operating. Because of this geographical difference between the two surveys

(Figure 1), comparison of trends for southern Britain and elsewhere is only practical based on data from the more widespread BBS. Given the diversity of habitats, it is perhaps not surprising to find that BBS data suggest significant differences in population trends between areas inside and outside of the square for 38 (52%) of the 73 species considered. These species cover a wide range — seed-eaters and insectivores, residents and migrants and a variety of taxonomic families — and full details can be found in a forthcoming BTO Research Report (No. 303). Nonetheless, the possibility remains for credible UK population indices dating right back to the start of the CBC for the remaining species. These would, of course, always carry the caveat that although geographical trends have been similar since 1994 this does not necessarily imply that they must have been so previously. In the absence of sufficient data from that period, this assumption cannot be tested.

These analyses were carried out as part of the BBS work programme and we are very grateful to JNCC and RSPB for their support.

HELP STILL NEEDED

To continue this work we welcome additional BBS volunteers for some areas. If you are interested in taking on a site in your area for this simple survey please contact Mike Raven at BTO Thetford HQ or e-mail mike.raven@bto.org.

REFERENCE

Fuller, R J, Marchant, J M and Morgan, R A. 1985. How representative of agricultural practice in Britain are Common Birds Census farmland plots? Bird Study 32, 56–70.

Bird Populations 7:143-146
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BTO News 243:8-10

WHAT HAPPENED TO BREEDING BIRD POPULATIONS IN 2001?

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Mike Raven, the BTO/JNCC/RSPB Breeding Bird Survey coordinator, looks at the findings for the Foot & Mouth-affected 2001 survey.

¿QUÉ LES OCURRIÓ A LAS POBLACIONES DE AVES REPRODUCTORAS EN 2001?
Mike Raven, coordinador del Conteo de Cría (BBS) de BTO/JNCC/RSPB, presenta los resultados del conteo de 2001, afectado por la fiebre aftosa.

In operation since 1994, the BTO/JNCC/RSPB Breeding Bird Survey (BBS) has proved to be highly successful in monitoring breeding bird populations in the UK. Each year, the results of BBS surveys carried out by thousands of volunteers are collated at BTO Thetford HQ and analysed over the winter. The annual BBS report summarises population trends for the UK for more than 100 species, and also provides population trends for many species in each country (England, Scotland, Wales and Northern Ireland) as well as the nine English Government Office Regions (GORs). In 2001, however, there was a problem; the Foot and Mouth Disease (FMD) epidemic that swept across the UK resulted in the closure of large areas of the countryside.

The BTO and its partners decided not to cancel the BBS altogether, but to collect data from observers who were able to gain access to their BBS route, or who were in urban areas where FMD was not a problem. Coverage is obviously biased towards these habitats, but the data that were collected are almost the only hint we have of what happened to terrestrial bird populations in the UK in the summer of 2001. It is in this context, not the long-term trends, that these results are presented.

METHODS

The BBS is a volunteer-based survey run by the BTO since 1994. 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, where birds are recorded on two visits per season. Its sampling and field protocols were designed to increase the level of coverage and eliminate the geographical and habitat biases of the long-running Common Birds Census (CBC). Since the CBC's final year in 2000, the BBS has become the principal terrestrial survey for monitoring population trends of common and widespread breeding bird species in the UK.

SURVEY COVERAGE

Despite the access restrictions imposed by the outbreak of FMD, a total of 581 BBS squares were completed in 2001, representing a considerable effort on the part of ROs and

observers alike. Large parts of the countryside were out of bounds to fieldwork, with the BBS being completely cancelled in Northern Ireland and North East England, and only very sparse coverage possible in Wales and much of western England. The South East and East of England were the least affected areas, although even there, only 40% of the coverage was achieved. Only in London was the survey virtually unaffected, with 87% of the squares visited in 2000 being surveyed in 2001.

SPECIES AND HABITAT COVERAGE

A total of 168 species was recorded in 2001 and of these, 63 species were found in 50 or more squares. No official UK rarities were reported, although a number of very localised breeding species were noted, together with several passage migrants and late winter visitors such as Black-necked Grebe, Bar-tailed Godwit, Sanderling and Knot. Not surprisingly, the access restrictions resulted in changes in the type of habitat surveyed. Urban and suburban squares formed a much larger proportion of the total area surveyed in 2001, resulting in gardens, parks and other man-made habitats forming 33% of the total habitat surveyed, instead of only 17% in 2000. Large areas of pasture and unimproved grassland remained out of bounds throughout the survey season, and this led to a considerable fall in the coverage of this habitat type, from 28% of the total in 2001 to only 13% in 2001. Upland areas of grassland, moor and bog were similarly affected. In contrast, arable farmland formed a larger proportion of the total habitat (although a much smaller number of sites) in 2001, while the percentage of woodland coverage was similar in both years.

POPULATION TRENDS

The bias caused by the shift in habitat coverage and the fact that 30% of the squares surveyed in 2001 did not receive an early visit, meant that analysis of the 2001 data was limited to considering just the late visits on those squares that were covered in both 2000 and 2001. Although coverage was much reduced, sample sizes were still large enough to produce inter-annual population indices for the UK, England and Scotland, plus three GORs within England; the South East, East of England and London. Although these inter-year changes cannot be linked to the longer-term population changes reported previously, the data collected in 2001 will be valuable in assessing population changes at particular sites and in associated research.

UNITED KINGDOM

Of 67 species recorded on at least 30 squares in the UK, 15 increased in numbers by 10% or more, 22 declined by 10% or more and 30 remained stable during 2000-01 (see Table 1). It must be stressed that considerable caution should be attached to all of these results, because of the differences in the type of habitat covered in 2001 compared with 2000. Results suggest that several familiar garden birds declined between 2000 and 2001, with Goldcrest numbers down 47%, Wren down 16%, Blue Tit down 14% and Robin and House Sparrow down 10%. Although some of these small-bodied residents are subject to considerable annual fluctuations in numbers caused partly by the severity of the previous winter, the recent run of wet springs may also be having an impact on the numbers of some species such as Blue Tit. Buzzard is now said to breed in virtually every county in England, and this expansion is borne out by the 56% increase in numbers recorded by the BBS between 2000 and 2001. The other two raptors monitored by the BBS also showed increases, with numbers of Sparrowhawk up by 11% and Kestrel up by 37% over the two-season period.

Recent concern over the populations of some of our woodland species appear justified by the fall in numbers of Treecreeper (down 37%) and Nuthatch (down 10%) during 2000–01. However, numbers of Green and Great Spotted Woodpeckers, Jay and Coal Tit increased, although it must be stressed that these results come from potentially biased samples.

ENGLAND, SCOTLAND AND WALES

Of the 581 squares surveyed in the UK, 483 were located in England, 71 in Scotland and 20 in Wales. Not surprisingly, with such a large proportion of the data coming from England, the English results were often similar to those

TABLE 1. Population changes of common and widespread species 2000–2001. (Estimates may be biased by unrepresentative coverage in 2001).

Species	Sample	Change 00-01	Species	Sample	Change 00-01
Cormorant	34	-26	Robin	434	-10
Grey Heron	91	-1	Blackbird	491	-5
Mute Swan	39	-3	Song Thrush	332	2
Canada Goose	50	-46	Mistle Thrush	165	2
Mallard	169	2	Sedge Warbler	49	-4
Sparrowhawk	36	11	Whitethroat	243	1
Buzzard	51	56	Garden Warbler	68	20
Kestrel	99	37	Blackcap	271	8
Red-legged Partridge	79	-12	Chiffchaff	204	20
Pheasant	250	-34	Willow Warbler	182	7
Moorhen	120	-1	Goldcrest	103	-47
Coot	58	35	Spotted Flycatcher	32	23
Oystercatcher	33	9	Long-tailed Tit	117	7
Lapwing	71	-12	Coal Tit	98	10
Curlew	35	-31	Blue Tit	434	-14
Black-headed Gull	94	-13	Great Tit	347	-9
Lesser Bl-backed Gull	83	-43	Nuthatch	58	-10
Herring Gull	94	-15	Treecreeper	33	-37
Feral Pigeon	164	-2	Jay	120	18
Stock Dove	123	-23	Magpie	371	-7
Woodpigeon	494	16	Jackdaw	244	-3
Collared Dove	290	-6	Rook	151	-2
Turtle Dove	60	-25	Carrion Crow	451	3
Cuckoo	81	-29	Starling	380	3
Swift	265	2	House Sparrow	339	-10
Green Woodpecker	121	11	Chaffinch	442	2
Gr Sp Woodpecker	135	23	Greenfinch	359	-4
Skylark	283	-5	Goldfinch	205	10
Swallow	265	9	Linnet	191	33
House Martin	183	1	Bullfinch	75	-18
Meadow Pipit	76	-11	Yellowhammer	207	-1
Pied Wagtail	167	0	Reed Bunting	48	28
Wren	462	-16	Corn Bunting	30	-15
Dunnock	363	-7			

for the UK. There were, however, a few differences, with numbers of Willow Warbler and Coal Tit declining in England over the last year, but not elsewhere. Meadow Pipit trends also differed regionally, showing a decline of 11% in the UK as a whole, while increasing by 20% in England. Of the 61 species detected in at least 30 squares in England, 17 increased in numbers by 10% or more, 17 declined by 10% or more and 27 remained relatively stable.

A number of scarce breeding species are being increasingly recorded on BBS squares, with Little Egret reported from Hampshire, Kent and Sussex, Cetti's Warbler from Suffolk and Red Kite from Berkshire and Oxfordshire. Wood Pigeon was the most widely recorded species in England, although it was closely followed by Blackbird, Carrion Crow, Wren and Blue Tit, all of which were recorded in more than 90% of squares.

The small number of squares surveyed in Scotland in 2001 severely restricted the number of species whose population changes could be assessed, with just nine species detected in 30 or more squares. Of these, Wren, Robin and Meadow Pipit appeared to show declines in excess of 10% in Scotland, as in the UK. On a more positive note, Black-throated and Red-

throated Divers, Golden Eagle, Merlin, Red Kite and Arctic Skua were all recorded from squares in the Highlands, together with Chough and Corncrake on Islay and Black Grouse in Lanarkshire. Chaffinch was the most widely recorded species on BBS squares in Scotland, followed by Wren, Willow Warbler and Meadow Pipit.

No data were received for Northern Ireland or the Isle of Man, and because of the small number of squares surveyed, we were unable to produce any population indices for Wales. Fortunately the BBS remained unaffected on the Channel Islands, where Short-toed Treecreeper was recorded on three of the six squares surveyed on Jersey.

ENGLISH REGIONS

We were able to produce population change measures for the 2000–01 period for three of the nine English GORs; the South East, East of England and London. Although estimates for the South East and East of England are biased by unrepresentative coverage, counts suggest that many familiar garden birds declined over this short period. Mistle Thrush numbers were down by 40% in the East, Long-tailed Tits by 30% in the South East and Blue Tit and Great Tit numbers fell by more than 10% in both regions. On a brighter note, both Green and Great Spotted Woodpeckers increased by more than 10%.

Coverage in the London region was close to the levels achieved in 2000, and this resulted in a relatively unbiased sample being obtained for 2001. BBS data since 1994 have shown the decline of the House Sparrow to be greatest in London and this was again apparent, with a 25% fall in numbers recorded during 2000–01. Numbers of Swift and Starling also declined, falling by 37% and 12% respectively over the same period. In common with the overall UK trend, Blue Tit numbers declined in London, falling by 28% during 2000–01, whereas Wren and Wood Pigeon both increased by 11%. The latter, together with Blackbird, was the most widespread in London, being recorded in 94% of squares.

THE FUTURE

Firstly, we are again extremely grateful to all the ROs, observers and members alike 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 during the FMD crisis. 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. The data you collect each year are used by government and non-government conservation organisations to identify priorities for research and conservation initiatives, which aim to improve the overall status of declining species. The scheme has already proved invaluable for identifying regional differences in the population trends of such species as Song Thrush, House Sparrow, Swallow and Starling.

The outlook for 2002 is very positive with larger than expected numbers of forms being sent out to ROs, and a general feeling that people are very keen to get out into the field again and take part in what is a very enjoyable and interesting survey. The number of completed forms returned for 2002 has already far exceeded the total for 2001, with at least two lucky observers recording White-tailed Eagle on their squares, and one obtaining the schemes' first ever sighting of Minke Whale! So you never know what you might find out there.

Copies of the report are available from Mike Raven at BTO Thetford HQ, price £5.00 inc p&p.

Bird Populations 7:147-150
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BTO News 242:8-9

WATERWAYS MONITORING UPDATE

JOHN MARCHANT AND PETER BEAVEN
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The Waterways Breeding Bird Survey (WBBS), still under development but now expanded in scope, is currently running alongside the long-established Waterways Bird Survey (WBS). *John Marchant* and *Peter Beaven* report on latest results and future prospects.

INFORME DEL MONITOREO DE CURSOS ACUÁTICOS
El Conteo de Cría en Cursos Acuáticos (Waterways Breeding Bird Survey - WBBS), todavía en periodo de desarrollo pero ampliado en alcance, está siendo ejecutado junto al veterano Conteo en Cursos Acuáticos (Waterways Bird Survey - WBS). John Marchant y Peter Beaven informan sobre los últimos resultados y planes a futuro.

The importance of a specific scheme to monitor the breeding birds along waterways has been recognised by the BTO since the early 1970s. Data from the WBS mapping survey then supplemented those from the Common Birds Census (CBC) for 27 years, extending coverage to a wider range of species. For specialist waterbirds, including Canada and Greylag Geese, Goosander, Common Sandpiper, Kingfisher, Dipper and Grey Wagtail, WBS has long been the most reliable provider of trends in breeding numbers (see www.bto.org/birdtrends).

CBC has now handed on its role of monitoring in the wider countryside to the BTO/JNCC/RSPB Breeding Bird Survey (BBS). There is still a need for specific surveys of waterways, however, because there are about nine waterside bird species for which BBS samples are too small to match the precision of monitoring that WBS mapping currently provides.

The origins of WBBS lay partly in the realisation that BBS would not be able to match the existing level of coverage for waterside birds, and partly in a strategy to transfer BBS's advantages of random plot selection and quick-and-easy fieldwork to this closely related sector of the monitoring programme. Furthermore, WBBS is designed specifically to meet the needs of the Environment Agency and similar UK bodies that have statutory responsibilities for nature conservation along waterways.

WBBS has been operating alongside WBS mapping since 1998. The field methods of the new scheme are based heavily on the BBS's transects, with early and late counting visits. We chose a name for it that reflects its links to BBS, despite the potentially confusing similarity that results between the names of the BTO's two surveys of waterway breeding birds! Newcomers to WBBS who had BBS experience would notice little difference between the schemes, except that the transect sections run alongside the selected waterway rather than approximating to a standard straight-line pattern, and are not 200 m but 500 m long, matching the Environment Agency's River Habitat Survey. In work reported elsewhere, we

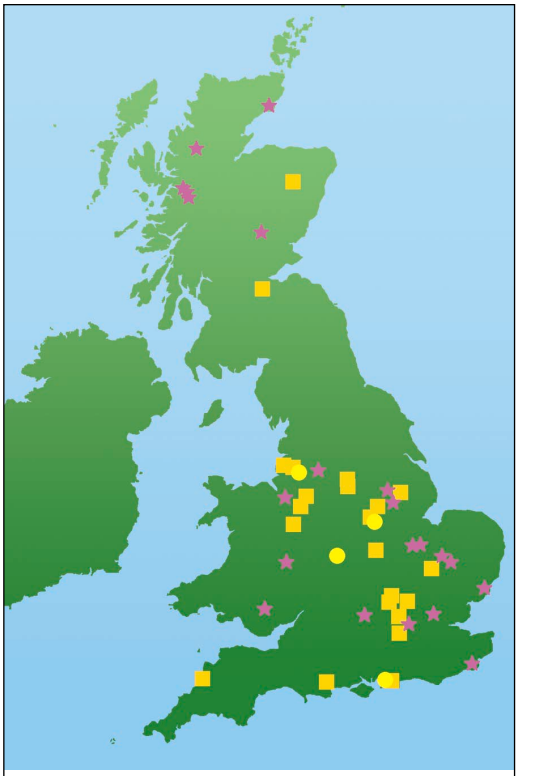
have analysed links between the RHS data and patterns of bird abundance.

BTO volunteers have provided coverage for two sets of WBBS stretches. First, BTO Regional Representatives have sought coverage of 263 randomly selected sites. These can be taken as a representative sample of UK waterways. Second, observers who contribute to the WBS mapping survey have been asked to carry out a WBBS as well, to provide a direct comparison of the two methods, with observer, year and site unchanged. This WBS-matched sample is non-random, because WBS observers are free to select their own study sites.

SURVEY COVERAGE IN 2001

We are very grateful to the 47 observers who managed to complete their WBBS in 2001, in some cases despite access restrictions for the early part of the season due to Foot and Mouth Disease (FMD). There were 21 randomly selected stretches covered, and 26 non-random stretches, of which 22 were linked to WBS mapping surveys. Their distribution shows quite clearly a general problem that will affect BTO survey results for 2001 — the concentration of fieldwork into areas where access restrictions were least widespread (Figure 1). No WBBS surveys were conducted in Northern Ireland, Devon or Northumberland, areas where the survey was effectively cancelled for the year. Surveys were no problem in those few areas where rural footpaths remained open and alongside urban waterways, where access was generally little affected. We are grateful to landowners who were able to give special permission for surveys to proceed.

In all, 23 WBS mapping surveys were completed in 2001— a drop from 97 in 2000. Three WBS plots, on the Leeds-Liverpool, Bude and Shropshire Union Canals, were welcome additions to the scheme in 2001. Coverage of three other plots was renewed in 2001 after a few years' interval.



The 47 sites at which WBBS fieldwork was conducted in 2001. Surveys at randomly chosen locations are shown as pink stars, those conducted at non-random WBS plots as orange squares, and other non-random sites as yellow spots.

FIGURE 1. WBBS sites for 2001.

WBS RESULTS FOR 2001

There were 15 WBS surveys in 2001 that could be paired with surveys in 2000 at the same sites, and so contribute to the calculation of population change. With such a reduced sample, the number of species for which a population change can be estimated from WBS is only nine, much less than the usual 22 or so, and we were unable to report on some of our target riparian specialists (Table 1).

A notable feature of the WBS results is that two-thirds of the changes tabulated, including those for the five most numerous species, are negative. The extent to which this observation may relate to changes in the pattern of census coverage is presently unclear, but may become more apparent once more years are added to the data and it becomes possible to view the 2001 season in a broader context.

WBBS POPULATION CHANGES, 2000–01

Because stretches surveyed vary in length, counts from each WBBS plot are converted to an

TABLE 1. WBS estimates of population change for 2000–01.

Species	Territory total 2000	Territory total 2001	% change	No. of contributing plots
Mute Swan	25	24	–4%	8
Mallard	345	305	–12%	14
Moorhen	187	175	–6%	13
Coot	169	133	–21%	9
Grey Wagtail	17	17	0%	8
Pied Wagtail	9	17	+89%	8
Sedge Warbler	143	112	–22%	12
Whitethroat	75	69	–8%	12
Reed Bunting	45	50	+11%	10

The estimates of population change for 2000–01 were drawn from 15 plots in total for which comparable data were received for both years. No estimates are given where the number of contributing plots was less than 8.

TABLE 2. WBBS population changes between 2000 and 2001.

	Random sites Mean count/10 km			WBS-linked sites Mean count/10 km		
Species	2000	2001	% change	2000	2001	% change
Grey Heron	3.8	4.6	+20%	9.2	8.8	–4%
Mute Swan	7.8	3.0	–62%	18.9	7.5	–60%
Mallard	50.0	51.0	+2%	84.9	69.0	–19%
Moorhen	16.2	15.3	–5%	19.0	16.2	–15%
Wood Pigeon	80.3	76.4	–5%	92.1	82.1	–11%
Swallow	15.8	11.4	–28%	13.1	18.6	+42%
Wren	29.3	26.5	–10%	53.8	41.6	–23%
Dunnock	5.9	7.2	+22%	13.2	8.9	–33%
Robin	11.3	11.5	+3%	21.8	19.3	–12%
Blackbird	29.5	27.7	–6%	40.5	40.1	–1%
Song Thrush	4.4	4.5	+1%	8.8	19.2	+120%
Sedge Warbler	18.5	16.1	–13%	13.4	9.1	–32%
Blue Tit	16.9	12.3	–27%	27.2	23.9	–12%
Great Tit	8.7	4.7	–46%	19.8	16.7	–16%
Magpie	10.0	11.1	+11%	14.0	19.9	+42%
Jackdaw	15.5	18.4	+18%	30.4	26.5	–13%
Carrion Crow	19.8	16.9	–14%	27.9	33.6	+20%
Starling	52.7	69.7	+32%	64.4	54.5	–15%
House Sparrow	26.1	23.6	–10%	24.9	17.0	–32%
Chaffinch	25.6	19.4	–24%	40.6	35.6	–12%
Goldfinch	10.1	10.3	+2%	11.2	7.1	–37%

Percentage changes in population between 2000 and 2001 as estimated from WBBS data. Sample sizes of plots were between 13 and 17.

estimated number per 10 km. Mean figures for 2000 and 2001 across paired sites (covered in both years) are presented in Table 2, together with the percentage change between the two. Results for the two main divisions of the WBBS sample, random and WBS-linked, are shown separately.

Because of FMD, both samples have substantial geographical and habitat bias. The values of the mean counts, as well as the percentage changes, can nevertheless be compared between the two samples. Interestingly, the mean counts in the WBS-linked sample are generally higher than among the random sites, substantially so in the cases of species as diverse as Mallard and Wren. A likely explanation for this is that WBS observers select sites that hold more birds than

average. Percentage changes often differ widely between the two samples: of the 21 species tabulated, there are nine cases where the signs of the estimates disagree. For some of the commonest species (Woodpigeon, Wren, Blackbird, Chaffinch), however, and for the species that apparently changed the most overall (Mute Swan), both estimates suggest a decline. Sedge Warbler decreased substantially according to all three measures presented here; it also recorded a decrease on BBS and CES plots in 2001.

Our feeling is that the discrepancies between the WBBS samples stem from the variability of the data. They emphasise the need for monitoring to be based on sample sizes an order of magnitude larger than was achievable in the difficult circumstances of the 2001 spring.

HOW CAN 2001 DATA CONTRIBUTE TO LONG-TERM MONITORING?

The data from WBS and WBBS give some indication of population changes between 2000 and 2001, although the small samples and the bias in plot distribution towards disease-free regions and habitat types must be borne in mind. For now, however, they add little to developing ideas about longer-term population change along the UK's waterways, because of the difference in plot distribution compared with earlier years. As more years' data are added to the sample, it may become practical to make full use of the 2001 data that exist.

WBBS DEVELOPMENT IN 2002–03

Spring 2002 saw the start of Phase 3 of WBBS development, which includes a major expansion of the random sample. An additional set of waterways has been selected randomly, bringing to 511 the number of random plots for which annual cover is now being requested. Details of these stretches are with RRs, who have already been successful in finding observers. Already, returns for 2002 include 27 random sites not covered in earlier years. We are very grateful to all WBBS participants, whether 'old hands' or new to the scheme in 2002. Naturally, we are hoping that existing WBBS participants will continue their support for the scheme over the coming seasons.

To achieve our aim of a doubling in the number of random surveys, however, we need many more new observers for 2003. Figure 2 shows the locations of waterways selected but for which no data have yet been returned to HQ. If you can help with a new site, please contact your RR or John Marchant at The Nunnery for details of the site and a recording pack.

We are very pleased to report that no fewer than nine new mapping WBS sites were due to start in spring 2002. The long-running WBS also needs continuing support, to ensure that we collect sufficient data to calibrate WBBS trends against those from WBS over a long-enough overlap period.

This project is funded by the Environment Agency.

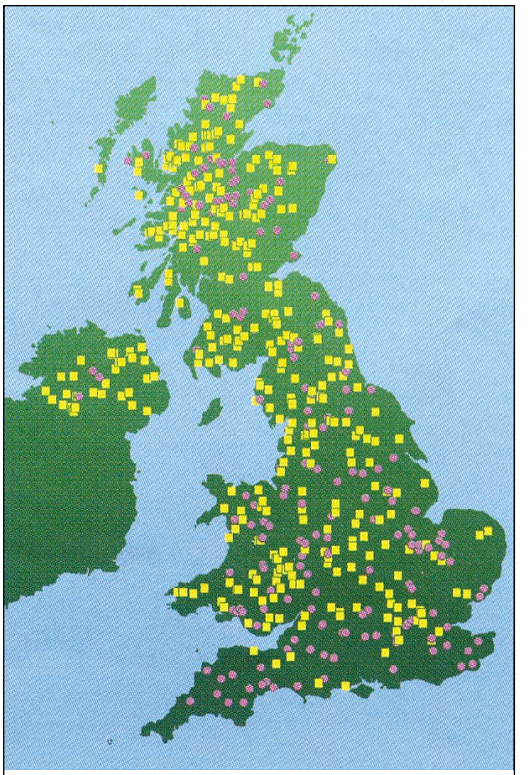


FIGURE 2. WBBS's 511 random sites.

Bird Populations 7:151-155
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BTO News 239:14-15

CES COMES OF AGE

DAWN BALMER AND LINDA MILNE
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Despite Foot & Mouth disease, ringers were able to continue to monitor population changes on their Constant Effort Sites. *Dawn Balmer* of the BTO's Demography Unit and *Linda Milne* of the Ringing Unit report on the 21st year of CES.

EL CES YA ES MAYOR DE EDAD

A pesar de la fiebre aftosa, los anilladores pudieron continuar el seguimiento de cambios poblacionales en su Sitios de Esfuerzo Constante (CES). Dawn Balmer, de la Unidad de Demografía del BTO, y Linda Milne de la Unidad de Anillamiento, informan sobre el vigésimo- primer año del CES.

CES ringers are a really dedicated bunch of people, up bright and early to set their nets and to catch birds. CES ringing involves making 12 visits to each site through the breeding season, spread evenly between late April and the end of August.

Given the standardised CES approach, we are able to use data from catches to monitor changes in the abundance and productivity of common breeding songbirds. Variations in the total number of adults caught indicate changes in population size, whilst the ratios of young birds to adults are used to monitor changes in breeding success. Annual survival rates can also be obtained from retraps of birds ringed in previous years. The CES Scheme is an essential arm of the BTO's Integrated Population Monitoring Programme. 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).

IMPACTS OF FOOT & MOUTH — COVERAGE IN 2001

With so many BTO surveys quite badly curtailed by Foot & Mouth, it was with great apprehension that we waited for CES annual returns to arrive at BTO HQ. How many would there be? Coverage was at an all-time high in 2000, with 147 sites operated. We are delighted that so many ringers were in fact able to carry out constant effort ringing in 2001 — 98 sites (with more sites yet to come in).

We checked for any regional effects of Foot & Mouth by comparing the number of sites operated in 2000 and 2001 in five broad regions across Britain and Ireland. For the purposes of this analysis, Wales has been included in the Central region. For Southern England, the Central region and Ireland, coverage in 2001 was only slightly down compared with 2000, and for Scotland coverage was actually better in 2001, with new recruits to the scheme. Only for Northern England was the difference in coverage notable (Figure 1). Devon was also badly affected by Foot & Mouth but the impact on CES was negligible, because there is currently only one CES site there. Thankfully, we have no reason to believe that Foot & Mouth has introduced much spatial bias into the CES results this year.

The results that follow come from the 98 sites that have submitted data for 2001 so far — 74

from England, 15 from Scotland, five from Wales and four from Ireland. Nine sites were operated for the first time in 2001. The habitats covered are comparable to previous years, (mostly in reedbed, wet and dry scrub and a small number in deciduous woodland).

BUOYANT ADULT POPULATIONS

The run of mild winters, including 2000/2001, has been good news for populations of resident species, such as Robin, Chaffinch and Greenfinch. Table 1 shows the changes in captures on CES sites from 2000–2001. There were statistically significant increases in the number of adults caught for five resident species (Blackbird, Blue Tit, Great Tit, Chaffinch and Greenfinch) and one migrant species (Whitethroat). Chaffinches and Greenfinches have been doing rather well over the last few years, their populations showing long-term increases on CES sites. Adult populations of Blue Tits and Great Tits fluctuate greatly over time and are particularly sensitive to cold winters. Blackbird is currently an amber-listed species (medium conservation concern) due to a moderate decline in UK breeding populations, so an increase of 18% on CES sites between 2000 and 2001 is welcome.

The number of adult Whitethroats caught on CES sites increased significantly between 2000 and 2001 and the long-term trend shows a fascinating cyclical pattern (Figure 2). Our Whitethroats winter in West Africa and it is

TABLE 1. Changes in captures on CES sites from 2000 to 2001.

	2001				Adult Abundance		Productivity (juvs per adult)	
	Adults		Juveniles					
Species	Sites	Total	Sites	Total	% change	trend	% change	trend
Wren	87	619	87	1207	-10	→	-11	→
Dunnock	87	606	85	728	+9	→	-24*	→
Robin	87	517	87	1452	+8	↑	-15*	↓
Blackbird	90	1030	78	629	+18*	↓	-32*	→
Song Thrush	75	276	60	202	-1	↓	-6	→
Sedge Warbler	57	983	55	875	-5	→	-32*	↓
Reed Warbler	40	1651	46	1340	-3	↓	-23*	→
Lesser Whitethroat	21	72	27	133	-9	↓	-20	→
Whitethroat	55	383	56	538	+37*	→	-18	↓
Garden Warbler	59	293	53	251	-1	→	0	↓
Blackcap	82	815	80	1150	+1	↑	-30*	→
Chiffchaff	60	339	71	958	+12	↑	-24*	↓
Willow Warbler	79	1109	80	1467	-9*	↓	-4	↓
Long-tailed Tit	71	413	64	646	-1	→	-39*	→
Willow Tit	7	14	11	30	-5	→	-49	→
Blue Tit	89	685	88	1252	+28*	→	-43*	↓
Great Tit	85	470	85	1152	+17*	→	-15	↓
Treecreeper	40	77	54	143	-2	→	-13	→
Chaffinch	30	680	58	442	+13*	→	-1	↓
Greenfinch	38	287	30	124	+35*	↑	-34*	↓
Goldfinch	32	87	14	50	-7	→	+6	↓
Linnet	8	25	13	22	+2	↓	-6	↓
Bullfinch	69	365	51	230	-12	↓	-11	→
Reed Bunting	51	332	37	136	+14	↓	-33*	↓

Total = total number of individuals captured on sites
% change = percentage change in numbers of birds caught between 2000 and 2001
* = significant change at the 5% level
trend = long-term trend during the period of CES ringing.
↑ = long-term trend shows an increase
↓ = long-term trend shows a decline
→ = long-term trend shows stability

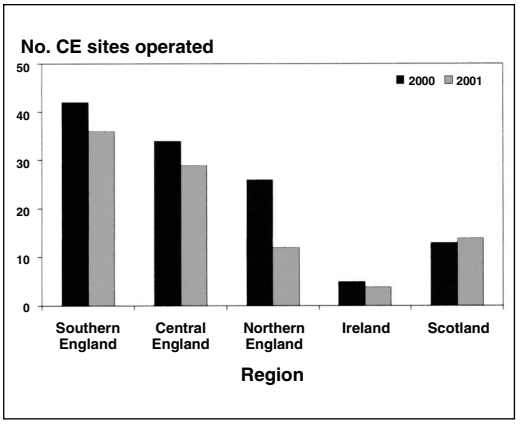
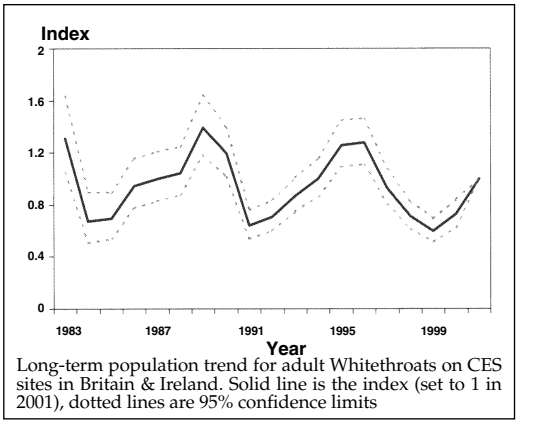


FIGURE 1. CES coverage in Britain and Ireland in 2000 and 2001.



Long-term population trend for adult Whitethroats on CES sites in Britain & Ireland. Solid line is the index (set to 1 in 2001), dotted lines are 95% confidence limits

FIGURE 2. Long-term population trend for adult Whitethroats.

widely acknowledged that drought in the Sahel region correlates with reduced catches of Whitethroats. Drought conditions must have been severe in 1984, 1985 and 1991 and the effect of these years can be seen in Figure 2. The steady drop in numbers of adults caught between 1997 and 1999 is a little anomalous. Previous declines have occurred when conditions in the wintering grounds were unfavourable. The upturn in fortune since 1999 is promising, and it will be interesting to see how the pattern continues over the next ten years. It would be nice to have a closer look at the factors influencing the population changes of this species.

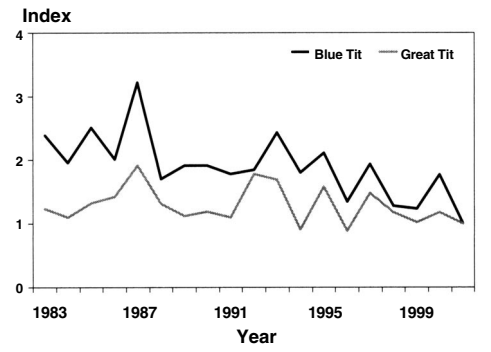
Willow Warbler was the only species to show a statistically significant decrease in adult numbers between 2000 and 2001, a continuation of the worrying long-term decline of this species on CES sites (see *BTO News* 233 p11 for more information).

POOR BREEDING SUCCESSES

Telephone calls and e-mails from CES ringers, anxious to find out how other sites across the country were faring, were a prominent feature of mid-summer. Many ringers were reporting low catches of juveniles, particularly for Blue Tits, Long-tailed Tits and Sedge Warblers, and wanted to know what was happening elsewhere — was it a late breeding season or a local phenomenon? The results (Table 1) show that breeding success in 2001 was poor for many species: 11 of the 24 species monitored showed a statistically significant decline in productivity, including both residents (Dunnock, Blackbird, Robin, Long-tailed Tit, Blue Tit, Greenfinch and Reed Bunting) and migrants (Sedge Warbler, Reed Warbler, Blackcap and Chiffchaff). The declines also encompass species that breed early (e.g. Robin) and late (e.g. Reed Warbler). For some of these species, the long-term pattern shows increasing or stable productivity, so that the declines this year may just be short-term 'blips'. For those species showing long-term declines in productivity (e.g. Reed Bunting), the trend is of more concern.

A comparison of the long-term trends in productivity for Blue Tit and Great Tit (Fig 3) reveals some interesting patterns. Breeding success has declined significantly for both species, but more markedly for Blue Tit. The between-year changes have been remarkably similar through time, suggesting that environmental variables play a similar role in affecting reproductive output. Recent analyses using CES data have shown that productivity is negatively correlated with temperature and rainfall for both Blue Tit and Great Tit.

As ever, new CES sites are welcomed, particularly from southwest England, Wales, Ireland and Scotland. Please contact Dawn Balmer at BTO Thetford HQ for further information. If you are interested in finding out more about ringing in general, then please contact the Ringing Unit at BTO Thetford HQ.



Long-term trends in productivity for Blue Tit and Great Tit on CES sites in Britain & Ireland.

FIGURE 3. Blue Tit and Great Tit productivity trends.

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 2001.

Whilst space prevents us from acknowledging all CES ringers, we would like to thank the following ringers and groups for their continued support: G E Austin, Aylesbury Vales RG, Barnsley RG, S Bodnar, A W Bowles, Brandon RG, H Brazier, I K Brockway, Chew Valley RS, Clyde RG, J L S Cobb, Dartford RG, C Donald, Durham Dales RG, East Yorkshire RG, I Grier, S Hales, A G Harbott, K J Herber, C

CONSTANT EFFORT RINGING ON A EUROPEAN SCALE

Following a meeting of representatives from ringing schemes across Europe in 1999, on Helgoland, a formal project has been set up, led by the BTO and endorsed by the European Union for Bird Ringing (EURING). There are three main aims: (i) to assess the current activities and methods of CES schemes in Europe; (ii) to develop guidelines for CES fieldwork methodology that are suitable for the particular conditions in each country, and for data exchange and analysis; (iii) to assess the potential for producing comparative and perhaps combined trends for a common suite of species across Europe.

Besides Britain and Ireland, seven countries are now operating CES-style schemes: Finland, France, The Netherlands, Spain, Germany, Sweden and Poland. Over the last year, we have been working closely with our European colleagues, particularly those in France, The Netherlands and Finland, who have the longest running schemes, to investigate ways of comparing trends between countries. So far, we have been able to look at adult numbers for a suite of species that are commonly caught.

The trends for Willow Warbler adult abundance are shown in Fig 4. A decline has occurred in all four countries with a particularly steep decline in France, where the Willow Warbler is on the southern edge of its range.

Over the coming months we will be continuing this very exciting work, and we will report in full in a future edition of *BTO News*.

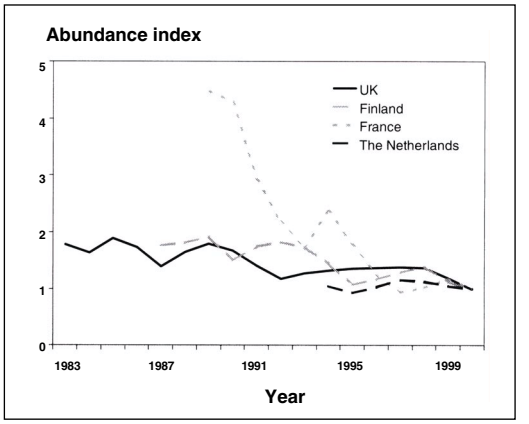


FIGURE 4. Willow Warbler adult abundance across Europe.

G Hughes, T Kittle, Maple Cross RG, S J Martin, C M & J Murray, North Down RG, P Newton, A N Poole, Runnymede RG, Rutland Water RG, B Shaw, W F Simcox, Sorby Breck RG, R L Swann, N & J Tardivel, Tay RG, Tring RG, R Ward-Smith, W J Webber, H A Williams, M A Wilson, M A Woodhead, M Wright, Wychavon RG (BO= Bird Observatory, RG= Ringing Group, RS= Ringing Station).

We would like to acknowledge the support and commitment of the late Alan Hilton and the late Mike King to the CES Scheme; their enthusiasm and dedication will be sadly missed.

ACKNOWLEDGEMENTS

Thanks to Chris Wernham, Steve Freeman, Jackie Coker, Angela Rickard and Viv Hiom for help running the CES Scheme and processing the data.

The CES Scheme was undertaken within the Partnership between the BTO and JNCC as part of its programme of research into nature conservation.

Bird Populations 7:200-201
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BTO News 240:15

STONECHATS AND STARLINGS SPURRED ON BY SPRING WARMTH

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BTO Research Biologist, *David Glue*, draws on observations from BTO nest recorders, surveyors and ringers, to review the nesting fortunes of the UK's birds so far this year.

TARABILLAS Y ESTORNINOS INCENTIVADOS POR EL CALOR PRIMAVERAL
El biólogo del BTO David Glue utiliza observaciones de registradores de nidos, conteadores y anilladores del BTO para evaluar las suertes de las aves del Reino Unido en lo que va de año.

Last year, 2001, showed yet again that a relatively mild winter and early spring warm spells do not necessarily lead to a successful breeding season. The mixture of cool, damp spring weather, followed by heatwaves in the summer impaired the breeding success of resident and migrant insectivores, many seed-eaters, waders, gamebirds and raptors (*BTO News* 237, 239).

On a more upbeat note, 2001 revealed further range expansions, (compared with *The New Atlas of Breeding Birds in Britain and Ireland: 1988–91*). These included Little Egret and Marsh Harrier (southern counties); Osprey and Dartford Warbler (Midlands); Avocet and Roseate Tern (N England); Hobby and Little Ringed Plover (Wales); Red Kite and Nuthatch (Scotland).

YULETIDE FREEZE HALTS LATE NESTING GREBES

In 2001, the coolest September since 1994 hastened the end of a 'below par' breeding season. A few resilient seabirds, as well as Mute Swans, Little Grebes, Tufted Ducks and hirundines were noted tending growing families. From 19–26 September, an unseasonably cold northeasterly blast, led to reports of orphaned, moribund or dead chicks of Manx Shearwater, Gannet, Stock Dove and House Martin.

A few species took advantage of the mildest October in some 300 years, courtesy of a warm, moist Atlantic airflow of tropical origin. Among those species rearing late broods were Moorhen (Bucks), House Martin (Staffs, Borders), Greenfinch (Oxon) and Stock Dove (Dyfed, Kent).

November maintained the mild theme. With frosts scarce, and growing seasons extended by a fortnight or more, Great Crested Grebe (Beds, Merseyside), Barn Owl (Lincs, Wilts), Coot and Feral Pigeon (various localities), were all seen looking after young. At Llanelli and Martin Mere WWT reserves, late hatching Mallard chicks coincided with the arrival of wintering Whooper Swans.

Mild interludes in an otherwise raw December, prompted tits, Mistle Thrushes, Robins, Jackdaws and Ring-necked Parakeets to sing, display territorial intent or explore for potential nest sites. Penetrating frosts and snow, affecting all areas by the year's end, effectively ended all nesting behaviour. Ironically, this

exceptionally warm calendar year (globally the second warmest on record after 1998), proved poor overall for UK's breeding birds.

NESTING SONG THRUSHES DEFY NEW YEAR STORMS

New Year's Day bird counts were undertaken in crisp and sunny, but freezing weather. Severe frosts on the 2nd saw temperatures dipping as low as –13°C in parts of Scotland. Emaciated corpses of Teal, Water Rail, Dunlin, Redwing and various finches, figured among cold-weather related losses reported to the BTO Ringing Office and the Natural History Museum. The cold snaps were never long enough, though, for any substantial impacts. Sea watching conditions for shearwaters and petrels in the New Year were more akin to October.

From mid January, the UK was battered by a string of vigorous troughs and deep depressions. Stick nest platforms, tree cavities, boxes and out-buildings used long-term by Red Kite, Buzzard, Grey Heron, Goldeneye and woodpeckers were destroyed. Spring-like spells from mid month, with temperatures of 10–14°C contributed to the warmest January since 1992. This led to premature nest-building and egg-laying. Attempts by Feral Pigeons and Collared Doves were not unexpected, but free-flying broods of Blackbirds (Bideford, Liverpool), Song Thrushes (Bedford, Chester) and Woodpigeons were more unusual.

VALENTINE'S DAY HEAT PROVIDES NESTING STIMULUS

A warm, very wet and windy February enhanced the early breeding picture. Temperatures approached 15°C on many days. By the month's end, 18 species with active nests had been reported to the BTO. Cases of egg-laying Grey Heron, Mallard, Egyptian Goose, Tawny Owl, doves and thrushes were not too surprising, especially in the south midlands and Thames Valley, where temperatures were 4°C above average. More surprising were well-grown or fledged broods of Robin (Leicester), Starling (Truro, Cornwall; Mountsandel, Coleraine) and Pheasant (Soar, Devon). Most success stories were in the protected warmer environs of suburbia (gardens, markets, shops, warehouses) or rural hamlets in valley or coastal settings — often aided by supplementary foods. Birds were helped by few frosts and little snow, but regular lashing rains (the wettest February since 1990) presented problems.

Events were far less advanced in Scotland and N Ireland, where daily temperatures were just 0.5°C above average and double the normal rainfall was endured. Elsewhere, conditions were good for certain wintering waders that had shown recent increases, notably Avocet, Black-tailed Godwit and Spotted Redshank (*WeBS News* 15, 2002). Mid month saw auks, Gannets and Fulmars returning to colony ledges; while Lapwings, Curlews and Ringed Plovers displayed early at inland sites.

WARM EASTER PROVIDES BOOST FOR BREEDING RESIDENTS

A quiet St David's Day saw a spurt in nesting activity, with early clutches started in the first week of the month by Peregrine (Gwent), Raven (Denbigh), Rook (Bucks) and Wren (Surrey). Osprey (Highland), Stone Curlew (Breckland, Norfolk) and Sand Martin (Worcester) were back at old haunts (reported to BTO *Migration Watch*), but generally slow to show nesting intent. Severe gales that followed, with temporary snow on northern hills, rocked treetop egg-laying Grey Herons, corvids, Cormorants and Mistle Thrushes.

Warm southerly airflow in mid March, with temperatures reaching 17°C along the south coast, prompted another surge in egg-laying, among grebes, dabbling ducks, Robins and thrushes. Noteworthy cases involved Canada Goose (Home Counties), Dipper (Gwynedd), Woodlark (Dorset) and Stonechat (New Forest). Brambling and Siskin lingered in gardens, singing tantalizingly. Following a 'gap' year caused by Foot and Mouth disease access restrictions, long-time BTO surveyors bemoaned the disappearance of Willow Tit, Lesser Spotted Woodpecker, Hawfinch and House Sparrow from survey areas. Others, encouragingly, reported fresh sites taken by Bittern, Red Kite, Raven and Black Redstart over a mild early Easter spell. The experience of recent years prompts a cautious outlook overall for the UK's breeding birds in 2002, though, as early clutches of Long-tailed Tits, Chiffchaffs and Swallows (Devon) were lost in the April chill.

Bird Populations 7:202-203
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BEE-EATERS — THE STARS OF AN UPBEAT BREEDING SEASON

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BTO Research Biologist, *David Glue*, outlines how nesting success by Avocet, Bee-eater and Chough will ensure that 2002 figures in bird history books.

ABEJARUCOS – LAS ESTRELLAS DE UNA TEMPORADA REPRODUCTIVA ANIMADA

El biólogo del BTO David Glue explica cómo el éxito reproductivo de la avoceta, el abejaruco y la chova piquirroja asegurarán que el 2002 figure en los libros de historia…

The UK's breeding birds in 2002 faced challenges from extremes of weather — premature spring warmth, nullified at times by destructive wind chill, record-breaking summer rains contributing to see-sawing water levels, torrid mid-summer heat triggering monsoon-like tropical downpours — it was all there. In spite of this there were reports of Hen Harrier, Cormorant, Avocet and Roseate Tern nesting for the first time in Cornwall, Bucks, Hants & Cheshire and Cleveland respectively. Raucous young Peregrines upset cathedral choral evensong at Chichester, Sussex and healthy populations of Short-eared Owls were bolstered by a peak in vole prey (Borders Region).

Such events were countered by stories of many bedraggled Mute Swan cygnets drowning (River Thames, Oxford), a Little Tern colony destroyed by vandals (Great Yarmouth, Norfolk) and auk, tern and Kittiwake chicks starving through a shortage of sand-eels (Shetland).

GREY HERON AND STONECHAT SPURRED ON BY SPRING HEAT

BTO nest recorders and surveyors ventured forth with greater expectations in spring 2002, following the somewhat poor breeding season for many species in 2001 (*BTO News* 237, 239). Survival and breeding chances were enhanced by a very mild, if cheerless March, with a dominant cloudy southwesterly airstream. This prompted a premature return of seabirds to coastal ledges and waders to inland wetlands. Conditions favoured a surge in egg-laying by grebes, dabbling ducks, doves and thrushes, with noteworthy clutches started by Canada Goose, Raven, Stonechat and Woodlark by mid-month.

Tail winds hastened the return of some spring migrants, including earliest ever Swallow, Grasshopper Warbler and Cuckoo to the Northern Isles during the third week. The swiftest yet Osprey also reached the Loch of Lowes (Perth) on the 19th but, sadly, the famous Loch Garten (Highland) site was unoccupied after a sequence of 43 years.

Early breeding promise was enhanced during a gloriously dry, and initially settled, April with temperatures climbing to 25°C. Broods of Grey Heron, Egyptian Goose, Woodcock, Mistle Thrush and Dipper fledged during the third week.

SAND MARTIN, REDSHANK AND TITS SATURATED BY SPRING RAINS

Yet again, with spring seemingly well set, a swift shift to inclement, unsettled weather from late April depressed much nesting activity. Torrential deluges, strong winds and a sharp drop in temperatures all played a part in heavy losses among tree-nesting corvids, doves, finches, Red Kite and Long-eared Owl. The strong winds, combined with freak high spring tides, decimated first clutches of saltmarsh nesting gulls, Redshank, Oystercatcher, Meadow Pipit and Reed Bunting along south and west coasts.

The relatively sunless, damp theme dominated May (one of wettest for a century). Adult Great Tits, Nuthatches and Great Spotted Woodpeckers resorted to ground feeding with the scarcity of caterpillars. Fortunately frosts were rare. Summer visitors filtered through erratically (as charted by BTO Migration Watch), helped by warm southerly winds during 15–17th, with temperatures reaching 27°C in West London.

On the debit side, Cuckoo, were in short supply, along with many of their primary hosts (Reed Warbler excepted), while Willow Warbler numbers dipped sharply in places, part of a worrying decline (*BTO News* 233, 239). Redstart, Tree Pipit, Wood Warbler and Yellow Wagtail were reported as lost or clinging-on to certain south-central and Midland counties. Encouragingly, Marsh Harrier, Little Egret, Woodlark and Cetti's Warbler further extended the northern limits of their previous breeding range.

CONTINENTAL CELEBRITIES LIVEN AN UNSETTLED JUNE

The nesting season stuttered along through a contrary June. Again, most western districts were very wet. Lengthy thundery downpours, often with damaging hail, from slow-moving fronts, brought flash flooding. Nests of Sand Martins, Kingfishers and waders were swamped, saturated broods of Mute Swans, Hen Harriers and Nightjars were left chilled and moribund. Hot spells in the south, followed by tropical humidity, with temperatures topping 29°C in Norwich (Norfolk), triggered a spate of nest building and egg laying by warblers, House Martins and Swifts. Those monitoring nest boxes reported many partial or complete brood losses among tits and Pied Flycatchers.

Scotland basked in heat around 5–7th, when conifer forests buzzed with mobile Siskin family parties, while newly fledged young appeared at garden feeders to the south. Redpoll also fared well, with nesting pairs spilling over on to commons and farmland scrub. Wryneck (Isles of Scilly), Great Reed Warbler (Surrey) and Rustic Bunting (East Lothian), Savi's Warbler and Common Rosefinch (various localities) all sang strongly, but failed to attract mates. The wild pair of Choughs in Cornwall, considered from arrival pattern and nesting habits to be of Brittany origin, were the first to breed in the county since 1952.

The breeding highlight of 2002, though, was the much-watched pair of Bee-eaters at Middleham Quarry (Co Durham), only the second successful UK attempt, following that at Street (East Sussex) in 1955. Three young fledged from a clutch of five eggs on 24 August, two surviving to fly south with their parents.

SIZZLING MID SUMMER HEAT TOO LATE FOR SWIFT AND HOBBY

A cool first half to July limited aerial insect food supplies, which was reflected by small hirundine and warbler broods. Many Hobbies, Nightjars and Swifts raised only single young. Osprey (Cumbria), Goosander (Hants) and Sedge Warbler (Shetland) each bred successfully for only the second occasion in modern times. Conditions changed dramatically in the last two days of July, when hot subtropical air brought a succession of mini heat waves, with fierce electrical storms, torrential deluges. This spilled over into early August, when sizzling temperatures topped 32.6°C at Northolt (West London), resulting in substantial losses among open-nesting waterfowl, finches and buntings. Nonetheless, late summer warmth helped Little Grebes, Moorhens, Barn Owls, Goldfinches and Tree Sparrows to rear second broods, Stock Doves, Song Thrushes, Greenfinches and Yellowhammers, tended third and subsequent families into September.

Overall, most observers charted another breeding season of mixed fortunes, with modest productivity, though an improvement on 2001.

Bird Populations 7:204-207
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BTO News 249:4-5

THE NEST RECORD SCHEME 2002 — HAS LINNET TURNED THE CORNER?

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The NRS results for 2002 provided several surprises and analysis of long-term trends has led to an increase in the number of species on the NRS Concern List to 12 species. However, there are some encouraging results for Linnet — at last! *Peter Beaven, Dave Leech* and *Humphrey Crick* have been assessing the results.

EL PROGRAMA DE REGISTRO DE NIDOS 2002 – ¿HA PASADO YA LO PEOR PARA EL PARDILLO COMÚN?

Los resultados del Programa de Registro de Nidos (Nest Record Scheme) para 2002 revelaron diversas sorpresas y el análisis de tendencias de largo plazo ha causado el aumento del número de especies a conservar a 12. Sin embargo, hay resultados esperanzadores para el pardillo común, ¡por fin! Peter Beaven, Dave Leech y Humphrey Crick evaluan los resultados.

Over 27,600 individual nest records were submitted for the 2002 breeding season. Data have now been sorted, input, computer-checked and analysed. While each record provides a fascinating insight into the private lives of a pair of birds for an individual nest recorder, the sum of all the records provides much-needed information, describing how the population of each species is faring as a whole. Here we compare the results for 2002 with previous years (back to 1966) and discuss the long-term trends that are of conservation importance.

2002 — A PECULIAR YEAR!

Most species began nesting particularly early in 2002, even allowing for the trends towards earlier laying that we have found in the past. We compared average laying dates in 2002 with those predicted from the trend calculated over the period 1966–2001. This analysis showed that 13 of 41 species tested started laying significantly earlier in 2002, with a further four species laying non-significantly earlier (41% of species in total, see Box 1 for details of analysis). In contrast, only seven species laid later. The majority of the early species were those that are resident in the UK and are therefore best placed to take advantage of the warm early spring we had in 2002.

Results for clutch sizes in 2002 were mixed. Four species (Moorhen, Kestrel, Spotted Flycatcher, Wren) laid significantly smaller clutches on average in 2002 than over the period 1966–2001, while five (Redshank, Ringed Plover, Blackcap, Reed Warbler and Goldfinch) laid significantly larger clutches.

Brood sizes in 2002 tended to be small. Fifteen species produced significantly smaller broods than predicted from trends measured over 1966–2001. The mean brood sizes of a further 17 species were smaller, but not significantly so. Thus 32 species produced smaller broods than predicted, whilst only eight

BOX 1. THE EARLY BIRDS

Expected laying dates in 2002 can be calculated for each species by extrapolating the trend calculated for the period 1966–2001. The table below indicates the difference between these values and the actual values for 2002 (positive numbers indicate earlier laying dates than expected, an asterisk indicates that the difference was statistically significant.)

Yellowhammer	16 days*
Wren	12-1/2 days*
Dunnock	12 days*
Great Tit	10-1/2 days*
Blue Tit	9 days*
Reed Warbler	9 days*
Crow	9 days*
Reed Bunting	8-1/2 days*
Oystercatcher	7-1/2 days*
Chiffchaff	7 days*
Linnet	7 days
Blackbird	6-1/2 days*
Kestrel	6 days*
Nuthatch	5-1/2 days*
Sedge Warbler	5 days
Chaffinch	4-1/2 days
Tree Sparrow	4 days

produced larger broods. Species producing particularly small broods included: Starling, down from 3.8 young on average to 1.9 young in 2002; Moorhen down from 4.7 to 3.6 young; Mistle Thrush down from 3.5 to 2.7 young and Little Owl down from 2.8 to 2.2 young. Again, it was mainly resident species that had reduced brood sizes.

These results contrasted sharply with nest failure rates. Of 43 species tested, 25 (55% of species) exhibited lower young-stage failure rates (i.e. improved success) in 2002 than predicted, and the difference was statistically significant for 11 of these species. Results for egg-stage failure rates were similar, with five of the 39 species analysed experiencing significantly low failure rates (i.e. more successful) in 2002 and 12 exhibiting near-significant reductions (44% in all). Only six species displayed higher failure rates (i.e. less successful) at either the egg or the nestling stage in 2002.

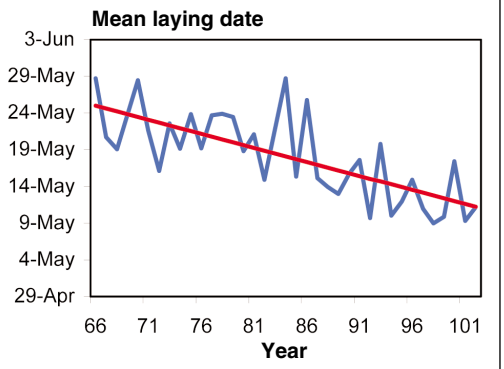
So which species appeared to do unusually well? Again, it was predominantly the resident species that experienced a drop in failure rates, such as Blue Tit, Barn Owl, and Goldfinch.

Overall, therefore, a very warm spring in 2002 permitted early laying, particularly for resident species. This was followed by poor weather during incubation, resulting in hatching failures, or losses of small young, such that brood sizes were small. However, warm weather during the nestling period meant that failure rates were low.

LONG-TERM TRENDS

While the results for 2002 are very interesting, it is the long-term trends in productivity that provide the most useful insight into the status of populations, as they have the potential to explain changes in abundance. Laying dates of Britain's birds continue to advance further. Of 60 species, 25 (42%) show a significant trend towards earlier laying since 1966 (see Figure 1), although trends for some species are apparent only over the last 10–15 years. Detailed analyses have shown that these trends are largely due to climate warming in the UK and provide one of the best examples that global climate change is already affecting wildlife in the UK (see *BTO News* 223: 2–3).

Ten species have significantly increased average clutch sizes since 1966, whilst brood sizes have increased for 16. A number of these species, such as Dunnock, Skylark and Starling,



Greenfinch provides a good example of how average laying dates have become progressively earlier since 1966, the trend line showing an advance of 13 days.

FIGURE 1. Greenfinch laying dates.

may be responding to declines in competition with their own kind as their populations become smaller. In addition, raptors have benefited from declines in pesticide pollution levels.

Statistically significant declines in clutch (10 species) and brood sizes (15 species) are slightly more prevalent than increases since 1966, although many are likely to be due to increased competition as populations have increased in size e.g. Buzzard, Nightjar and Nuthatch.

Declines in nest failure rates (i.e. improvements) far outweigh increases (i.e. lower success), and for many species breeding performance has therefore improved since 1966. Twenty-eight of 59 species analysed (48%) exhibit trends towards lower egg-stage nest failure rates and 19 out of 57 (33%) show progressively lower failure rates at the young stage over this period. Again, the breeding success of many of these species may have been affected by their rising population level.

Most worrying are declines in breeding performance of species that are showing declines in population levels. Such declines in breeding performance have the capacity to retard population recovery, although in most cases this may need exploring further. We highlight the following species, four of which — Grey Wagtail, Dunnock, Bullfinch and Yellowhammer — are new or have come back onto to the List of NRS Concern (see Box 2).

Grey Wagtail — Over the last 15–20 years, average clutch size has fallen from 5.0 to 4.8 eggs and average brood size from 4.4 to 4.2 young. Although these declines are relatively small, they are statistically significant and perhaps indicate a reduction in the quality of their riverine habitats. Grey Wagtail was recently added to the amber list of birds of conservation concern because the population has declined by >25% over the past 25 years (see *BTO News* 242: 11–14 about the new amber and red lists).

Dunnock — Egg stage failure rates of this amber-listed species have risen since the mid-1980s to levels found previously in the 1960s.

Bullfinch — Egg-stage failure rates of this red-listed species declined from the 1960s to 1980s, possibly due to the withdrawal of organochlorine pesticides from the marketplace, but they have risen again through the 1990s.

Yellowhammer — This species was recently added onto the red-list of conservation concern because of population declines of >50%. Declines in brood size and increases in egg-stage failure rates warrant its inclusion on the NRS Concern List.

Lapwing — This species is amber-listed and continues to show increases in failure rates at the egg stage. The recent survey of waders on lowland wet grassland identified a 40% population decline between 1982 and 2002 (*BTO News* 247: 12–13).

Ringed Plover — Although Ringed Plover is not on the red or amber lists, it is poorly monitored and little is known about its population trends. As the NRS is the only BTO census scheme monitoring this species during the breeding season, it is worrying that the results show increasing rates of nest loss at the egg-stage since the 1990s (Figure 2).

Moorhen — The NRS has been concerned about declines in clutch sizes and increases in egg-stage failures for the past 10 years. These trends are continuing, with average clutch size nearly half an egg less than it was in 1966 (down from 6.5 to 6.1) and daily failure rates at the egg-stage doubling over the same period, coinciding with a decline in Moorhen abundance on Common Birds Census (CBC) farmland plots of >25%.

Yellow Wagtail — The average clutch size of Yellow Wagtail has fallen from 5.4 to 4.9 and brood size from 4.9 to 4.4 since 1966. Concern over this amber-listed species has led to the formation of a Yellow Wagtail Study Group (*BTO News* 245: 14–15).

BOX 2. THE NRS CONCERN LIST

Species are placed on the NRS Concern List if:

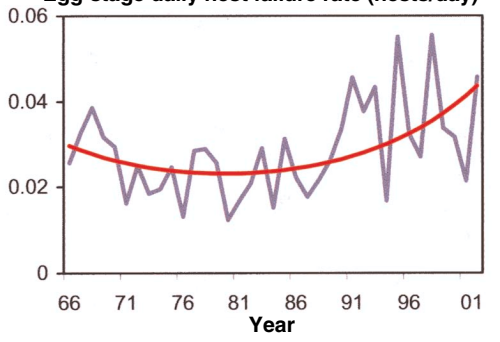
- They show statistically significant declines in some aspect of breeding performance measured from 1966 to present

AND

- They show declines of >25% in population abundance or geographical range

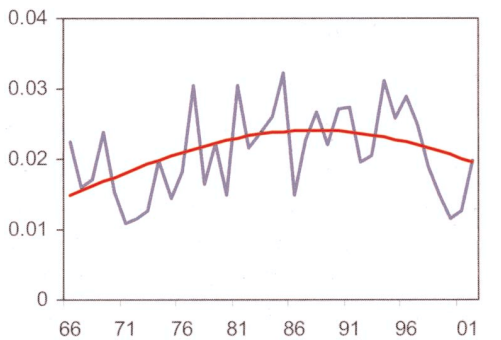
OR

- There is no known information on their population status except for NRS data.



Ringed Plovers have suffered a number of poor years with increasing failure rates at the egg stage, especially since 1980.

FIGURE 2. Ringed Plover nest failure.



Linnets have experienced falling nest failure rates at the egg-stage in recent years – which may help to reverse the species' population decline.

FIGURE 3. Linnet nest failure.

Willow Warbler — A recent addition to the amber list due to population declines of >25% exhibited over the last 25 years, this species was included on the NRS Concern List in 1998 because of increasing failure rates at the chick stage since 1966 which have continued into 2002. This year, we have also detected a trend of increasing failure rates at the egg stage, a worrying development.

Linnet — Increases in nest failure rates at the egg stage appear to have been the main reason for the population decline (>50%) of this species since the mid-1960s and its subsequent addition to the red list. There is some indication that brood sizes have fallen recently (by 0.1 young), and failure rates at the chick stage have continued to increase, and so we are able to report here that failure rates at the egg-stage have finally begun to fall (Figure 3), suggesting that Linnet populations may start to increase again. Although the BTO/JNCC/RSPB Breeding Bird Survey shows no change in abundance since 1994, Linnet numbers on farmland CBC plots increased by 23% from 1989-2000. It is possible, therefore, that government agri-environment schemes, including those for the improved management of hedgerows, are bearing some 'fruit' for this species.

Reed Bunting — This red-listed species exhibited large increases in nest failure rates at the egg stage since the 1990s and detailed analyses of BTO's datasets suggested that this might hold back the species' recovery.

Overall, the number of species on the NRS Concern List has increased to 12. This information provides conservation bodies with a tangible starting point for developing further research and policies to bring about species recoveries.

WHY NOT START RECORDING NESTS TOO?

As the number of nest records increases, so too does the accuracy with which we can monitor a species' productivity. We are incredibly grateful to those volunteers who go out and put a great deal of effort into finding and recording nests as part of the NRS, but we could always use more, particularly of open-nesting species!

If you would like a free 'Starter Pack', please contact Peter Beaven at nest.records@bto.org and you will be ready for the next season – some birds start now in December!

The NRS is funded by a partnership of the BTO and JNCC. We are very grateful to Karen Wright for help with the NRS database and to David Glue for his contribution to the scheme.

Bird Populations 7:208-211
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WATERBIRD ALERTS

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Graham Austin, Sarah Jackson and *Heidi Mellan*, of the BTO's Wetland & Coastal Ecology Unit, explain the new standardised system of identifying significant changes in wintering waterbird populations in the UK.

ALERTAS DE AVES ACUÁTICAS
Graham Austin, Sarah Jackson y Heidi Mellan, de la Unidad de Ecología de Costas y Marismas del BTO explican el nuevo sistema estandarizado para identificar cambios significativos en las poblaciones invernantes de aves acuáticas en el Reino Unido.

Spring 2004 sees the launch of the Wetland Bird Survey (WeBS) Alerts reporting. Being internet based, this report represents a new venture for WeBS reporting. The full report will be available later this year at http://www.bto.org/survey/webs/index.htm where it will be possible to view it and download information for those regions or sites that may interest you.

THE NEED FOR ALERTS

The WeBS Alerts System was developed to provide a standardised method of identifying the direction and magnitude of changes in numbers , at a variety of spatial and temporal scales, for a range of waterbird species. Sufficient WeBS data are available for 33 species. Species that have undergone major changes in numbers can then be flagged by issuing an Alert. The Alerts are intended to be advisory and, subject to interpretation, provide a platform from which to direct research and subsequent conservation efforts if required.

UK MONITORING

The UK holds internationally important numbers of non-breeding waterbirds, and government has agreed to international obligations to protect these populations. Monitoring is essential if populations are to be managed and conserved efficiently as both time and resources available with which to do so are finite. It is essential, therefore, that time and resources are directed towards where they are most needed. Numbers of wintering waterbirds have been recorded in Britain as part of WeBS. Wildfowl data have been collected from the majority of English, Scottish and Welsh sites since the late 1960s and the majority of sites in Northern Ireland since the early 1980s. Many of these sites are, or have been proposed as, Ramsar sites, Special Protection Areas (SPAs) or, in Britain, Sites of Special Scientific Interest (SSSIs) and, in Northern Ireland, Areas of Special Scientific Interest (ASSIs).

The Alerts system reports on changes in numbers at a number of spatial scales — the whole of the UK or Great Britain as appropriate for the species, the four constituent countries and protected sites (SPAs and SSSIs/ASSIs). The national trends of all species will be assessed annually, while each year, one in three SPAs and one in six SSSIs/ASSIs, with waterbird interest,

will be assessed on a rolling cycle. The WeBS Alerts System is concerned solely with highlighting changes in the abundance of waterbirds in Britain and Ireland outside the breeding season.

ESTIMATING ALERTS

WeBS assesses the Alerts status of a given species at either the country level or for a particular site by considering the proportional change in numbers over the short-, medium- and long-term (last 5, 10 and 25 years respectively). This is calculated on a smoothed line fitted through the annual indices. This is important because, if using raw numbers, natural temporary fluctuations, for example those caused by variation in the severity of conditions over the winter period, could trigger false Alerts due to misinterpretation of temporary, short-term declines as longer-term trends. Alternatively, long-term trends that may have led to Alerts being flagged could be

TABLE 1. Alerts and percentage changes of waterbirds.

			Alert				Percentage change			
Great Britain	First winter	Last winter	5-yr	10-yr	25-yr	Max-yr	5-yr	10-yr	25-yr	Max-yr
Little Grebe	85/86	00/01	o	+		++	15	69		544
Great Crested Grebe	82/83	00/01	o	o		+	11	22		67
Cormorant	86/87	00/01	o	o		++	–1	13		163
Mute Swan	74/75	00/01	o	o	+		14	31	98	
Bewick's Swan	74/75	00/01	o	–	+		–15	–37	99	
Whooper Swan	74/75	00/01	+	o	++		57	27	132	
European White-fronted Goose	74/75	00/01	–	—	—		–49	–58	–50	
Dark-bellied Brent Goose	74/75	00/01	o	o	+		–13	–24	90	
Shelduck	74/75	00/01	o	o	o		–20	–22	7	
Wigeon	74/75	00/01	o	o	+		–3	27	73	
Gadwall	74/75	00/01	o	+	++		24	77	699	
Teal	74/75	00/01	o	o	+		6	11	94	
Mallard	74/75	00/01	o	–	–		–12	–28	–27	
Pintail	74/75	00/01	o	–	o		–18	–30	–24	
Shoveler	74/75	00/01	o	o	+		3	3	60	
Pochard	74/75	00/01	o	o	–		–12	–8	–28	
Tufted Duck	74/75	00/01	o	o	o		8	13	8	
Goldeneye	74/75	00/01	o	o	o		–14	–6	5	
Red-breasted Merganser	74/75	00/01	o	o	+		–18	7	80	
Goosander	74/75	00/01	–	o	+		–25	–6	56	
Coot	82/83	00/01	o	o		o	11	24		31
Oystercatcher	74/75	00/01	o	o	o		0	–12	8	
Avocet	74/75	00/01	+	++	++		73	223	>2000	
Ringed Plover	74/75	00/01	o	–	–		–16	–25	–28	
Grey Plover	74/75	00/01	o	o	++		–17	2	196	
Knot	74/75	00/01	o	o	o		6	–5	15	
Sanderling	74/75	00/01	o	o	o		18	18	–6	
Dunlin	74/75	00/01	o	–	–		–24	–26	–39	
Black-tailed Godwit	74/75	00/01	o	+	++		17	65	188	
Bar-tailed Godwit	74/75	00/01	o	o	o		–24	–22	–13	
Curlew	74/75	00/01	o	o	o		14	17	31	
Redshank	74/75	00/01	o	o	o		6	1	–1	
Turnstone	74/75	00/01	o	-	o		–7	–25	–10	

Percentage change and Alerts over short (5 years), medium (10 years) and long term (25 years or maximum available if less than 25 years) of counts in the United Kingdom (waders) and in Great Britain (wildfowl and waders). Symbols: – Medium-Alert, — High-Alert, + Medium-Increase, ++ High-Increase, o No Substantial Change.

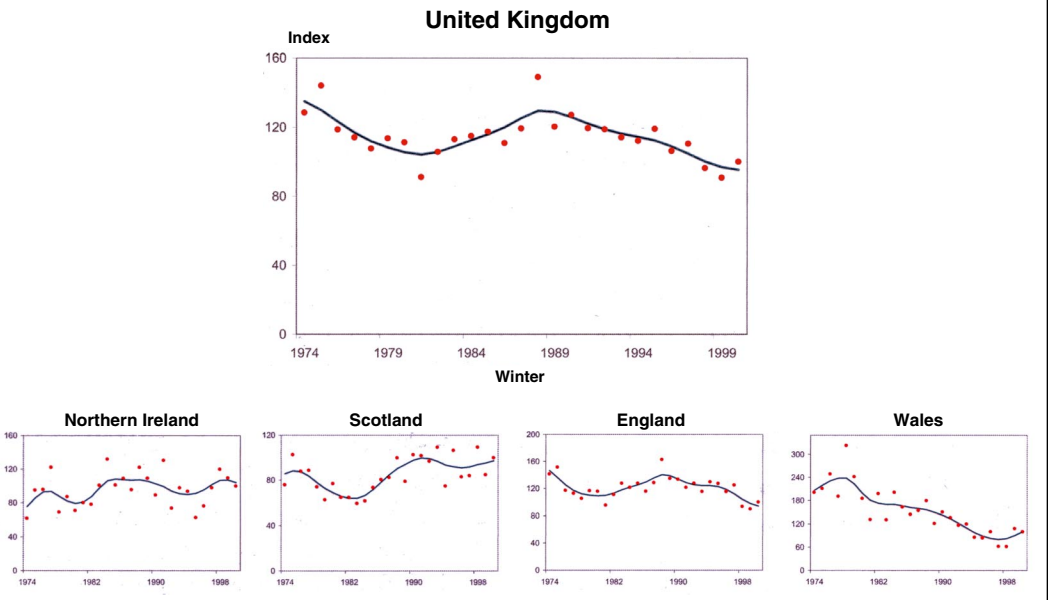
obscured by short-term fluctuations. The degree of smoothing is carefully chosen so that, while removing temporary fluctuations not likely to be representative of long-term trends, those aspects of the trends that may be considered to be important are retained. The proportional changes are categorised according to their magnitude and direction.

Population declines of between 25% and 50% trigger Medium Alerts and declines of greater than 50% trigger High Alerts. Although they do not trigger Alerts, increases of 33% and 100% (values chosen to be those necessary to return numbers to their former size following declines of 25% and 50% respectively) are also identified (see Table 1).

Examples of trends from the report are shown below.

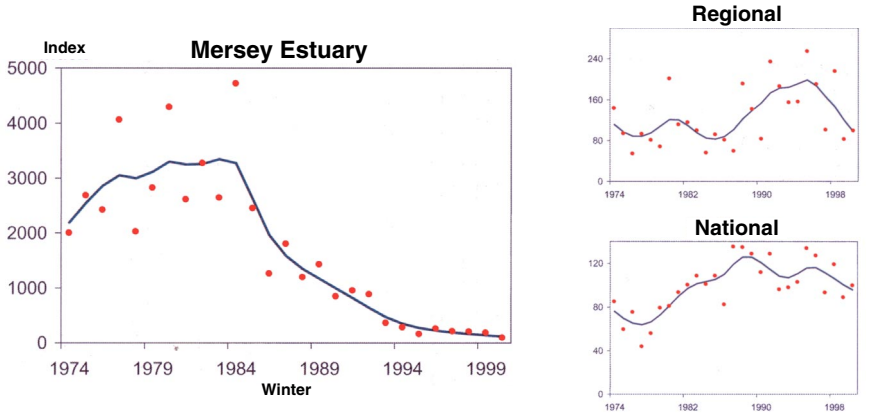
Alerts are there to bring apparent change in wintering waterbird numbers to the attention of managers, decision makers and politicians. Whether this is a real cause for concern then needs to be investigated further, or to assess if it simply reflects a regional or national trend. Further investigation of possible causes of declines may then be warranted.

BOX 1. RINGED PLOVER TRENDS



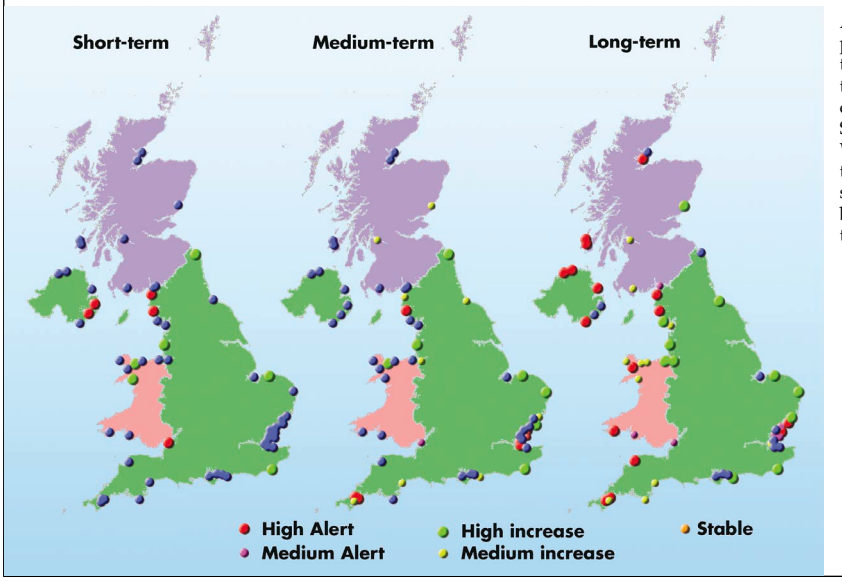
Annual indices and smoothed trends for Ringed Plover evaluated for the United Kingdom. Smaller charts show breakdown of these trends for England, Scotland, Wales and Northern Ireland (these are given full consideration in the relevant country sections of the report).

BOX 2. AN EXAMPLE FROM AN SPA ACCOUNT: PINTAIL TRENDS



Annual indices and smoothed trends for Pintail for Mersey Estuary SPA, Environment Agency Northwest Region (regional) and Great Britain as a whole (national).

BOX 3. GEOGRAPHICAL TRENDS IN ALERTS STATUS OF CURLEW



All sites for which it is possible to assess trends are included for the species. These include all SPAs and SSSIs covered by the WeBS Alerts system together with WeBS sites not encompassed by either of these statutory designations.

Bird Populations 7:212-215
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VARIETY AT WINTER BIRD TABLES

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BT0 Research Biologist, *David Glue*, looks back at the findings from winter 2002/03 of the Garden Bird Feeding Survey.

VARIEDAD EN LOS COMEDEROS DE INVIERNO
El biólogo del BTO David Glue examina los resultados del inviero de 2002/03 del Conteo en Comederos de Aves de Jardín (Garden Bird Feeding Survey).

The BTO's Garden Bird Feeding Survey (GBFS) was conceived in the late 1960s, to assess the range of birds capitalizing on supplementary foods in gardens and to examine their food preferences. Since the winter of 1970/71, observers have been charting the weekly peak counts of feeding birds countrywide. Today, the survey also provides a check on changes in status of garden species. Bird food and feeders have changed markedly and currently, up to 60,000 tonnes of peanuts and wild bird seed are provided annually in the UK, a bird care facility worth £150–180 millions.

GARDEN FEEDING STATIONS RICH AND POOR

Weekly counts of all species attracted to foods from October 2002 to March 2003 inclusive were kept by 264 householders throughout the UK — 120 in rural villages and homesteads, 144 in town and city dwellings. Top rural and suburban gardens each attracted 35 species, belonging to Mrs M E Bateman of Beccles, Suffolk and K Russell of Walbottle Village, Newcastle-upon-Tyne respectively.

Perhaps surprisingly, in winter 2002/03, gardens in suburbia supported fractionally more feeding species than their rural counterparts (21.2 and 19.7 respectively). This has been a feature of other recent winters (see *BTO News* 200, 242). This may reflect the attractive nature of bird tables within the warmer microclimate of built-up areas, coupled with mild winters and an increasingly impoverished avifauna in the open UK farmed countryside.

Overall, 78 species were recorded taking food and water. Robin was the only species to patronize all gardens (Table 1). The top 12 species, and their relative frequency, closely matched that of the previous winter 2001/02 (*BTO News* 242). More revealing is a comparison with the same dozen species averaged across winters in the initial decade of study in the 1970s. Far greater use of bird tables is now made by Collared Dove and Magpie (the latter overtaking Song Thrush). Other changes worthy of note are increases of the forest-dwelling Coal Tit and finches, and decline in the proportion of feeding stations supporting House Sparrow and Starling (Table 1).

AUTUMN GALES AND MARCH WARMTH HAVE AN EFFECT

Three key factors strongly affected flock-sizes

TABLE 1. GBFS Top Twelve garden feeding species Winter 2002/03.

Rank	Species	% of gardens	% of gardens in 1970s (*)
1	Robin	100.0	99
2	Blue Tit	99.6	99
3	Blackbird	99.2	99
4	Great Tit	98.1	93
= 5	Chaffinch	97.0	92
= 5	Greenfinch	97.0	92
7	Dunnock	96.2	95
8	Collared Dove	91.7	60
9	Coal Tit	87.9	70
10	House Sparrow	86.7	97
11	Starling	85.6	96
12	Magpie	72.7	29

* Figures are the average of 10 winters from 1970/71 to 1979/80.

and the range of species at UK birdtables in winter 2002/03:–

• widespread, prolific yields of certain major wild fruits, including beech mast, hazel nuts, acorns, haws, some conifers and some domestic soft fruits — in sharp contrast to the previous winter.

• a relatively productive breeding season in 2002 for many resident tits, thrushes and several finches — in contrast with recent years.

• yet another largely snow-free winter, lacking long-term penetrating frosts, and with unseasonal warmth in the New Year and March.

Various striking weather episodes influenced feeding patterns over the winter. Dry, Indian summer heat in September (in contrast to a chilly 2001) dominating until mid October, led to late broods of doves, Dunnock, Greenfinch and House Sparrow, enlivening birdtables. The coolest October since 1993, brought an early return of tits and finches to feeders. Violent storms around 27 October (locally the most severe since 1987), as well as damaging housing fabric, depressed feeding activity, and led to disorientated waterfowl, thrushes, warblers and cage-birds turning up in gardens.

A very wet and mild November (warmest widely since 1994), saw many gulls, corvids and thrushes able to obtain food from damp pasture and berry-rich hedges. Food-caching by Coal Tit, Marsh Tit, Nuthatch and Magpie remained low key, with seed-specialists in fewer numbers than the previous winter (see Box).

Drier cold snaps with severe night frosts and snow flurries in December, from 9–11th and 18–19th, brought the first Goldcrest, Blackcap and Yellowhammer to favoured feeders. Spring-like heat over Christmas week, though, saw many birdtable offerings largely left ignored. Lashing rain at times, leading to saturated lawns, brought first-time feeding Moorhen, Mallard, Grey Wagtail and even Kingfisher in some gardens.

In the New Year, cold snaps with snow, including a numbing easterly blast from the Continent on 12th and bitter arctic northerly winds from 29th, encouraged winter thrushes, Woodpigeon and Blackcap to switch from hedgerow ivy and haws to birdtable fare in January.

The winter's coldest, and most destructive cold spell, from 13–19 February, with widespread, sub-zero temperatures during the day, saw a marked increase in flock sizes of tits and finches, the appearance in many areas of Long-tailed Tit, Siskin, Brambling, Redpoll and Tree Sparrow, as natural stocks of alder and birch seed and beech mast became depleted. Redwing and Fieldfare progressively capitalized on stocks of windfall apples, where provided. Mild southerly winds in late February, heralding a glorious, sunny, settled March (warmest since 1997), saw winter thrushes quick to leave and Robin, Woodpigeon and Collared Dove bringing premature first-brood families to feeding stations. A progressively dry March (driest widely since 1973), saw Brambling, Reed Bunting and Siskin drawn to bird baths, with pairs of the latter lingering to later bring juveniles to garden bird feeders in Liss Forest (Hants) and Ringshall (Herts).

GREY WAGTAILS AND BULLFINCHES AT NEW SITES

The birdtable community continued to change over the winter of 2002/03. Among regular feeders, Collared Dove (92%), Great Spotted Woodpecker (52%) and Pheasant (29% of sites) reached all-time high levels of attendance. Equally encouraging were the high incidence of feeding Goldcrest (13%), Grey Wagtail (11%), Tree Sparrow (9%) and Yellowhammer (7% of sites), despite the abundant natural food larder and absence of prolonged spells of cold

weather, each adding extra sparkle and colour. These increases, endorsed by findings of the year-round BTO Garden BirdWatch, are considered the product of a greater tolerance of man, improved quality food-mixes, increasing populations, or combination of these factors. A current challenge is to attract to feeding stations scarce solo feeders, such as Mistle Thrush, Marsh Tit and Willow Tit, and similarly shy, social feeders, such as Linnet, Redpoll, Hawfinch and Corn Bunting, on a regular basis.

Further positive news arrived over the winter. Green Woodpecker, often drawn initially to ant colonies exposed by saturated lawns, turned widely to fat and fine grains (5% of sites). Lesser Spotted Woodpecker, a Red Listed species, delighted home-owners by appearing at peanut baskets as far afield as New Milton (Hants) and Grange-over-Sands (Cumbria). Also encouraging was the presence of three essentially insectivorous species, Wren (51%), Blackcap (25%) and Chiffchaff (4% of sites), sustained by fatty products, peanuts and softbill mixes during the cold weather. Meanwhile, the growing ability of Pheasant to exploit feeding stations within towns and cities, and Raven to rural dwellings, reflects bolder behaviour and reduced keepering.

Against the backcloth of a wild fruit glut, Goldfinch (66% of sites) failed to sustain its sharp upturn shown during the 1990s, with maximum flock-sizes of only 20–45. Nonetheless, birds drawn into gardens by the seeds of teasel, lavender and evening primrose, turned for the first-time to feeders (often holding nyger seed) in many parts of the country. Equally encouraging, Redpolls were drawn to seed feeders for the first time in a number of gardens.

While depleted populations of House Sparrow (87%) and Black-headed Gull (16%) showed no change, Reed Bunting (6% of sites) dipped below all-time GBFS low levels.

BUZZARD AND WATER RAIL AMONG SURPRISE FEEDERS

As ever, unexpected visitors turned to provided food and water. An exotic escapee, Grey Singing Finch (Dorking, Surrey), brought the 33-year GBFS tally to 163 species. Elsewhere, visiting Water Rail (Isles of Scilly), Black Redstart (Dunsford, Devon) and Woodcock (Argyll), quickened the pulse of observers. Waxwings (Norwich, Norfolk) were part of a New Year influx some 2,000 strong, initially to east coast counties, switching from crab apple and *Cotoneaster* berries to seed-mixes.

Sparrowhawk (hunting at 47% of feeding stations) easily retained top predator spot. Some watchers noted between four and five different birds visiting (based upon plumage characters), taking prey ranging in size from Goldcrest and Siskin to Jay and Pheasant. Far fewer feeding stations supported Kestrel (3%) or Tawny Owl (1% of sites) — their hunting methods not being as effective within the garden environment. The ongoing expansion of reintroduced Red Kites was reflected by birds being attracted to meaty scraps, or dead day-old chicks, at Amersham (Bucks), Tredegar (Gwent) and Rhayader (Powys). Similarly, the resurgent Buzzard population was reflected by birds drawn to kitchen scraps at gardens on Anglesey, fringing the Chilterns, Exmoor, Stafford and Cheviots.

Garden feeding visitors recorded outside of the GBFS in Winter 2002/03 included Little Egret (Ringwood, Hants), Lesser Whitethroat (West Sussex) and a spring highlight, Sardinian Warbler to a fat basket at Beeton Stump (Norfolk), a food source regularly used on the Continent.

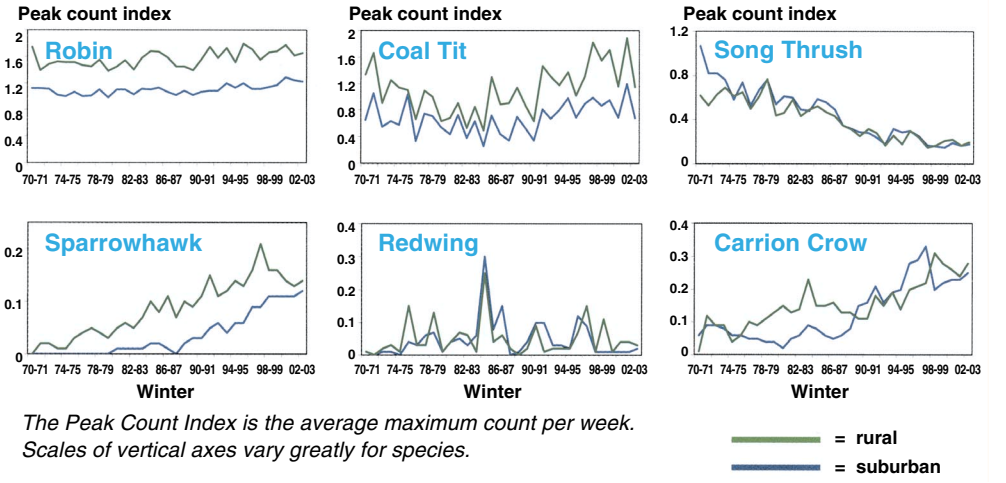
One ponders quite what species will be detected over the coming winter.

THANK YOU

The BTO extends its thanks to the dedicated team of garden bird surveyors who have carefully counted and observed the behaviour of their feeding birds for one-third of a century. Jacky Prior, Carol Povey and Frances Bowman kindly helped with the preparation of forms and Mike Toms assisted with the generation of Peak Count Indices.

FLUCTUATING FORTUNES AT BIRDTABLES — GBFS PEAK COUNT INDEX 1970–2003

The GBFS provides the BTO with a very useful yardstick of garden bird numbers in winter via the Peak Count Index. Few birds, like Robin, have relatively constant attendance at birdtables. Even here, some relinquish territories, generally in cold winter snaps, as in 1978/79, the mid 1980s and 1996/97 to feed amicably in groups, at which time vulnerable species such as Redwing (also Pied Wagtail, Blackcap and Fieldfare), tend to also achieve peak numbers. Many more, like Coal Tit (also Great Tit, Nuthatch and certain fine-billed finches), show erratic 'boom and bust' attendance patterns at feeders in winter. Bumper beech mast yields, as in autumn 1976, 1985, 1991, 2000 and 2002, resulted in far fewer seed-eaters resorting to feeders. The UK Song Thrush population, in long-term decline, looks to have stabilised at a low level, as reflected by numbers feeding within winter gardens. In contrast, the increase of the UK Sparrowhawk population, having bounced back from pesticide induced breeding performance losses following the 1950s, has slowe, in part, perhaps, reflecting fewer small bird prey at large. Intriguingly, those Sparrowhawks venturing into GBFS rural gardens and, more recently, in towns and cities to hunt and kill, have also raided less frequently. Carrion Crow typifies the increasingly successful corvid family, commensal with man, ever bolder birds venturing into suburbia to feed and breed, perhaps to be followed by Raven in coming years.



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

Bird Populations is an entirely electronic annual journal of dynamic global avian demography and biogeography that publishes original research and review papers dealing with changes in the numbers, demographics, distributions, and ecological relationships of birds. Papers providing documentation of quantitative changes in bird populations or distributions are preferred, but papers providing baseline population or distribution information are also acceptable. Papers describing or evaluating field techniques or analytical methods for assessing population and distribution changes are also welcome. Contributions are encouraged from throughout the world from both well-known and little-studied avifaunas. *Bird Populations* is published in English with abstracts in Spanish. *Bird Populations* can be accessed free-of-charge at www.birdpop.org.

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Any agency or organization from anywhere in the world coordinating or conducting a long-term, standardized avian monitoring program is invited to submit the annual (or longer time period) report of that program to *Bird Populations* for publication or reprinting. All reports submitted for original publication will undergo peer review. Please submit one complete, double-spaced, electronic copy of any such report, in English, to David G. Ainley, Editor, *Bird Populations*, dainley@penguinscience.com. Already published reports submitted for reprinting will not be peer reviewed, but will be screened by the Editor when first submitted with regard to the scope and scientific merit of the monitoring program and the appropriateness of the methods and analyses. Please submit electronic copies of such reports, in English, to the Editor. Reports of avian monitoring programs accepted for publication will be published or reprinted without page charges.

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