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North American Breeding Bird Survey Annual Summary 1988



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by

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Introduction

The North American Breeding Bird Survey (BBS) is run by approximately 2,000 skilled amateur ornithologists, and is coordinated cooperatively by the U.S. Fish and Wildlife Service and the Canadian Wildlife Service. Beginning in 1966, BBS cooperators have been collecting standardized information on North

American bird populations. The BBS is a roadside survey, comprised of permanent routes that are surveyed yearly (Fig. 1). Each route is 39.4 km (24.5 miles) long and consists of 50 stops spaced 0.8 km (0.5 mile) apart. All birds heard or seen during a 3-min observation period at each stop are recorded, and the sum of the individual stops for each species is used as an index of species density on the route.

In this report, we present the population changes of the 222 bird species reported on > 50 BBS routes during 1987 and 1988. Population trends for 1966–87 are presented for comparison. Owing to space constraints, trends are not reported for States, Provinces, or physiographic regions. Instead, we present maps illustrating patterns of population change for selected species, and summarize State and physiographic strata patterns of population change as the proportion of species that increased in each region. Detailed State, Provincial, and physiographic strata changes are available to interested readers.



Fig. 1. Location of North American BBS routes.

Methods

The route-regression method was used to estimate population changes between 1987 and 1988 for all breeding bird species. The method has been presented elsewhere (Geissler 1984; Robbins et al. 1986), but we will briefly discuss its application. In the 2-year analysis, a population change was estimated for each route as the ratio (count + 0.5 in 1988; count + 0.5 in 1987). To

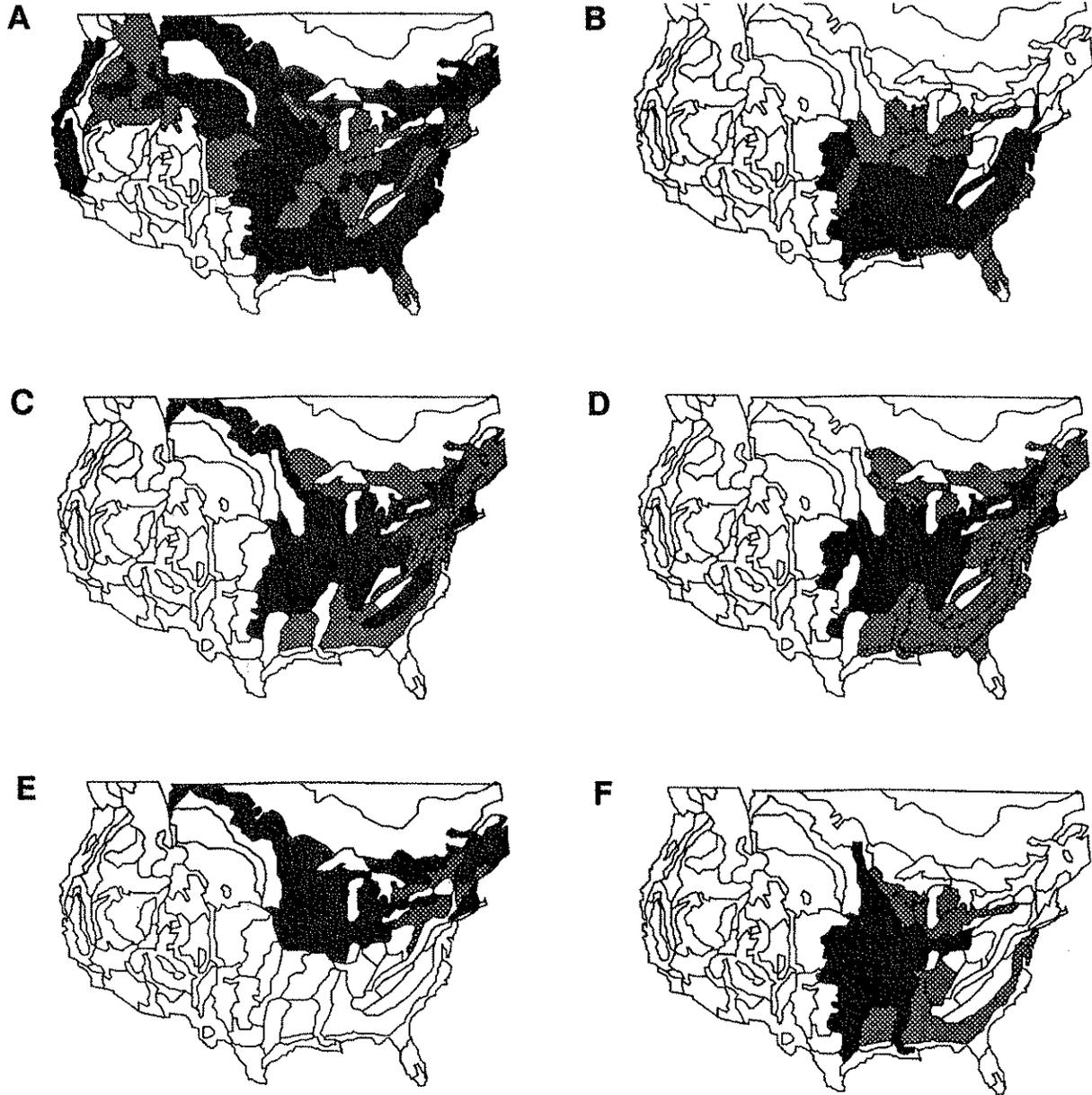
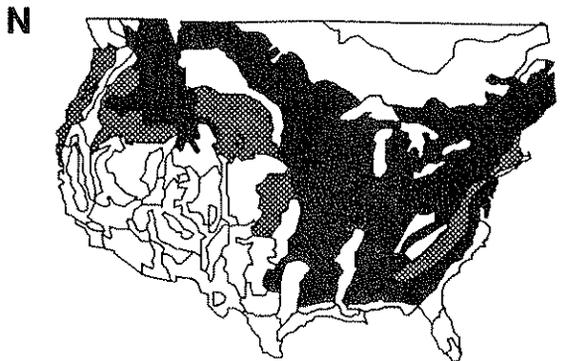
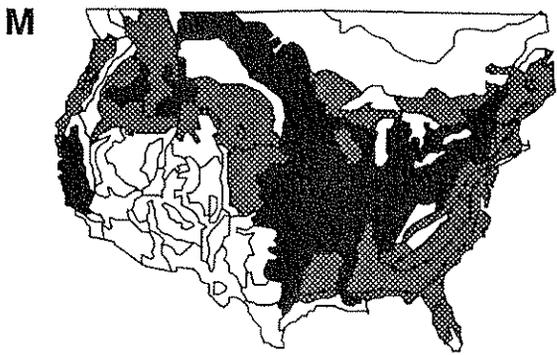
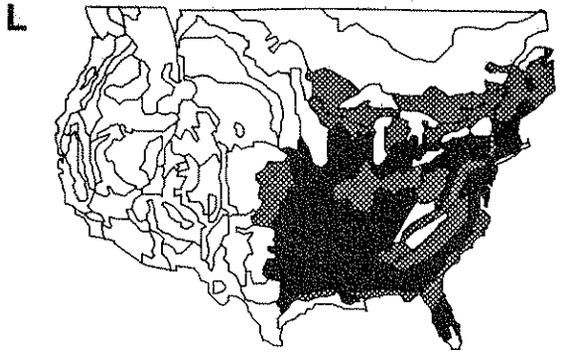
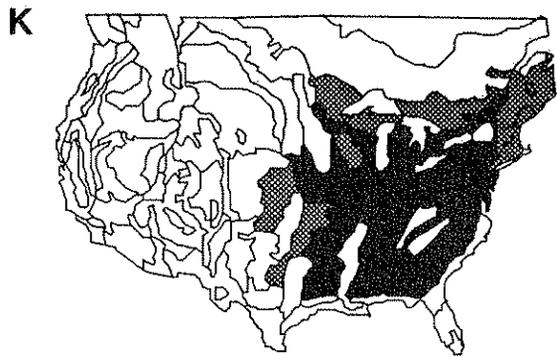
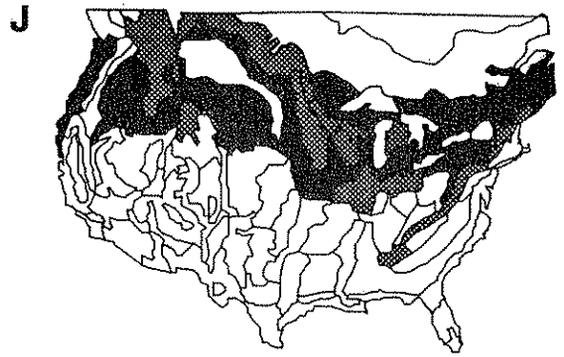
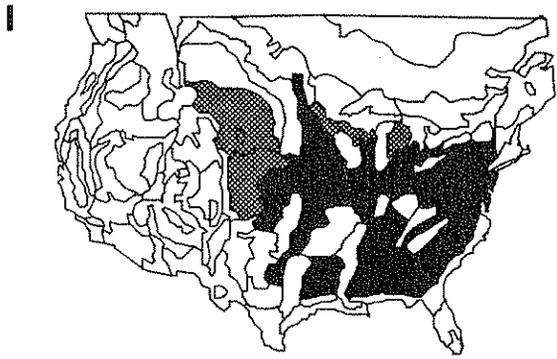
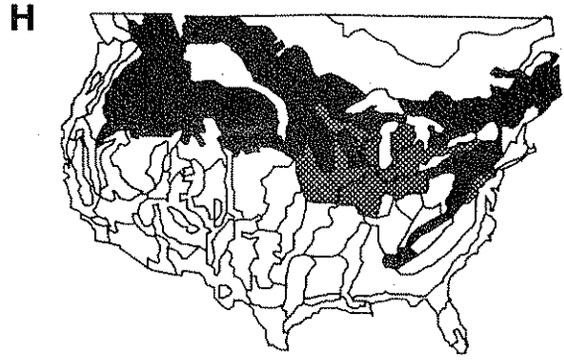
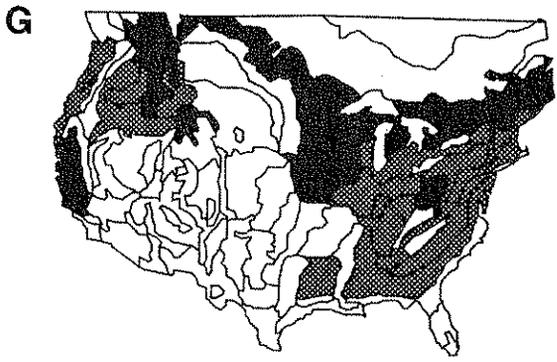


Fig. 2. Maps showing calculated population changes (1987–88) for species by physiographic region. *Solid* areas had population decreases; *cross-hatched* areas had increases; *blank* areas had insufficient sample size. *A.* Killdeer. *B.* Northern bobwhite. *C.* Eastern phoebe. *D.* Indigo bunting. *E.* Bobolink. *F.* Dickcissel. *G.* Song sparrow. *H.* Vesper sparrow. *I.* Grasshopper sparrow. *J.* Savannah sparrow. *K.* Field sparrow. *L.* Eastern meadowlark. *M.* Red-winged blackbird. *N.* American goldfinch.



those routes run by the same observer in both years. Regional estimates of population trends were established by taking a weighted mean of the route estimates—number of birds on the route, areas of State, Province, or other geographic regions, and sample sizes of routes in the region were used as weighting factors. Bootstrapping (Efron 1982) was used to estimate variances of the regional population trend estimates, and statistical significance was assessed using confidence intervals based on Z-statistics. Population trends are presented as percent change per year.

We present population trends for those species recorded on more than 50 routes during 1987 and 1988. To assess overall regional patterns of changes in bird populations, we also determined the proportion of bird species with increasing populations in each State, Province, and physiographic region. In this analysis, we included only those species observed along 10 or more routes in the State, Province, or region. We used Z-statistics to examine the null hypothesis that the proportion of increasing species was not significantly different from 0.5. The physiographic strata used in this analysis were modified from those in Robbins et al. (1986; Appendix A).

We also examined the consistency of population changes for groups of birds. We classified birds into eight guilds—six based on breeding habitat and two on migratory status (Appendix B). We found the proportion of bird species that were increasing in each category. The breeding habitat categories we examined were grassland, wetland, woodland, deciduous forest, coniferous forest, and urban. Many species also were categorized as permanent residents or neotropical migrants.

Weather, changes in the time of the breeding season when routes were surveyed, changes in stop locations, observer fatigue, and other factors—in addition to actual changes in population size—influence the number of individuals of each species detected along a

route. Because only two data points exist for each route, 2-year trends are more affected by these biases than trends calculated over a longer period. Therefore, the significance of trends calculated over only 2 years must be assessed with these biases in mind. For comparison with the 2-year trends, we have included North American 22-year (1966–87) trend estimates for those species for which 2-year trends could be estimated. These trend estimates were calculated as in Robbins et al. (1986), except that observers were included as a covariable in the route-regressions (Geissler 1984).

Results and Discussion

BBS volunteers ran 2,005 routes in 1987 and 2,076 routes in 1988. Of these, 1,471 were run by the same competent observer in both years. Sufficient data exist to analyze trends for 222 species (Appendix C). Across North America, 122 species showed increasing population statistics on BBS routes from 1987 to 1988; 25 of these increases were statistically significant ($P < 0.05$). Of the 100 species with negative trend estimates, 33 were statistically significant. For many species, especially those that flock, there were large differences in trend throughout their range; consequently, many species had large—but not statistically significant—population changes. This increase was the result of observing large groups of birds on only a few routes.

A number of species display strong geographic patterns in their population trends (Fig. 2). A common tendency among these species is for the populations in the Midwest to show declines. We hypothesize that these populations were responding to the severe weather conditions during 1988, when a major spring and summer drought occurred throughout the Midwest (Fig. 3).

In Table 1, we present by guild the proportion of species that had increasing continental trends. The only groups showing a significant departure from a 50:50

Table 1. *Proportion of species in each breeding habitat guild or migratory status that increased in population between 1987 and 1988, with associated Z-statistics.*

Habitat	Proportion	Z	P^a
Grassland	0.43	-0.54	
Wetland	0.46	-0.48	
Woodland	0.68	3.17	**
Deciduous	0.68	1.72	
Coniferous	0.61	0.96	
Urban	0.75	2.00	*
Permanent resident	0.64	1.73	
Neotropical migrant	0.60	1.85	
Overall	0.55	1.66	

^a * = $P < 0.05$, ** = $P < 0.01$.

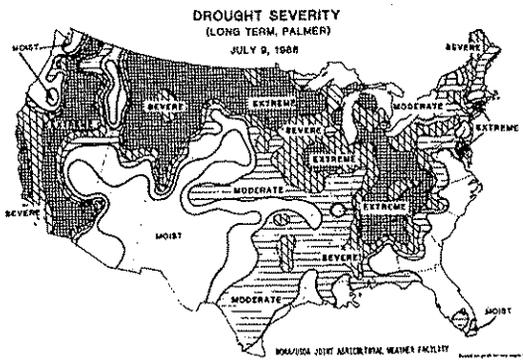


Fig. 3. Long-term Palmer Drought Severity Index for 9 July 1988 (USDA/NOAA 1988).

groups showing a significant departure from a 50:50 ratio of increases and decreases were woodland and urban nesting species, which had more increasing species than projected. The only guilds showing more species decreasing than increasing were grassland and wetland guilds.

When the proportion of increasing species is mapped using State, Province (Fig. 4; Table 2), or physiographic regions (Fig. 4; Table 3), a pattern again emerges that seems to indicate that an association exists between the severity of the drought and population change. However, when States are placed into categories of drought severity (Table 4), there is a negative but nonsignificant association ($P > 0.05$) between the degree of drought the State or Province experienced and the proportion of species that increased between the two years. The pattern was nearly the same at the guild level: Most guilds had a greater number of species that declined between the two years, but none was statistically significant (Table 4).

There is evidence from anecdotal reports that some species, such as dickcissel, lark bunting, and sedge wren, relocated in large numbers to peripheral portions of their range (Drennan 1988; correspondence with various BBS observers). High temperatures have been associated with the early cessation of breeding activity and reduced singing frequency in one grassland species (Schartz and Zimmerman 1971). Because there was an increase in temperature as well as a lack of precipitation, some bird species may have been recorded at lower rates in 1988, not because of regional abandonment, but because of a lower probability of their being detected on a BBS route. We cannot determine what changes occurred in fecundity or survival from our 1988 survey data; however, low recruitment in 1988 should be expressed by steep declines in 1989 counts.

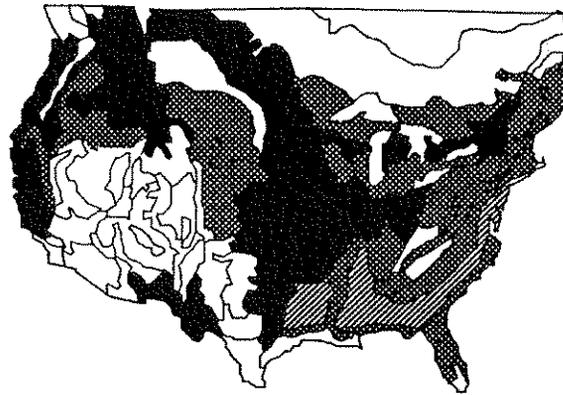
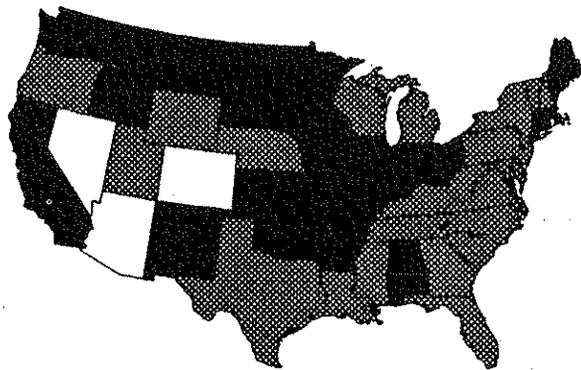


Fig. 4. Regional maps for Canada, the United States, and BBS physiographic regions showing the proportion of species increasing between 1987 and 1988 within each Province, State, or stratum. *Crosshatched* regions had >50% increasing; *solid* had >50% decreasing; *slashes* had equal numbers; *blank* had insufficient sample size.

Table 2. *Proportion of increasing species in each State or Province, with associated sample sizes and Z-statistics.*

State/Province	N	Drought ^a	Proportion	Z	p ^b
Alabama	76	1	0.49	-0.23	
Alberta	49	2	0.51	0.14	
Arkansas	64	1	0.36	-2.34	*
British Columbia	52	—	0.44	-0.84	
California	147	2	0.38	-2.97	**
Connecticut	47	1	0.43	-1.03	
Florida	78	0	0.77	5.64	**
Georgia	77	1	0.55	0.80	
Idaho	28	1	0.46	-0.38	
Illinois	76	2	0.50	0.00	
Indiana	78	2	0.44	-1.14	
Iowa	48	2	0.40	-1.48	
Kansas	62	1	0.39	-1.82	
Kentucky	69	2	0.58	1.34	
Louisiana	34	1	0.62	1.41	
Massachusetts	41	1	0.36	-1.78	
Maryland	89	2	0.63	2.52	**
Maine	83	2	0.46	-0.77	
Michigan	101	2	0.54	0.90	
Minnesota	85	2	0.31	-3.88	**
Mississippi	60	2	0.52	0.26	
Missouri	68	1	0.41	-1.48	
Montana	65	2	0.46	-0.62	
Nebraska	47	1	0.64	1.97	*
New Brunswick	56	—	0.66	2.54	**
New Hampshire	63	1	0.52	0.38	
New Jersey	47	1	0.57	1.03	
New Mexico	35	0	0.40	-1.21	
New York	106	1	0.53	0.58	
North Carolina	48	1	0.54	0.58	
North Dakota	34	2	0.32	-2.20	*
Ohio	61	2	0.48	-0.38	
Oklahoma	40	1	0.25	-3.65	**
Ontario	90	—	0.47	-0.63	
Oregon	70	1	0.57	1.21	
Pennsylvania	103	1	0.67	3.67	**
Quebec	50	—	0.50	0.00	
Saskatchewan	30	2	0.27	-2.89	**
South Carolina	48	1	0.58	1.17	
South Dakota	12	1	0.42	-0.59	
Tennessee	75	2	0.64	2.53	**
Texas	91	1	0.56	1.16	
Utah	19	1	0.84	4.09	**
Vermont	46	1	0.67	2.52	**
Virginia	76	1	0.60	1.88	
Washington	70	1	0.44	-0.96	
West Virginia	58	2	0.53	0.53	
Wisconsin	107	2	0.50	0.10	
Wyoming	48	2	0.73	3.57	**

^a 0 = no drought, 1 = moderate or mixed conditions, 2 = severe, — = no data.

^b * = $P < 0.05$, ** = $P < 0.01$.

Table 3. Proportion of increasing species by physiographic stratum, with associated sample sizes and Z-statistics.

Strata	N	Proportion	Z	P ^a
2	43	0.74	3.67	**
3	75	0.68	3.34	**
4	112	0.50	0.00	
5	48	0.52	0.29	
8	32	0.44	-0.71	
10	73	0.60	1.79	
11	74	0.55	0.94	
12	67	0.57	1.11	
13	101	0.66	3.47	**
14	85	0.52	0.33	
15	61	0.38	-1.98	*
16	87	0.56	1.19	
17	68	0.60	1.73	
18	65	0.48	-0.37	
19	70	0.43	-1.21	
20	98	0.49	-0.20	
22	72	0.53	0.47	
24	104	0.56	1.18	
26	60	0.42	-1.31	
27	85	0.64	2.59	**
28	133	0.54	0.96	
30	74	0.32	-3.23	**
31	77	0.42	-1.50	
32	77	0.43	-1.27	
33	55	0.35	-2.41	**
34	53	0.40	-1.54	
35	29	0.28	-2.70	**
36	13	0.77	2.30	*
37	35	0.26	-3.29	**
39	56	0.61	1.64	
40	52	0.38	-1.71	
56	16	0.31	-1.62	
64	89	0.45	-0.96	
65	73	0.44	-1.06	
66	15	0.60	0.79	
84	4	0.50	0.00	
85	7	0.29	-1.25	
87	4	1.00	— ^b	
88	4	0.50	0.00	
89	45	0.58	1.06	
91	16	0.25	-2.31	*
92	70	0.37	-2.23	*
93	68	0.38	-2.00	*

^a * = $P < 0.05$, ** = $P < 0.01$.

^b — = No data.

Table 4. Mean proportion of increasing species for States or Provinces that experienced either moderate or severe drought conditions in early July 1988 with associated sample sizes. T-tests revealed no significant differences between mean proportions in each category.

Guild	Moderate	N	Severe	N
Grassland	0.63	5	0.35	9
Wetland	0.41	6	0.47	13
Woodland	0.54	18	0.53	17
Deciduous	0.55	8	0.49	13
Coniferous	0.34	3	0.39	3
Urban	0.55	21	0.51	20
Permanent	0.54	19	0.55	17
Neotropical	0.53	20	0.49	17

Acknowledgments

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Appendix A. Physiographic strata of the United States and Canada (see map on following page).

1. Subtropical	26. Adirondack Mountains	67. Cascade Mountains
2. Floridian	27. Northern New England	68. Northern Rockies
3. Coastal Flatwoods	28. Northern Spruce–Hardwoods	80. Great Basin Deserts
4. Upper Coastal Plain	29. Closed Boreal Forest	81. Mexican Highlands
5. Mississippi Alluvial Plain	30. Aspen Parklands	82. Sonoran Desert
6. Coastal Prairies	31. Till Plains	83. Mojave Desert
7. South Texas Brushlands	32. Dissected Till Plains	84. Pinyon–Juniper Woodlands
8. East Texas Prairies	33. Osage Plain–Cross Timbers	85. Pitt–Klamath Plateau
9. Glaciated Coastal Plain	34. High Plains Border	86. Wyoming Basin
10. Northern Piedmont	35. Rolling Red Prairies	87. Intermountain Grasslands
11. Southern Piedmont	36. High Plains	88. Basin and Range
12. Southern New England	37. Drift Prairie	89. Columbia Plateau
13. Ridge and Valley	38. Glaciated Missouri Plateau	90. Southern California Grasslands
14. Highland Rim	39. Great Plains Roughlands	91. Central Valley
15. Lexington Plain	40. Black Prairie	92. California Foothills
16. Great Lakes Plain	53. Edwards Plateau	93. Southern Pacific Rainforests
17. Driftless Area	54. Rolling Red Plains	94. Northern Pacific Rainforests
18. St. Lawrence River Plain	55. Staked Plains	95. Los Angeles Ranges
19. Ozark–Ouachita Plateau	56. Chihuahuan Desert	96. Southern Alaska Coast
20. Great Lakes Transition	61. Black Hills	98. Willamette Lowlands
21. Cumberland Plateau	62. Southern Rockies	99. Tundra
22. Ohio Hills	63. Fraser Plateau	
23. Blue Ridge Mountains	64. Central Rockies	
24. Allegheny Plateau	65. Dissected Rockies	
25. Open Boreal Forest	66. Sierra Nevada	



**Appendix B. Bird species composition by guilds (listed in taxonomic order).
Four-letter codes are slight modifications of Klimkiewicz and
Robbins (1978).**

Grassland

GRPA, RPHE, GPCH, STGR, UPSA, LBCU, HOLA, SPPI, DICK, BOSP, CASP, VESP, LRKB, SAVS, BRDS, GRSP, HESP, MCLO, CCLO, BOBO, EAME, WEME

Wetland

COLO, PBGR, HOGGR, RNGR, EAGR, AECH, DCCO, ANHI, AMBI, LEBI, GTBH, GREG, SNEG, LBHE, GNBH, BCNH, YCNH, WFIB, WOST, FWDU, BBWD, MUSW, CAGO, WODU, AGWT, ABDU, MODU, MALL, NOPI, BWTE, CITE, NSHO, GADW, AMWI, CANV, REDH, RNDU, LESC, HADU, BLSC, S USC, WWSC, COGO, BAGO, BUFF, HOME, COME, RBME, RUDU, OSPR, BAEA, YERA, BLRA, KIRA, VIRA, SORA, PUGA, COMO, AMCO, LIMP, SACR, KILL, BNST, AMAV, WILL, SPSA, COSN, FRGU, BOGU, CAGU, HRGG, COTE, FOTE, BLTE, ALFL, WIFL, SEWR, MAWR, PROW, NOWA, LOWA, LESP, STSP, LISP, SWSP, YHBL, RUBL

Woodland

SSHA, COHA, NOGO, RSHA, BWHA, SPGR, BGSE, RUGR, WITU, BTPI, BBCU, YBCU, SPOW, BAOW, CWWI, WPWI, RNSA, GFWO, RBWO, YBSA, RBSA, WISA, HAWO, RCWO, PIWO, WWPE, EWPE, ACFL, LEFL, HAFL, WEFL, GCFL, GRYJ, STJA, CLNU, RBNU, WBNU, PYNU, BHNU, BRGR, WIWR, GCKI, TOSO, VEER, GCTH, SWTH, HETH, WOTH, VATH, SOVI, YTVI, PHVI, REVI, NOPA, MAGW, CMWA, BTBW, MYWA, TOWA, HEWA, BTNW, BLBW, YTWA, GRWA, PIWA, BBWA, BPLW, CERW, BAWW, AMRE, PROW, WEWA, SWWA, OVEN, LOWA, KEWA, AUWA, HOWA, RFWA, PARE, YRWA, SUTA, SCTA, WETA, PIGR, PUFI, CAFI, RECR, WWCR, PISI, EVGR

Deciduous

RSHA, BWHA, RUGR, WITU, BBCU, YBCU, ACFL, LEFL, WBNU, VEER, YTVI, PHVI, REVI, CERW, BAWW, AMRE, PROW, SWWA, KEWA, HOWA, SCTA

Coniferous

SPGR, BGSE, SPOW, WISA, RCWO, HAFL, GRYJ, STJA, CLNU, RBNU, PYNU, BHNU, GCKI, TOSO, GCTH, VATH, CMWA, MYWA, TOWA, HEWA, BLBW, GRWA, PIWA, BBWA, BPLW, AUWA, YRWA, WETA, PIGR, PUFI, CAFI, RECR, WWCR, PISI, EVGR

Urban

RODO, ECDO, MODO, BLJA, AMCR, FICR, AMRO, NOMO, EUST, NOCA, SOSP, HOFI, HOSP

Permanent Resident

HRSH, CRCA, GRPA, CHUK, RPHE, SPGR, BGSE, RUGR, SAGR, GPCH, LPCH, STGR, WITU, NOBO, GAQU, CAQU, MOUQ, RODO, ECDO, INDO, CGDO, GHOW, BAOW, ACWO, GIWO, LBWO, NUWO, DOWO, HAWO, STWO, RCWO, WHWO, PIWO, GRYJ, STJA, SCJA, GBJA, BBMA, YBMA, CORA, BCCH, CACH, MECH, MOCH, BOCH, CBCH, BRTI, PLTI, BCTI, ETTI, VERD, COBU, PYNU, BHNU, CACW, CYNW, CARW, AMDI, WREN, NOMO, LBTH, CBTH, CATH, CRTH, LCTH, NOCA, PYRR, BRTO, ABTO, COGR, HOSP, ETSP

Neotropical Migrant

FWDU, BBWD, OSPR, ASTK, MIKI, BWHA, SWHA, UPSA, WIPH, LAGU, FRGU, LETE, BLTE, BBCU, YBCU, LENI, CONI, CWWI, WPWI, CHSW, VASW, RTHU, OSFL, WWPE, EWPE, YBFL, ACFL, ALFL, WIFL, TRFL, LEFL, HAFL, DUFL, HDFL, GRYF, WEFL, ATFL, GCFL, WEKI, EAKI, STFL, PUMA, VGSW, RWSW, BNKS, CLSW, CASW, BARS, BGGN, VEER, GCTH, SWTH, WOTH, WEVI, BEVI, SOVI, YTVI, WAVI, PHVI, REVI, BWWA, GWWA, TEWA, NAWA, NOPA, YWAR, CSWA, MAGW, CMWA, BTBW, BTNW, BLBW, YTWA, PRAW, BBWA, BPLW, CERW, BAWW, AMRE, PROW, WEWA, SWWA, OVEN, NOWA, LOWA, KEWA, CONW, MOWA, COYE, HOWA, WIWA, CAWA, YBCH, SUTA, SCTA, WETA, RBGR, BHGR, BGBK, LAZB, INBU, VABU, PABU, DICK, BOBO, OROR, HOOR, BUOR, BAOR, SCOR

Appendix C. Two-year and long-term (1966–87) population trends for bird species.

Two-year and long-term (1966–87) population trends for bird species that were seen on 50 or more BBS routes in 1987–88. For both long- and short-term trends, we present percent change per year, sample size (in N of routes), statistical significance (* = $P < 0.05$, ** = $P < 0.01$) and relative abundance (the average count on BBS routes over the interval).^a

Species	1987–88				1966–87			
	%	P	N	R.A.	%	P	N	R.A.
Common loon	-18.2		82	1.4	2.1	**	395	0.9
Pied-billed grebe	18.0		81	0.6	-1.9		451	0.3
Double-crested cormorant	-3.4		59	1.6	4.6		296	0.8
Great blue heron	-13.8		654	1.1	1.6	**	1,664	0.8
Great egret	18.8		121	3.4	-1.3		360	1.8
Little blue heron	30.0		107	2.4	-1.6		337	1.7
Cattle egret	71.8		160	28.8	2.4	*	363	14.3
Green-backed heron	1.2		503	0.9	0.0		1,435	0.8
Canada goose	19.6		204	3.7	7.4	**	628	2.1
Wood duck	-1.5		254	0.7	3.6	**	1,042	0.3
Mallard	-4.4		500	6.7	0.9		1,520	4.8
Northern pintail	-39.4	**	54	1.5	-6.9	**	383	2.3
Blue-winged teal	5.6		113	2.5	-0.8		646	1.9
Northern shoveler	40.0		58	1.5	-1.1		273	1.3
Gadwall	86.7		57	2.7	3.5		257	1.7
Black vulture	52.5	*	140	1.6	2.0		426	1.2
Turkey vulture	16.5	*	542	3.0	0.4		1,378	2.1
Osprey	0.2		72	0.3	2.7	*	325	0.2
Northern harrier	17.6		213	0.7	-1.1	*	871	0.5
Cooper's hawk	-21.4	*	61	0.1	0.3		566	0.0
Red-shouldered hawk	4.8		219	0.8	2.1		748	0.3
Broad-winged hawk	-12.3		156	0.3	1.0	*	830	0.2
Swainson's hawk	14.0		146	1.1	1.5	*	482	0.7
Red-tailed hawk	2.7		756	1.1	2.0	**	2,014	0.7
American kestrel	2.7		626	1.0	1.2	**	1,952	0.9
Gray partridge	56.1		51	1.0	3.0	*	229	0.5
Ring-necked pheasant	22.9	**	375	9.5	-0.6		1,098	8.0
Ruffed grouse	32.6	**	74	0.3	-2.4		597	0.3
Wild turkey	6.9		113	0.5	1.9	*	337	0.2
Northern bobwhite	-8.4	**	553	22.9	-1.9	**	1,186	23.9
California quail	35.8	**	93	4.0	-0.9		227	3.1
Sora	-18.2		76	1.2	-2.2		415	0.7
American coot	38.6		86	4.8	3.5		486	2.2
Sandhill crane	-4.8		74	1.5	4.4	*	154	1.2
Killdeer	-9.5	**	1,046	5.8	1.2	**	2,329	5.4
Spotted sandpiper	24.4	**	177	0.8	-0.1		988	0.6
Upland sandpiper	-9.6		150	3.2	4.1	**	585	1.8
Common snipe	-22.6	**	232	2.6	2.8	**	827	2.5
Ring-billed gull	-8.4		144	11.3	6.2	*	496	5.0
Herring gull	372.0		89	24.3	-0.4		384	10.9
Rock dove	5.8		791	5.9	2.0	**	1,924	4.7
Mourning dove	1.4		1,166	25.7	0.2		2,337	28.0
Common ground dove	-12.5		69	2.3	-5.4	**	141	2.1
Black-billed cuckoo	7.3	**	305	2.2	1.8		1,148	0.7

Species	1987-88				1966-87			
	%	P	N	R.A.	%	P	N	R.A.
Yellow-billed cuckoo	-7.2		620	3.9	-0.9		1,477	4.3
Greater roadrunner	1.5		58	0.8	0.8		238	0.6
Great horned owl	-35.1	**	248	0.5	1.1	**	1,226	0.2
Barred owl	9.2		141	0.3	1.7	**	699	0.1
Common nighthawk	10.6		388	3.1	-0.1		1,318	2.2
Chuck-will's-widow	5.5		187	1.5	-0.8		446	1.6
Whip-poor-will	7.8		113	0.5	-0.2		561	0.3
Chimney swift	-3.2		785	8.2	-0.3		1,627	6.6
Ruby-throated hummingbird	3.6		352	0.5	1.3		1,266	0.3
Belted kingfisher	0.3		498	0.5	-0.6		1,827	0.4
Red-headed woodpecker	2.6		415	2.1	-0.9	*	1,100	2.0
Red-bellied woodpecker	9.2	**	571	5.9	0.2		1,065	5.0
Yellow-bellied sapsucker	33.9	**	178	2.8	0.0		0	0.0
Downy woodpecker	9.0	**	851	1.8	0.4		1,952	1.1
Hairy woodpecker	0.6		539	0.6	0.8	*	1,764	0.4
Red-shafted flicker	-11.1	*	205	2.6	-0.7		549	2.2
Yellow-shafted flicker	-15.4	**	834	2.3	-2.8	**	1,845	2.8
Pileated woodpecker	9.0		544	1.1	0.9	*	1,278	0.7
Olive-sided flycatcher	-5.3		174	1.6	-3.5	**	649	1.5
Western wood-pewee	-2.0		187	4.4	-0.9		521	3.2
Eastern wood-pewee	1.0		733	3.7	-1.4	**	1,575	2.7
Acadian flycatcher	9.8		290	1.7	-0.2		727	1.4
Alder flycatcher	2.8		233	6.0	1.8	*	645	4.0
Willow flycatcher	1.3		320	2.4	0.6		845	1.4
Least flycatcher	-0.3		339	6.4	0.0		1,028	3.5
Hammond's flycatcher	14.9		55	3.5	0.2		166	3.3
Dusky flycatcher	0.9		67	3.2	4.0	*	200	1.8
Western flycatcher	-14.9	**	79	3.3	3.3	*	283	1.9
Black phoebe	3.8		51	1.8	6.1	**	138	0.5
Eastern phoebe	-2.0		634	2.0	-0.3		1,496	1.3
Say's phoebe	23.0	**	111	1.1	2.0	**	364	0.9
Ash-throated flycatcher	-2.8		118	5.9	3.3	**	310	4.6
Great crested flycatcher	4.1		814	3.3	0.2		1,611	3.3
Western kingbird	-11.7	**	296	7.4	1.7	**	768	5.5
Eastern kingbird	0.0		921	4.6	-0.3		1,989	4.1
Scissor-tail flycatcher	-1.0		100	11.6	-0.8		229	10.9
Horned lark	-3.1		508	29.7	-0.4		1,505	26.1
Purple martin	9.9	*	535	6.1	2.0	**	1,441	4.4
Tree swallow	7.8		516	6.5	2.1	**	1,439	4.5
Violet-green swallow	8.2		127	6.7	-0.6		397	4.5
Northern rough-winged swallow	-4.3		592	3.0	0.9		1,807	1.6
Bank swallow	-14.5		262	6.0	2.1		1,137	4.5
Cliff swallow	17.3		488	24.8	2.3	*	1,440	17.2
Barn swallow	-1.4		1,114	13.2	2.0	**	2,358	13.0
Gray jay	-15.6		55	1.7	-3.8	**	284	2.8
Steller's jay	4.7		95	4.0	-0.8		268	3.0
Blue jay	2.5		890	9.3	-1.4	**	1,780	8.5
Scrub jay	7.5		92	5.5	1.1		225	3.5
Black-billed magpie	-1.2		150	6.1	-2.7	**	427	6.9
American crow	1.4		1,050	21.9	0.7	**	2,252	18.4
Fish crow	15.1	*	178	5.3	4.5	**	358	3.3

Species	1987-88				1966-87			
	%	P	N	R.A.	%	P	N	R.A.
Common raven	1.7		348	5.0	3.1	**	936	4.3
Black-capped chickadee	7.3		530	3.6	1.6	**	1,266	2.4
Carolina chickadee	-5.4		409	6.3	0.0		759	5.1
Mountain chickadee	-2.0		77	4.7	-0.6		227	3.2
Plain titmouse	-4.0		52	4.4	-1.0		148	2.5
Tufted titmouse	4.0		583	7.6	-0.2		1,136	6.0
Common bushtit	23.3	**	65	4.8	0.4		214	1.6
Red-breasted nuthatch	6.5		257	2.8	-0.7		736	1.6
White-breasted nuthatch	5.8		593	1.4	2.1	**	1,451	0.7
Brown-headed nuthatch	19.1	*	109	2.1	0.2		239	1.7
Brown creeper	24.4	*	115	0.6	0.6		458	0.3
Rock wren	-17.0	**	130	1.9	0.3		398	1.7
Carolina wren	-6.6	*	467	10.0	0.3		915	7.8
Bewick's wren	7.2		144	5.2	-0.2		522	2.3
House wren	-9.7	**	693	6.5	1.7	**	1,664	4.1
Winter wren	-4.7		194	5.7	-0.5		555	5.0
Sedge wren	-42.4	**	84	2.7	3.3	*	322	0.7
Golden-crowned kinglet	30.6	*	138	2.0	-2.2		420	1.7
Ruby-crowned kinglet	27.1		144	5.1	-3.0		561	5.1
Blue-gray gnatcatcher	-6.0		438	2.6	0.5		1,035	1.5
Eastern bluebird	1.2		653	3.9	0.1		1,396	2.2
Western bluebird	-23.1		51	1.8	-0.3		198	1.1
Mountain bluebird	-13.0		94	2.0	0.4		308	1.9
Townsend's solitaire	7.9		55	1.3	3.3	*	184	0.5
Veery	-0.3		312	6.5	-0.8	*	847	4.5
Swainson's thrush	-18.0	**	175	17.3	0.3		610	16.3
Hermit thrush	21.4		259	4.5	0.8		772	3.8
Wood thrush	-0.8		632	4.2	-1.7	**	1,366	5.2
American robin	1.4		1,079	29.2	1.4	**	2,267	26.0
Gray catbird	-2.3		753	2.9	-0.2		1,760	2.4
Northern mockingbird	-1.9		677	19.8	-1.8	**	1,445	15.2
Sage thrasher	16.1		59	5.1	1.8		167	8.6
Brown thrasher	-0.5		753	3.5	-0.9	**	1,724	3.2
Cedar waxwing	-1.3		559	4.9	2.8	**	1,365	3.3
Loggerhead shrike	-1.9		368	2.1	-3.1	**	1,154	2.0
European starling	-6.2		1,137	31.5	-0.7	**	2,396	31.3
White-eyed vireo	1.6		369	4.4	-0.5		802	4.3
Bell's vireo	-14.1	**	53	1.4	-2.4		270	1.0
Solitary vireo	5.0		248	2.1	2.0	**	788	1.3
Yellow-throated vireo	5.2		398	0.9	0.6		1,044	0.6
Warbling vireo	3.4		592	4.2	1.7	**	1,520	2.6
Red-eyed vireo	2.2		781	12.1	1.3	**	1,802	9.2
Blue-winged warbler	-8.9		125	0.8	0.5		426	0.3
Golden-winged warbler	10.3		64	0.4	-2.8	**	293	0.3
Tennessee warbler	21.4		54	10.1	0.0		293	7.1
Orange-crowned warbler	-18.7	**	81	4.2	-0.3		283	2.7
Nashville warbler	-6.7		200	6.8	3.6		596	5.6
Northern parula	5.6		296	2.0	0.4		816	1.2
Yellow warbler	-0.2		700	4.5	0.6	*	1,895	4.3
Chestnut-sided warbler	6.9		263	5.9	-0.8		717	6.1
Magnolia warbler	1.6		134	7.7	2.3	*	461	5.7

Species	1987-88				1966-87			
	%	P	N	R.A.	%	P	N	R.A.
Black-throated blue warbler	84.0	**	98	0.9	0.3		385	0.5
Myrtle warbler	-2.6		179	7.3	2.0		500	7.8
Black-throated gray warbler	6.0		51	3.0	2.8	*	156	1.4
Black-throated green warbler	9.5	**	185	4.1	-0.7		553	3.0
Blackburnian warbler	9.0		124	1.7	1.1		451	1.2
Yellow-throated warbler	10.3		122	0.8	0.5		410	0.5
Pine warbler	7.2	*	319	4.2	1.6	**	651	2.3
Prairie warbler	-3.6		248	1.6	-2.2	**	673	1.7
Cerulean warbler	26.2	**	57	0.6	-3.4	**	255	0.3
Black-and-white warbler	-1.3		334	1.7	1.0		996	1.5
American redstart	17.6		348	5.7	0.0		1,176	2.7
Prothonotary warbler	17.1		139	1.5	1.0		394	0.9
Worm-eating warbler	-19.4	**	89	0.4	-0.6		311	0.2
Ovenbird	8.2	**	451	9.8	0.6		1,133	6.1
Northern waterthrush	-0.9		137	2.2	3.9	**	540	4.6
Louisiana waterthrush	6.5		159	0.5	-0.4		517	0.2
Kentucky warbler	3.1		227	1.5	-1.1	*	598	1.2
Mourning warbler	15.2		156	5.1	1.0		468	4.9
MacGillivray's warbler	9.9		82	3.1	0.6		258	2.9
Common yellowthroat	-1.6		963	7.5	-0.3		2,082	7.2
Audubon's warbler	-4.4		101	5.4	0.9		301	4.6
Hooded warbler	-0.5		171	1.8	0.0		496	1.2
Wilson's warbler	-13.1		97	2.6	1.6	*	445	2.4
Canada warbler	8.9		122	1.2	-0.4		447	1.3
Yellow-breasted chat	0.0		446	4.2	-1.5	**	1,109	3.1
Summer tanager	6.1		299	3.4	0.2		664	2.8
Scarlet tanager	3.7		477	2.1	1.2	**	1,130	1.3
Western tanager	0.0		135	6.1	-0.8		394	3.5
Northern cardinal	1.1		756	22.6	-0.6	**	1,412	21.6
Rose-breasted grosbeak	2.3		436	2.7	1.6	**	1,024	2.6
Black-headed grosbeak	4.3		159	2.3	-0.6		408	2.1
Blue grosbeak	7.3	*	415	3.3	2.3	**	867	2.4
Lazuli bunting	2.7		112	2.4	-1.2		331	1.2
Indigo bunting	2.7		753	14.7	-0.5	**	1,563	9.8
Painted bunting	1.3		85	4.6	-3.3	**	235	5.5
Dickcissel	-14.6	**	323	14.9	-1.0		702	16.3
Rufous-sided towhee	9.1	**	774	6.8	-2.3	**	1,697	5.8
Brown towhee	8.0		74	4.4	-1.0		178	3.2
Chipping sparrow	-5.1		891	8.9	-1.0		2,036	6.8
Clay-colored sparrow	-8.5		110	10.4	-1.4	**	348	6.6
Brewer's sparrow	2.6		92	6.1	-2.0		247	7.7
Field sparrow	-9.5	**	618	5.8	-3.7	**	1,443	5.8
Vesper sparrow	-10.0	**	401	10.2	0.0		1,285	6.3
Lark sparrow	-10.2	*	250	4.7	-2.5	**	768	4.1
Black-throated sparrow	-10.8	*	52	12.8	-1.7		181	14.2
Lark bunting	19.3		69	66.9	-2.8	**	263	31.6
Savannah sparrow	-10.0	**	446	8.2	-0.4		1,222	7.9
Grasshopper sparrow	-8.0		425	4.9	-3.2	**	1,288	3.5
Song sparrow	-2.5		783	12.3	-1.1	**	1,844	10.3
Lincoln's sparrow	-16.1	**	86	2.4	4.8	*	338	3.6
Swamp sparrow	-17.1	**	218	2.0	1.4		695	2.2

Species	1987-88				1966-87			
	%	P	N	R.A.	%	P	N	R.A.
White-throated sparrow	-9.9		198	33.9	-1.7	*	569	31.7
White-crowned sparrow	1.7		57	3.9	-2.0	*	223	6.1
Slate-colored junco	1.5		130	7.7	-2.7		475	10.6
Oregon junco	0.1		114	8.2	0.0		301	9.6
Bobolink	-13.8	**	385	6.2	-0.4		1,023	6.0
Red-winged blackbird	-5.5	*	1,167	50.8	0.1		2,406	55.4
Eastern meadowlark	-3.8		747	18.4	-1.9	**	1,574	21.1
Western meadowlark	3.5		419	49.9	-0.8	*	1,107	44.9
Yellow-headed blackbird	-18.6	*	147	9.7	5.6		474	7.6
Brewer's blackbird	-12.4	**	312	21.3	0.4		816	16.8
Great-tailed grackle	-30.7		66	15.3	3.1		145	14.9
Common grackle	-0.1		951	31.8	-0.6	**	1,932	35.4
Brown-headed cowbird	6.7	*	1,170	12.8	-0.5	*	2,426	12.7
Orchard oriole	3.5		499	3.2	-1.8	**	1,118	3.1
Bullock's oriole	-1.6		182	2.6	-1.5		497	1.8
Baltimore oriole	-11.0	**	601	4.2	1.1	**	1,456	2.9
Purple finch	-3.9		277	3.3	-0.1		840	2.7
Cassin's finch	-17.0		59	2.1	1.5		180	2.0
House finch	9.3		451	10.3	-1.1		859	7.0
Red crossbill	10.5		71	3.7	7.8	**	336	1.5
Pine siskin	-10.4		174	9.4	1.0		634	6.2
Lesser goldfinch	-20.5	**	79	2.9	-0.7		243	2.0
American goldfinch	-12.8	**	848	5.8	-0.6	**	1,912	5.0
Evening grosbeak	-3.2		130	4.0	-0.3		474	6.2
House sparrow	3.4		1,060	33.2	-1.1	**	2,256	41.0

^a See Appendix A of Robbins et al. (1986) for scientific names of bird species.

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