U.S. Fish & Wildlife Service

American Woodcock

Population Status, 2023

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U.S. Fish and Wildlife Service
Division of Migratory Bird Management
Branch of Assessment and Decision Support
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Cover photograph: American woodcock chick fitted with a radio transmitter, Rhode Island. Photo by Colby Slezak.

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AMERICAN WOODCOCK POPULATION STATUS, 2023

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Abstract: The American Woodcock (*Scolopax minor*) Singing-ground Survey data for 2023 indicate that the index for singing males was similar to that of 2022 in the Eastern and Central Management Regions. Both regions had a significant negative trend over the most recent 10 years (2013–2023): Eastern = -1.18%/year; Central = -1.25%/year. Both regions had a significant, long-term (1968–2023) negative trend: Eastern = -0.86%/year; Central -0.53%/year. The 2022 recruitment index in the U.S. portion of the Eastern Region (1.21 immatures per adult female) was 12.3% less than the 2021 index and 24.9% less than the long-term regional average, while the recruitment index in the Central Region (1.23 immatures per adult female) was 18.2% less than the 2021 index, and 17.0% less than the long-term regional average. Estimates from the Harvest Information Program indicated that U.S. woodcock hunters in the Eastern Region spent 94,000 days afield and harvested 65,400 woodcock during the 2022–23 season, while in the Central Region hunters spent 189,600 days afield and harvested 112,500 woodcock.

INTRODUCTION

The American woodcock is a popular game bird throughout eastern North America. The management objective of the U.S. Fish and Wildlife Service (USFWS) is to stabilize woodcock populations, while ultimately returning the population to a level that occurred in the early 1970s (Kelley et al. 2008). Reliable annual population estimates, harvest estimates, and information on recruitment and distribution are essential for comprehensive woodcock management. This information is difficult and often impractical to obtain. Woodcock are difficult to find and count because of their cryptic coloration, small size, and preference for areas with dense vegetation. The Singing-ground Survey (SGS) was developed to provide indices to changes in abundance. The Parts-collection Survey (PCS) provides annual indices of woodcock recruitment. The Harvest Information Program (HIP) utilizes a sampling frame of woodcock hunters to estimate annual harvest and hunter days spent afield.

This report summarizes the results of these surveys and presents an assessment of the population status of woodcock as of early June 2023. The report is intended to assist managers in regulating the sport harvest of woodcock and to draw attention to areas where management actions are needed. Historical woodcock hunting regulations are summarized in Appendix A.

The primary purpose of this report is to facilitate the prompt distribution of timely information. Results are preliminary and may change with the inclusion of additional data.

METHODS

Woodcock Management Regions

Woodcock are managed on the basis of two regions or populations, Eastern and Central (Fig. 1), as recommended by Owen et al. (1977). Coon et al. (1977) reviewed the concept of management regions for woodcock and recommended the current configuration over several alternatives. This configuration was biologically justified because analysis of band recovery data indicated that there was little crossover between the regions (Krohn et al. 1974, Martin et al. 1969). Furthermore, the boundary between the two regions conforms to the boundary between the Atlantic and Mississippi Flyways. The results of the PCS and SGS, as well from HIP, are reported by state or province, and management region. Although state and province level results are included in this report, analyses are designed to support management decisions made at the management region scale.

Singing-ground Survey

The SGS was developed to exploit the conspicuous courtship display of the male woodcock. Early studies demonstrated that counts of singing males provide indices to woodcock population abundance and could be used to monitor annual changes (Mendall and Aldous 1943, Goudy 1960, Duke 1966, Whitcomb 1974). Before 1968, counts were conducted on nonrandomly located routes. Beginning in 1968, routes were relocated along lightly traveled secondary roads in the center of randomly chosen 10-minute degree blocks within each state

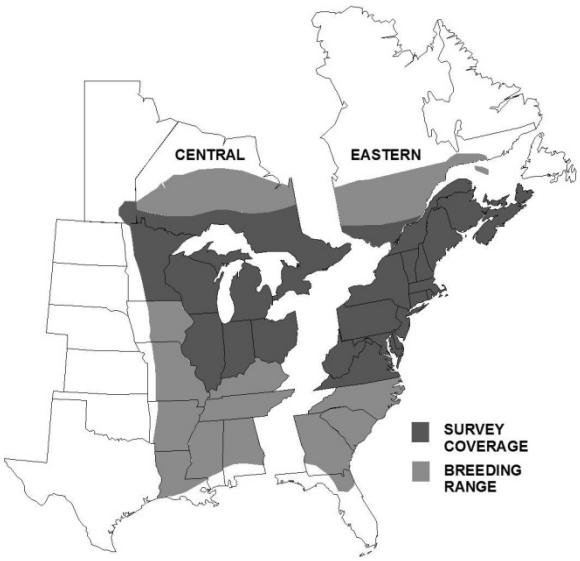

Fig. 1. Woodcock management regions, breeding range, and Singing-ground Survey coverage.

and province in the central and northern portions of the woodcock's breeding range (Fig. 1). Data collected prior to 1968 are not included in this report.

Each route was 3.6 miles (5.4 km) long and consisted of 10 listening points. The routes were surveyed shortly after sunset by an observer who drove to each of the 10 stops and recorded the number of woodcock heard peenting (the vocalization by displaying male woodcock on the ground). Acceptable dates for conducting the survey were assigned by latitude to coincide with peaks in courtship behavior of local woodcock. In most states and provinces, the peak of courtship activity (including local woodcock and woodcock still migrating) occurred earlier in the spring and local reproduction may have already been underway when the survey was conducted. However, it was necessary to conduct the survey during the designated survey dates to minimize the counting of migrating woodcock. Because adverse weather conditions may affect courtship behavior and/or the ability of observers to hear woodcock, surveys were only conducted when wind, precipitation, and temperature conditions were within prescribed limits.

The survey consists of about 1,500 routes. To avoid expending unnecessary resources and funds, approximately two-thirds of these routes were selected for survey each year. The remaining routes were carried as "constant zero" routes. Routes for which no woodcock were heard for 2 consecutive years enter this constant zero status and were not surveyed for the next 5 years. If woodcock were heard on a constant zero route during its next survey, the route reverted to normal status and was surveyed again each year. Data from constant zero routes were included in the analysis only for the years they were surveyed. Sauer and Bortner (1991) reviewed the implementation and analysis of the SGS in more detail.

Trends in the number of male woodcock heard were estimated using a hierarchical model. Sauer et al. (2008) describe a hierarchical log-linear model for estimation of population change from SGS data. Sauer et al. (2021) compared the Sauer et al. (2008) model with a model with additional forms for year effects and the distribution of overdispersion effects and concluded that population change is best modeled as the difference in expected counts between successive years (their 'D' model). We used this new D model for inference in this report. The 2 model forms are similar except in how year effects are modeled: the old approach (denoted as the 'S' in Sauer et al. 2021) modeled year effects as random effects in the context of a slope parameter to estimate population change, whereas the D model describes population change as the difference in expected counts between successive years. The D model provides population trend and annual index values that are generally comparable to the estimates provided by the previous model, except that the D model provides slightly fewer extreme estimates of trend.

For the hierarchical model, the log of the expected value of the counts was modeled as a linear combination of strata-specific intercepts and year effects, a random effect for each unique combination of route and observer, a start-up effect on the route for first year counts by new observers, and overdispersion. The parameters of interest were treated as random and were assumed to follow distributions that were governed by additional parameters. The hierarchical model is fit using Bayesian methods. Markov-chain Monte Carlo methods were used to iteratively produce sequences of parameter estimates which were used to describe the distribution of the parameters of interest. After an initial "burn-in" period, means, medians, and credible (i.e., Bayesian confidence) intervals (CI) for the parameters were estimated from the replicates. Annual indices for a stratum (state or province) are a function of year effects, defined as exponentiated random strata and year effects. Population trends were defined as ratios of the indices at the start and end of the interval of interest, taken to the appropriate power to estimate a yearly change (Sauer et al. 2021). Trend estimates were expressed as percent change per year, while indices were expressed as the number of singing males per route. Annual indices were calculated for the 2 regions and each state and province, while short-term (2022–2023), 10-year (2013–2023) and long-term (1968–2023) trends were evaluated for each region as well as for each state and province.

Due to SARS-CoV-2 (i.e., coronavirus) related restrictions in Canada and the U.S., only a portion of the SGS (n=329 routes) was conducted in 2020. Indices for

states and provinces with little or no data for 2020 were estimated with the hierarchical model using strata-specific intercepts and year effects that were calculated from the limited 2020 data and the long-term dataset.

Credible intervals were used to describe uncertainty around the estimates when fitting hierarchical models. If the CI did not overlap 0 for a trend estimate, the trend was considered significant. We present the median and 95% CIs of 10,000 samples (i.e., we simulated 20,000 replicates and thinned by 2), which were calculated after an initial burn-in of 20,000 iterations to allow the series to converge. Refer to Link and Sauer (2002) and Sauer et al. (2008, 2021) for a detailed description of the statistical model and fitting process.

The reported sample sizes are the number of routes on which trend estimates are based. Each route was to be surveyed during the peak time of daily singing activity. For editing purposes, "acceptable" stops were surveyed between 22 and 58 minutes after sunset (or between 15 and 51 minutes after sunset on overcast evenings). Due to observer error or road conditions, some stops on some routes were surveyed before or after the peak times of singing activity. Earlier analysis revealed that routes with 8 or fewer acceptable stops tended to be biased low. Beginning with data from 1988, only route observations with at least 9 acceptable stops were included in the analysis. Route observations prior to 1988 are used regardless of the number of acceptable stops. Routes for which data were received after 27 June 2023 were not included in this analysis but will be included in future trend estimates.

Parts-collection Survey

The primary objective of the PCS is to provide data on the reproductive success of woodcock. The survey is administered as a cooperative effort between woodcock hunters, the USFWS, and state wildlife agencies. Participants in the 2022 survey included hunters who either: (1) participated in past surveys; (2) were a subset of hunters that indicated on the HIP Survey that they hunted woodcock; or (3) contacted the USFWS to volunteer for the survey.

Parts-collection Survey participants were provided with prepaid mailing envelopes and asked to submit 1 wing from each woodcock they harvested. Hunters were asked to record the date of the hunt as well as the state and county where the bird was shot. Hunters were not asked to submit envelopes for unsuccessful hunts. The age and gender of birds were determined by examining plumage characteristics (Martin 1964, Sepik 1994).

The ratio of immature birds per adult female in the harvest provides an index to recruitment of young into the population. The 2022 recruitment index for each state with ≥ 125 submitted wings was calculated as the number of immatures per adult female. The regional indices for 2022 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963–2021.

Harvest Information Program

The HIP was cooperatively developed by the USFWS and state wildlife agencies to provide reliable annual estimates of hunter activity and harvest for all migratory game birds (Elden et al. 2002). The HIP sampling frame consists of all migratory game bird hunters. Under this program, state wildlife agencies collect the name, address, and additional information from each migratory bird hunter in their state and send that information to the USFWS. The USFWS then selects stratified random samples of those hunters and asks them to voluntarily provide detailed information about their hunting activity. For example, hunters selected for the woodcock harvest survey are asked to complete a daily diary about their woodcock hunting and harvest during the current year's hunting season. Their responses are then used to develop nationwide woodcock harvest estimates. The HIP survey estimates of woodcock harvest have been available since 1999. Although estimates from 1999–2002 have been finalized, the estimates from 2003–2022 should be considered preliminary as refinements are still being made in the sampling frame and estimation techniques. Canadian hunter and harvest estimates, which were obtained through the Canadian National Harvest Survey Program, are presented in Appendix B (Gendron and Smith 2019).

RESULTS AND DISCUSSION

Singing-ground Survey

Data for 847 routes were submitted by 27 June 2023 (Table 1). There was no significant change in the number of woodcock heard singing during 2023 from last year for the Eastern and Central Management Regions (Table 1). Trends for individual states and provinces are reported in Table 1. Consistency in route coverage over time is a critical component of precision in estimation of population change. Low precision of 2-year change estimates reflects the low numbers of routes surveyed by the same observer in both years. Ensuring that observers participate for several years on the same route would greatly enhance the quality of the results.

The 10-year trend (2013–2023) indicated a significant decline in both the Eastern and Central Management Regions (Table 1, Fig. 2). Many states and provinces in both management regions have experienced significant long-term (1968–2023) declines as measured by the SGS (Table 1, Fig. 3). The long-term trend estimate was −0.86%/year in the Eastern Management Region and -0.53%/year in the Central Management Region (Table 1).

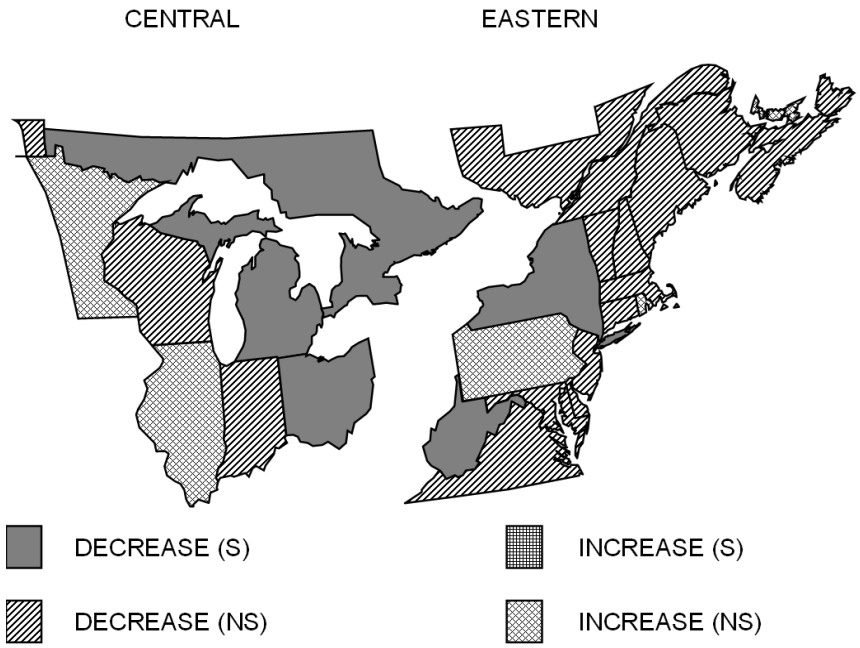

Fig. 2. Ten-year trends in the number of American woodcock heard on the Singing-ground Survey, 2013–2023, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

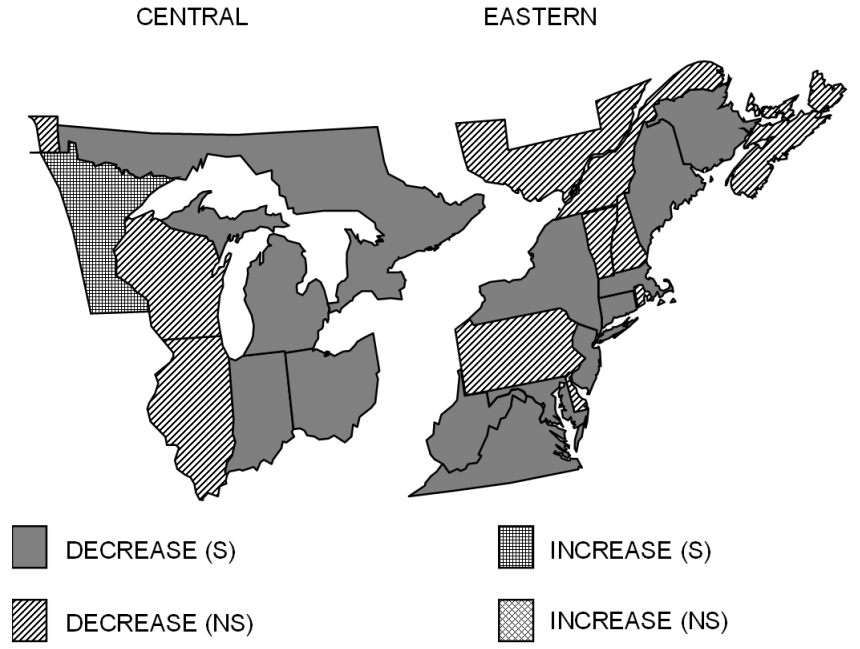

Fig. 3. Long-term trends in the number of American woodcock heard on the Singing-ground Survey, 1968–2023, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

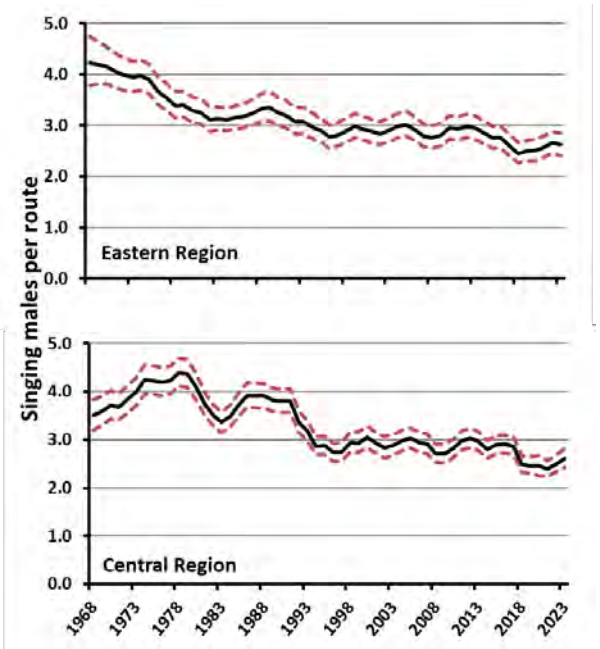

Fig. 4. Annual indices of the number of woodcock heard during the Singing-ground Survey, 1968–2023 as estimated using hierarchical modeling. The red dashed lines represent the 95% credible interval for the estimate**.**

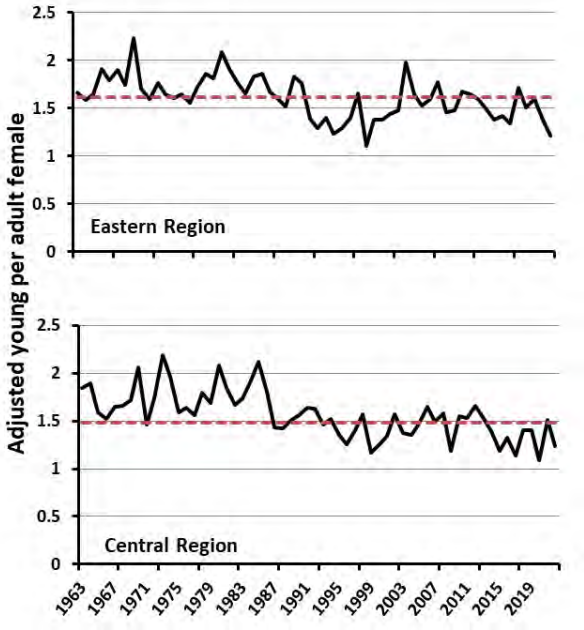

Fig. 5. Annual indices of recruitment (U.S.), 1963–2022. The red dashed line is the 1963–2021 average.

In the Eastern Region, the 2023 index was 2.62 singing males per route, while it was 2.61 in the Central Management Region (Figure 4, Table 2). Annual indices (1968–2023) by state, province, and region are available in Table 2.

Parts-collection Survey

A total of 756 woodcock hunters (Table 3) from states with a woodcock season sent in a total of 7,051 usable woodcock wings for the 2022–2023 PCS (Table 4).

The 2022 recruitment index in the U.S. portion of the Eastern Region (1.21 immatures per adult female) was 12.3% less than the 2021 index of 1.38, and 24.9% less than the long-term (1963–2021) regional average of 1.61 (Table 4, Fig 5). In the Central Region, the 2022 recruitment index (1.23 immatures per adult female) was 18.2% less than the 2021 index of 1.51 and was 17.0% less than the long-term regional average of 1.49 (Table 4, Fig 5). Percent change for all comparisons was calculated using unrounded recruitment indices.

Harvest Information Program

Estimates of woodcock harvest, number of active hunters, days afield, and seasonal hunting success from the 2022–2023 HIP survey are provided in Table 5. In the Eastern Management Region, woodcock hunters spent an estimated 94,000 days afield (Figure 6) and harvested 65,400 birds (Figure 7) during the 2022–2023 hunting season. In the Eastern Region, harvest in 2022–2023 was 12.1% less than the long-term (1999–2021) average (74,400 birds/year) and 11.0% less than last year (73,500 birds). Woodcock hunters in the Central Region spent an estimated 189,600 days afield (Figure 6) and harvested 112,500 birds (Figure 7) during the 2022–23 hunting season. In the Central Region, harvest in 2022–23 was 42.7% less than the long-term (1999–2021) average (196,300 birds/year) and 20.4% less than last year (141,300 birds).

Although HIP provides statewide estimates of woodcock hunter numbers, it is not possible to develop regional estimates due to some hunters being registered for HIP in more than 1 state. Therefore, regional estimates of seasonal hunting success rates cannot be determined on a per hunter basis. All estimates have been rounded to the nearest hundred. Data from Canada indicate that the annual number of successful hunters and annual harvest have been similar since 2009 (Appendix B). The most recent data available indicate that an estimated 3,018 successful hunters harvested 20,855 woodcock during the 2021 season in Canada (Gendron and Smith 2019; Appendix B).

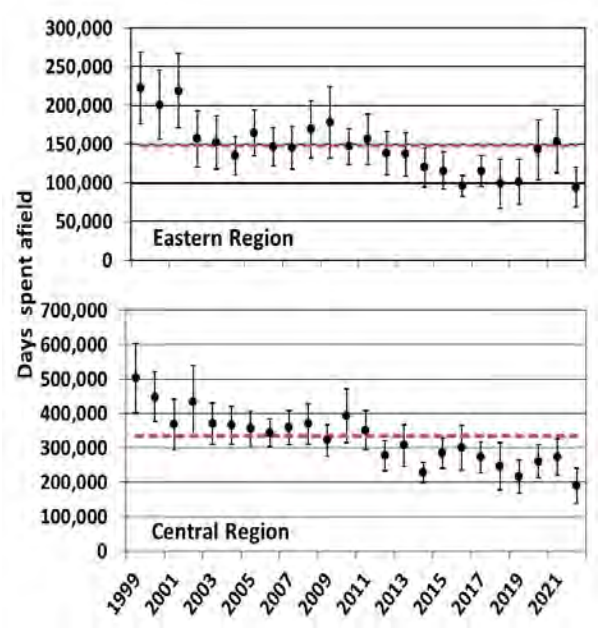

Fig. 6. Harvest Information Program Survey estimates of days spent afield by U.S. woodcock hunters, 1999–2022. The dashed line represents the 1999–2021 average and error bars represent the 95% confidence interval of the point estimate.

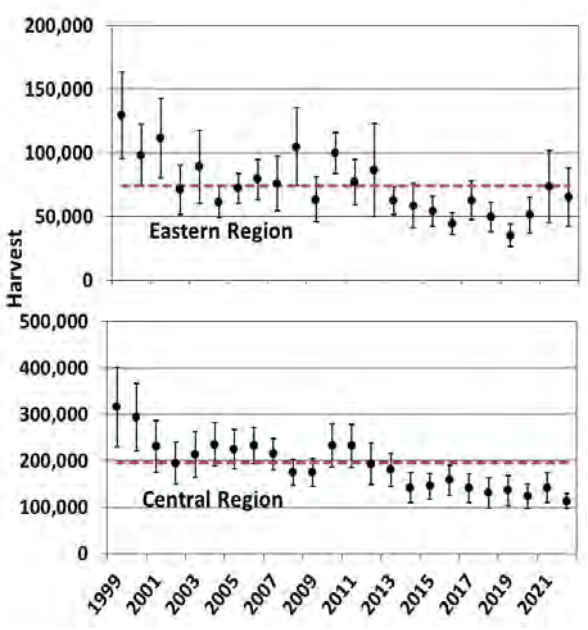

Fig. 7. Harvest Information Program Survey estimates of U.S. woodcock harvest, 1999–2022. The dashed line represents the 1999–2021 average and the error bars represent the 95% confidence interval of the point estimate.

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Table 1. Short-term (2022–2023), 10-year (2013–2023), and long-term (1968–2023) trends (% change per year[a]) in the number of American woodcock heard during the Singing-ground Survey. Trends and 95% credible intervals (CI) were estimated using a hierarchical log-linear modeling technique (Sauer et al. 2021).

State, Province, or Region	Routes 2022[b]	Routes 2023[c]	n[d]	Short-Term % Change	Short-term Lower 95% CI	Short-term Upper 95% CI	10-year % Change	10-year Lower 95% CI	10-year Upper 95% CI	Long-term % Change	Long-Term Lower 95% CI	Long-Term Upper 95% CI
CT	6	3	11	-3.59	-28.52	26.32	-1.98	-7.43	3.17	-2.32	-3.99	-0.59
DE	0	0	3	0.00	-27.06	37.44	-0.66	-10.95	8.52	-1.20	-5.58	1.07
ME	56	54	78	-5.35	-18.45	8.18	-1.84	-3.80	0.08	-1.00	-1.45	-0.53
MD	5	9	26	-1.66	-25.25	28.91	-2.69	-9.49	3.72	-3.43	-5.08	-2.02
MA	9	9	23	-0.18	-19.41	23.56	-2.23	-5.97	1.75	-2.42	-3.38	-1.45
NB	54	53	76	1.61	-12.13	17.51	-1.94	-3.86	0.00	-1.04	-1.61	-0.51
NH	13	14	19	-1.29	-18.95	18.24	-2.06	-5.40	1.17	-0.66	-1.54	0.19
NJ	3	9	19	0.85	-29.53	44.70	-2.10	-9.16	5.54	-4.02	-5.43	-2.61
NY	80	82	119	-4.05	-14.83	6.35	-1.95	-3.64	-0.35	-0.80	-1.21	-0.40
NS	40	41	66	0.90	-12.06	14.92	-0.11	-2.20	1.98	-0.32	-0.91	0.24
PA	33	31	86	3.94	-11.13	24.22	2.41	-0.60	6.08	-0.47	-1.09	0.18
PEI	10	9	13	-1.81	-21.85	21.32	1.16	-2.60	4.92	-0.53	-1.54	0.52
QUE	36	36	155	-1.08	-12.75	11.30	-0.93	-3.41	1.36	-0.28	-0.99	0.45
RI	2	1	5	1.27	-31.80	54.47	2.46	-7.13	17.95	-2.29	-5.13	0.28
VT	19	18	24	-2.90	-22.71	20.61	-0.18	-3.34	3.04	-0.61	-1.48	0.26
VA	20	18	75	-1.24	-28.17	33.10	-1.85	-8.44	4.98	-4.14	-5.36	-3.01
WV	18	19	59	-4.76	-22.60	14.11	-3.78	-7.64	-0.22	-2.39	-3.31	-1.53
Eastern	**404**	**406**	**857**	**-1.20**	**-6.34**	**3.84**	**-1.18**	**-2.06**	**-0.33**	**-0.86**	**-1.11**	**-0.62**
IL	29	20	51	-34.94	-69.46	8.98	3.15	-5.92	13.63	-1.08	-3.24	0.97
IN	14	11	63	0.07	-26.86	36.49	-2.73	-9.86	3.98	-3.73	-5.09	-2.50
MB[e]	4	13	31	-0.04	-17.76	22.28	-0.38	-3.63	3.01	-0.46	-2.63	1.66
MI	113	113	161	4.96	-5.29	16.61	-1.64	-2.92	-0.34	-0.65	-0.96	-0.32
MN	76	78	127	6.26	-6.34	21.21	0.71	-0.94	2.40	0.94	0.44	1.50
OH	37	34	74	-1.78	-19.38	20.45	-6.04	-9.21	-3.09	-2.24	-2.96	-1.55
ON	84	89	177	5.86	-6.02	19.67	-2.12	-3.65	-0.52	-1.01	-1.41	-0.60
WI	94	83	134	4.46	-7.33	18.05	-0.74	-2.39	0.96	-0.01	-0.43	0.41
Central	**451**	**441**	**787**	**4.64**	**-1.12**	**10.82**	**-1.25**	**-1.98**	**-0.49**	**-0.53**	**-0.73**	**-0.33**
Continent	**855**	**847**	**1,644**	**1.61**	**-2.27**	**5.61**	**-1.22**	**-1.78**	**-0.64**	**-0.71**	**-0.87**	**-0.54**

[a] Median of route trends estimated used hierarchical modeling. To estimate the total percent change over several years, use: $(100((\%\ change/100)+1)^{y})-100$, where y is the number of years. Note: extrapolating the estimated trend statistic (% change per year) over time (e.g., 30 years) may exaggerate the total change over the period.

[b] Total number of routes surveyed in 2022.

[c] Total number of routes surveyed in 2023 for which data were received by 27 June 2023.

[d] Number of routes with at least one year of non-zero data between 1968 and 2023.

[e] Manitoba began participating in the Singing-ground Survey in 1992.

Table 2. Breeding population indices (singing-males per route) for American woodcock from the Singing-ground Survey, 1968–2023. These indices are based on 1968–2023 trends that were estimated using hierarchical modeling techniques. Dashes indicate no data were available for that year.

State, Province, or Region	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Eastern Region																
CT	----	3.01	3.04	2.89	2.83	2.60	2.44	2.22	1.84	1.62	1.41	1.37	1.37	1.42	1.49	1.44
DE	0.77	0.76	0.77	0.76	0.76	0.77	0.77	0.76	0.68	0.65	0.62	0.62	0.63	0.64	0.64	0.65
MA	----	3.84	3.95	3.96	3.75	3.77	3.41	2.86	2.59	2.45	2.36	2.34	2.14	2.07	1.87	1.74
MD	1.78	1.83	1.75	1.72	1.65	1.60	1.54	1.46	1.32	1.30	1.32	1.33	1.36	1.29	1.16	1.01
ME	6.64	6.73	7.11	6.83	6.77	6.99	7.28	7.36	6.81	5.92	5.59	5.67	5.27	5.40	4.73	4.88
NB	----	10.32	9.68	8.81	8.32	7.82	8.06	8.13	6.95	7.14	6.10	5.94	5.34	5.58	5.41	5.22
NH	----	3.83	3.91	3.74	3.83	3.56	3.69	3.59	3.52	3.46	3.39	3.33	3.39	3.23	2.95	2.91
NJ	4.19	4.39	4.93	5.87	5.40	5.85	5.40	4.35	3.19	2.78	2.44	2.47	2.11	1.96	1.82	1.87
NS	4.74	4.33	3.96	4.16	4.16	4.30	4.41	4.29	4.15	4.03	3.97	3.63	3.40	3.15	3.01	3.09
NY	4.54	4.55	4.31	4.43	4.38	4.39	4.33	4.04	3.94	3.84	3.69	3.90	4.14	4.04	3.84	3.86
PA	2.07	2.05	2.15	2.13	2.06	1.96	1.78	1.72	1.69	1.64	1.58	1.54	1.43	1.36	1.33	1.33
PEI	----	4.98	5.07	5.23	4.90	4.88	5.15	5.55	5.19	4.81	4.45	4.16	3.64	3.41	3.49	3.81
QUE	----	----	----	4.95	5.02	4.96	5.01	5.04	5.09	5.17	5.45	5.64	5.68	5.55	5.53	5.65
RI	----	1.43	1.49	1.66	1.56	1.41	1.22	1.04	0.90	0.78	0.69	0.63	0.59	0.56	0.55	0.52
VA	----	1.34	1.32	1.15	1.04	0.95	1.08	1.03	0.97	0.91	0.81	0.76	0.71	0.76	0.79	0.78
VT	----	3.51	3.92	4.01	4.32	4.24	4.61	5.01	5.13	4.92	4.04	3.64	3.20	2.72	2.30	2.53
WV	1.59	1.57	1.48	1.44	1.48	1.42	1.34	1.29	1.18	1.08	0.98	1.04	1.07	1.14	1.11	1.05
Region	**4.22**	**4.20**	**4.15**	**4.07**	**4.00**	**3.95**	**3.98**	**3.90**	**3.67**	**3.55**	**3.39**	**3.40**	**3.30**	**3.25**	**3.11**	**3.13**
Central Region																
IL	----	----	0.24	0.29	0.29	0.27	0.29	0.27	0.23	0.28	0.33	0.31	0.32	0.41	0.44	0.78
IN	1.37	1.10	0.99	0.90	1.05	1.02	0.92	0.80	0.77	0.76	0.80	0.88	0.80	0.79	0.64	0.60
MB	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MI	6.99	6.95	6.94	6.68	6.82	7.24	8.09	8.28	7.96	7.57	7.93	7.89	7.38	6.64	6.59	5.92
MN	----	2.34	2.43	2.68	2.86	3.30	3.84	3.83	3.92	4.05	4.24	4.11	4.42	4.12	3.93	3.54
OH	----	----	1.65	1.57	1.55	1.47	1.52	1.45	1.52	1.44	1.31	1.22	1.24	1.30	1.18	1.17
ON	7.35	8.04	8.56	8.45	8.97	9.03	9.13	8.97	9.14	9.47	9.82	9.89	9.17	8.20	7.10	6.87
WI	3.39	3.52	3.90	3.92	4.00	4.21	4.34	4.44	4.28	4.54	4.72	4.68	3.97	3.46	3.41	3.41
Region	**3.50**	**3.58**	**3.71**	**3.68**	**3.83**	**3.99**	**4.24**	**4.23**	**4.19**	**4.23**	**4.39**	**4.37**	**4.10**	**3.74**	**3.50**	**3.36**
Continent	**3.87**	**3.89**	**3.94**	**3.88**	**3.92**	**3.97**	**4.11**	**4.06**	**3.93**	**3.89**	**3.89**	**3.88**	**3.70**	**3.49**	**3.31**	**3.25**

Table 2. Continued

State, Province, or Region	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Eastern Region																
CT	1.39	1.39	1.40	1.35	1.34	1.19	1.12	1.07	1.01	0.98	1.01	1.05	1.07	1.03	1.01	0.98
DE	0.64	0.63	0.64	0.64	0.64	0.64	0.64	0.63	0.63	0.64	0.64	0.65	0.65	0.65	0.64	0.61
MA	1.79	1.80	1.76	1.71	1.65	1.53	1.47	1.41	1.33	1.29	1.29	1.31	1.36	1.45	1.55	1.73
MD	0.92	0.82	0.72	0.66	0.62	0.60	0.57	0.54	0.50	0.51	0.49	0.47	0.46	0.43	0.41	0.42
ME	5.06	5.33	5.71	5.98	5.75	5.55	4.83	4.84	4.47	4.45	4.23	4.09	3.75	3.84	3.95	4.22
NB	4.93	4.88	4.57	4.80	5.45	6.09	5.68	5.44	5.36	5.91	6.13	5.89	5.48	5.79	6.02	6.57
NH	2.96	3.21	3.64	3.50	3.38	3.26	3.14	3.20	3.13	3.19	3.36	3.65	3.78	3.82	3.84	3.86
NJ	1.93	1.90	1.82	1.85	1.60	1.46	1.34	1.21	1.05	0.94	0.87	0.90	0.89	0.85	0.89	0.92
NS	3.08	3.17	3.21	3.04	3.09	3.09	3.04	3.19	3.28	3.33	3.23	3.31	3.36	3.34	3.48	3.74
NY	3.67	3.78	3.64	3.56	3.64	3.55	3.74	3.75	3.53	3.33	3.06	3.00	2.89	2.91	2.95	2.99
PA	1.35	1.34	1.35	1.34	1.34	1.38	1.49	1.57	1.48	1.45	1.36	1.40	1.42	1.43	1.47	1.40
PEI	4.07	4.22	4.34	4.19	4.39	4.46	4.19	4.01	3.84	3.67	3.61	3.76	3.98	3.92	3.74	3.53
QUE	5.68	5.78	5.96	6.23	6.53	6.68	6.47	6.27	6.17	6.10	5.86	5.50	5.19	5.20	5.36	5.31
RI	0.49	0.46	0.44	0.43	0.42	0.42	0.43	0.43	0.44	0.45	0.44	0.42	0.41	0.40	0.39	0.38
VA	0.84	0.61	0.57	0.53	0.47	0.43	0.44	0.43	0.44	0.42	0.37	0.33	0.31	0.31	0.28	0.27
VT	2.63	2.70	3.01	3.47	3.81	3.81	3.60	3.37	2.80	2.72	2.65	2.64	2.69	2.92	3.30	3.72
WV	1.00	0.95	0.93	0.90	0.87	0.86	0.86	0.82	0.81	0.80	0.81	0.83	0.80	0.78	0.74	0.73
Region	**3.11**	**3.14**	**3.17**	**3.24**	**3.32**	**3.35**	**3.25**	**3.20**	**3.08**	**3.08**	**2.98**	**2.89**	**2.77**	**2.81**	**2.90**	**2.98**
Central Region																
IL	0.80	1.00	1.02	1.08	0.67	0.63	0.51	0.61	0.53	0.54	0.42	0.34	0.34	0.34	0.38	0.42
IN	0.59	0.59	0.64	0.63	0.59	0.59	0.66	0.67	0.63	0.55	0.48	0.44	0.41	0.41	0.43	0.41
MB	----	----	----	----	----	----	6.05	6.05	6.07	6.11	6.04	5.74	4.99	4.14	4.16	4.19
MI	6.44	6.71	6.99	6.73	6.99	6.91	6.97	7.19	5.98	5.68	5.20	5.44	5.33	5.32	5.87	5.36
MN	3.46	3.76	4.00	4.11	4.35	3.96	4.35	4.20	3.72	3.59	3.32	3.32	3.19	3.06	3.39	3.62
OH	1.15	1.07	1.02	1.04	1.08	1.05	1.19	1.16	1.13	1.05	1.00	0.95	0.90	0.84	0.85	0.79
ON	7.05	7.71	8.04	8.03	8.10	8.10	7.80	7.69	7.17	6.65	5.91	5.87	5.26	5.52	5.74	5.77
WI	3.63	3.76	4.16	4.26	4.10	4.05	3.84	3.68	3.18	3.03	2.77	2.72	2.68	2.65	2.80	3.04
Region	**3.50**	**3.72**	**3.92**	**3.92**	**3.91**	**3.82**	**3.81**	**3.80**	**3.36**	**3.17**	**2.87**	**2.87**	**2.74**	**2.74**	**2.95**	**2.93**
Continent	**3.30**	**3.43**	**3.54**	**3.58**	**3.61**	**3.59**	**3.53**	**3.50**	**3.22**	**3.13**	**2.92**	**2.88**	**2.76**	**2.78**	**2.92**	**2.96**

Table 2. Continued

State, Province, or Region	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Eastern Region																
CT	0.90	0.83	0.78	0.77	0.75	0.75	0.76	0.79	0.85	0.89	0.95	1.04	1.08	1.05	1.04	1.00
DE	0.59	0.56	0.54	0.52	0.50	0.49	0.47	0.46	0.45	0.44	0.43	0.42	0.42	0.41	0.40	0.40
MA	1.70	1.66	1.67	1.70	1.74	1.67	1.64	1.59	1.63	1.59	1.49	1.40	1.31	1.28	1.29	1.31
MD	0.45	0.47	0.45	0.45	0.44	0.44	0.45	0.44	0.43	0.41	0.39	0.36	0.35	0.34	0.34	0.34
ME	4.36	4.11	3.94	4.12	4.33	4.45	4.39	4.19	4.19	4.21	4.48	4.64	4.68	4.61	4.38	4.10
NB	6.59	6.76	6.80	7.20	7.35	7.68	7.16	6.66	6.35	6.14	7.12	7.20	7.50	7.14	6.65	6.08
NH	3.62	3.60	3.64	3.80	3.81	3.66	3.33	2.98	2.98	3.23	3.30	3.20	3.31	3.30	3.21	2.94
NJ	0.87	0.79	0.71	0.67	0.58	0.54	0.55	0.56	0.55	0.56	0.49	0.53	0.57	0.54	0.48	0.41
NS	3.77	3.60	3.37	3.32	3.41	3.32	3.18	3.12	3.07	3.17	3.48	3.49	3.82	4.03	3.78	3.38
NY	2.92	2.87	2.90	3.05	3.21	3.16	3.18	3.09	3.08	3.30	3.50	3.46	3.53	3.56	3.51	3.64
PA	1.28	1.35	1.39	1.43	1.47	1.50	1.45	1.46	1.57	1.61	1.61	1.45	1.31	1.26	1.33	1.37
PEI	3.41	3.13	2.84	2.79	2.85	2.99	3.12	3.09	2.91	2.96	3.00	3.19	3.40	3.37	3.46	3.19
QUE	5.13	5.05	4.98	5.01	5.06	5.09	4.88	4.75	4.67	4.69	4.66	4.63	4.61	4.69	4.58	4.53
RI	0.38	0.37	0.36	0.34	0.33	0.32	0.32	0.31	0.31	0.31	0.30	0.30	0.30	0.31	0.31	0.32
VA	0.25	0.22	0.21	0.21	0.20	0.19	0.18	0.18	0.17	0.15	0.16	0.17	0.16	0.16	0.15	0.13
VT	3.74	3.29	3.02	3.06	3.14	3.25	3.17	2.85	2.66	2.68	2.74	2.69	2.71	2.58	2.41	2.42
WV	0.69	0.65	0.63	0.62	0.59	0.58	0.59	0.61	0.63	0.64	0.64	0.66	0.66	0.62	0.60	0.57
Region	**2.93**	**2.88**	**2.83**	**2.92**	**2.99**	**3.02**	**2.91**	**2.80**	**2.77**	**2.80**	**2.95**	**2.94**	**2.98**	**2.95**	**2.85**	**2.76**
Central Region																
IL	0.43	0.48	0.53	0.70	0.68	0.44	0.39	0.26	0.20	0.16	0.15	0.13	0.10	0.10	0.11	0.13
IN	0.39	0.37	0.33	0.31	0.32	0.32	0.29	0.27	0.27	0.27	0.27	0.25	0.24	0.23	0.22	0.21
MB	4.31	4.28	4.03	4.23	4.25	4.49	4.40	4.42	4.44	4.63	4.87	5.23	5.16	4.86	4.86	5.16
MI	5.41	5.21	5.30	5.46	5.56	5.40	5.05	4.88	4.63	4.64	4.86	5.31	5.59	5.78	5.65	5.58
MN	3.95	3.67	3.21	3.19	3.33	3.61	3.56	3.56	3.39	3.67	4.23	4.24	4.05	3.63	3.34	4.07
OH	0.78	0.78	0.79	0.83	0.98	0.97	0.91	0.80	0.83	0.96	0.97	0.97	0.96	0.93	0.88	0.87
ON	6.26	6.02	5.94	5.74	5.95	6.22	6.17	6.12	5.52	5.14	4.96	5.30	5.42	5.21	5.06	4.91
WI	2.98	2.86	2.63	2.72	2.85	3.12	3.13	3.36	3.16	3.17	3.28	3.55	3.70	3.64	3.17	3.32
Region	**3.05**	**2.93**	**2.84**	**2.88**	**2.98**	**3.03**	**2.94**	**2.90**	**2.71**	**2.71**	**2.81**	**2.98**	**3.03**	**2.96**	**2.79**	**2.89**
Continent	**2.99**	**2.90**	**2.84**	**2.90**	**2.99**	**3.02**	**2.93**	**2.85**	**2.74**	**2.76**	**2.88**	**2.96**	**3.01**	**2.96**	**2.83**	**2.82**

Table 2. Continued

State, Province, or Region	2016	2017	2018	2019	2020	2021	2022	2023
Eastern Region								
CT	1.00	0.98	0.96	0.92	0.91	0.90	0.89	0.86
DE	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
MA	1.23	1.12	1.04	0.99	0.96	0.98	1.02	1.02
MD	0.34	0.34	0.32	0.30	0.29	0.28	0.27	0.26
ME	4.22	3.73	3.51	3.72	3.78	3.99	4.04	3.82
NB	6.01	5.07	4.72	5.32	5.34	5.35	5.77	5.86
NH	2.78	2.53	2.40	2.38	2.51	2.65	2.71	2.67
NJ	0.39	0.36	0.34	0.34	0.37	0.39	0.44	0.44
NS	3.37	3.27	3.21	3.30	3.30	3.59	3.95	3.99
NY	3.61	3.55	3.21	3.13	3.10	3.07	3.04	2.92
PA	1.41	1.41	1.41	1.42	1.44	1.48	1.53	1.60
PEI	2.97	3.07	3.07	3.19	3.52	3.87	3.85	3.77
QUE	4.51	4.42	4.25	4.11	4.18	4.24	4.31	4.25
RI	0.32	0.33	0.34	0.35	0.37	0.38	0.40	0.41
VA	0.12	0.12	0.13	0.13	0.14	0.14	0.14	0.14
VT	2.60	2.47	2.42	2.16	2.12	2.32	2.60	2.53
WV	0.56	0.56	0.53	0.52	0.50	0.47	0.44	0.42
Region	**2.76**	**2.59**	**2.46**	**2.49**	**2.51**	**2.57**	**2.66**	**2.62**
Central Region								
IL	0.13	0.14	0.15	0.17	0.22	0.18	0.21	0.13
IN	0.21	0.20	0.20	0.19	0.18	0.17	0.17	0.17
MB	5.37	5.76	5.45	5.32	5.11	4.91	4.68	4.69
MI	5.29	5.04	4.08	4.22	4.22	4.21	4.66	4.89
MN	4.72	4.84	4.30	4.02	3.93	3.67	3.66	3.89
OH	0.80	0.72	0.70	0.70	0.61	0.53	0.51	0.50
ON	4.77	4.61	4.11	3.86	3.90	3.91	3.97	4.21
WI	3.36	3.49	3.06	3.13	3.19	3.15	3.23	3.37
Region	**2.90**	**2.87**	**2.49**	**2.46**	**2.46**	**2.40**	**2.49**	**2.61**
Continent	**2.83**	**2.73**	**2.48**	**2.48**	**2.49**	**2.49**	**2.58**	**2.62**

Table 3. The number of U.S. hunters by state that submitted woodcock wings for the 2021–2022 and 2022–2023 Parts-collection Surveys. This number may include a small number of hunters that were sent envelopes in prior years and who subsequently submitted wings from birds shot in the current survey year. In addition, some hunters hunted and submitted wings from more than one state.

State of residence	2021-2022 Season	2022-2023 Season
Alabama	3	3
Arkansas	3	1
Connecticut	14	13
Delaware	6	6
Florida	0	0
Georgia	3	3
Illinois	0	1
Indiana	13	14
Iowa	4	2
Kansas	0	0
Kentucky	4	3
Louisiana	9	10
Maine	104	89
Maryland	10	8
Massachusetts	23	20
Michigan	171	159
Minnesota	94	85
Mississippi	1	2
Missouri	10	9
Nebraska	0	0
New Hampshire	43	39
New Jersey	13	10
New York	50	33
North Carolina	8	7
North Dakota	0	0
Ohio	12	9
Oklahoma	0	0
Pennsylvania	41	28
Rhode Island	4	2
South Carolina	7	5
Tennessee	1	1
Texas	1	2
Vermont	34	33
Virginia	24	20
West Virginia	9	5
Wisconsin	149	134
Total	**868**	**756**

Table 4. Number of woodcock wings received from hunters, and indices of recruitment in the U.S. Recruitment indices for individual states with ≥125 submitted wings were calculated as the ratio of immatures per adult female. The regional indices for 2022 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963–2021.

State or Region of harvest	Total Wings 1963-2021	Total Wings 2022	Adult Female Wings 1963-2021	Adult Female Wings 2022	Immature Wings 1963-2021	Immature Wings 2022	Recruitment Index 1963-2021	Recruitment Index 2022
CT	16,045	60	3,611	19	9,746	32	2.7	----
DE	648	20	105	6	437	12	4.2	----
FL	678	0	153	0	422	0	2.8	----
GA	3,485	15	1,100	4	1,471	2	1.3	----
ME	94,267	740	27,921	256	47,029	321	1.7	1.3
MD	5,250	39	1,283	13	2,987	22	2.3	----
MA	26,529	155	8,325	53	12,799	74	1.5	1.4
NH	40,047	368	13,020	120	18,545	168	1.4	1.4
NJ	28,312	81	6,539	27	16,756	35	2.6	----
NY	67,631	245	23,010	103	30,384	86	1.3	0.8
NC	4,983	111	1,622	42	2,310	38	1.4	----
PA	35,185	130	11,194	43	16,206	64	1.4	1.5
RI	2,505	6	487	1	1,657	3	3.4	----
SC	4,749	117	1,526	47	2,134	35	1.4	----
VT	31,453	310	10,349	111	14,291	117	1.4	1.1
VA	7,525	188	2,002	51	4,046	92	2.0	1.8
WV	6,810	15	2,066	6	3,384	6	1.6	----
Eastern Region	**376,102**	**2,600**	**114,313**	**902**	**184,604**	**1,107**	**1.6**	**1.2**
AL	1,088	24	312	14	491	0	1.6	----
AR	614	4	201	1	249	3	1.2	----
IL	1,519	2	358	1	851	0	2.4	----
IN	9,091	70	2,325	32	5,014	26	2.2	----
IA	1,423	2	459	0	638	2	1.4	----
KS	50	0	9	0	26	0	----	----
KY	1,387	12	355	2	697	5	2.0	----
LA	34,677	109	7,830	24	22,343	72	2.9	----
MI	154,990	1,586	51,182	544	75,340	745	1.5	1.4
MN	50,921	955	18,289	406	21,632	351	1.2	0.9
MS	2,028	13	569	7	1,026	3	1.8	----
MO	4,971	56	1,354	21	2,413	13	1.8	----
NE	13	0	5	0	6	0	----	----
ND	4	0	3	0	1	0	----	----
OH	15,854	63	4,878	19	7,454	30	1.5	----
OK	178	0	39	0	94	0	2.4	----
TN	1,402	1	378	0	707	1	1.9	----
TX	1,177	34	347	16	568	13	1.6	----
WI	105,500	1,520	36,228	547	49,043	658	1.4	1.2
Central Region	**386,887**	**4,451**	**125,121**	**1,634**	**185,853**	**1,922**	**1.5**	**1.2**

Table 5. Preliminary estimates of woodcock harvest, hunter numbers, days afield, and hunter success from the 2022–2023 Harvest Information Program (note: estimates rounded to the nearest 100 for harvest, hunters, and days afield).

State or Region	Harvest	Harvest SE	Active Woodcock Hunters	Active Woodcock Hunters SE	Days Afield	Days Afield SE	Season Harvest Per Hunter	Season Harvest Per Hunter SE
CT	400	200	200	<100	800	200	2.67	1.04
DE	300	100	100	<100	200	100	4.71	2.69
FL	7,500	7,000	4,800	3,300	7,600	5,200	1.58	1.83
GA	1,000	200	400	100	1,600	300	2.48	0.66
MA	2,800	1,300	600	100	3,700	900	4.41	1.98
MD	800	200	300	<100	1,000	200	2.83	0.9
ME	20,400	8,000	6,800	3,100	17,600	5,000	3.00	1.79
NC	9,900	2,600	6,900	3,600	19,100	6,200	1.43	0.85
NH	5,000	800	2,100	1,000	8,100	3,100	2.42	1.26
NJ	600	100	200	<100	1,400	400	2.68	0.63
NY	4,300	1,700	5,700	2,700	13,500	6,700	0.75	0.46
PA	1,900	200	3,400	1,600	7,900	2,600	0.57	0.28
RI	100	<100	100	<100	200	100	2.20	1.09
SC	5,500	3,700	3,900	3,700	5,100	3,700	1.39	1.60
VA	2,700	500	500	<100	3,300	500	4.91	1.06
VT	1,900	300	500	<100	2,300	300	3.65	0.58
WV	300	100	100	<100	400	100	2.55	0.88
Eastern Region	**65,400**	**11,800**	**36,500**	**na[a]**	**94,000**	**13,000**	**na[b]**	**na[b]**
AL	500	300	100	<100	400	200	3.83	2.81
AR	2,400	1,600	1,800	1,600	2,200	1,600	1.37	1.55
IA	100	<100	100	<100	400	200	0.65	0.28
IL	100	100	1,800	1,700	2,300	1,700	0.06	0.07
IN	300	100	1,100	900	1,400	1,000	0.25	0.23
KS	100	<100	100	<100	100	<100	0.75	0.63
KY	400	200	1,500	1,400	6,100	5,500	0.24	0.24
LA	9,200	5,300	2,300	1,800	8,200	5,300	3.95	3.77
MI	32,100	1,400	23,700	5,500	55,800	8,700	1.36	0.32
MN	23,300	3,000	14,100	4,000	54,700	19,200	1.65	0.52
MO	3,800	3,200	1,700	1,600	2,500	1,600	2.21	2.74
MS	1,400	900	200	<100	900	300	6.50	4.28
NE[c]								
OH	2,100	1,300	1,700	1,200	3,100	1,300	1.20	1.11
OK[c]								
TN	200	100	200	<100	700	200	1.12	0.51
TX	3,900	2,300	4,800	3,200	5,700	3,200	0.82	0.74
WI	32,600	2,900	13,300	3,200	45,200	10,100	2.45	0.62
Central Region	**112,500**	**8,300**	**68,600**	**na[a]**	**189,600**	**25,000**	**na[b]**	**na[b]**
U.S. Total	**177,900**	**14,400**	**105,100**	**na[a]**	**283,600**	**28,100**	**na[b]**	**na[b]**

[a]Hunter number estimates at the regional and national levels may be biased high because the HIP sample frames are state specific; therefore, hunters were counted more than once if they hunted in >1 state. Variance was inestimable.

[b] Regional estimates of hunter success could not be obtained due to the occurrence of individual hunters being registered in the Harvest Information Program in more than 1 state.

[C] No hunters that registered for HIP in Nebraska or Oklahoma said they intended to hunt American woodcock in 2022.

Appendix A. History of federal framework dates, season lengths, and daily bag limits for hunting American woodcock in the U.S. portion of the Eastern and Central Regions, 1918 – 2023.

Eastern Years(s)	Eastern Outside Dates	Eastern Season Length	Eastern Daily Bag Limit	Central Year(s)	Central Outside Dates	Central Season Length	Central Daily Bag Limit
1918-26	Oct. 1 - Dec. 31	60	6	1918-26	Oct. 1 - Dec. 31	60	6
1927	Oct. 1 - Dec. 31	60	4	1927	Oct. 1 - Dec. 31	60	4
1928-39	Oct. 1 - Dec. 31	30	4	1928-39	Oct. 1 - Dec. 31	30	4
1940-47	Oct. 1 - Jan. 6	15	4	1940-47	Oct. 1 - Jan. 6	15	4
1948-52	Oct. 1 - Jan. 20	30	4	1948-52	Oct. 1 - Jan. 20	30	4
1953	Oct. 1 - Jan. 20	40	4	1953	Oct. 1 - Jan. 20	40	4
1954	Oct. 1 - Jan. 10	40	4	1954	Oct. 1 - Jan. 10	40	4
1955-57	Oct. 1 - Jan. 20	40	4	1955-57	Oct. 1 - Jan. 20	40	4
1958-60	Oct. 1 - Jan. 15	40	4	1958-60	Oct. 1 - Jan. 15	40	4
1961-62	Sep. 1 - Jan. 15	40	4	1961-62	Sep. 1 - Jan. 15	40	4
1963-64	Sep. 1 - Jan. 15	50	5	1963-64	Sep. 1 - Jan. 15	50	5
1965-66	Sep. 1 - Jan. 30	50	5	1965-66	Sep. 1 - Jan. 30	50	5
1967-69	Sep. 1 - Jan. 31	65	5	1967-69	Sep. 1 - Jan. 31	65	5
1970-71	Sep. 1 - Feb. 15	65	5	1970-71	Sep. 1 - Feb. 15	65	5
1972-81	Sep. 1 - Feb. 28	65	5	1972-90	Sep. 1 - Feb. 28	65	5
1982	Oct. 5 - Feb. 28	65	5	1991-96	Sep. 1 - Jan. 31	65	5
1983-84	Oct. 1 - Feb. 28	65	5	1997-20	Sep. 22[a] - Jan. 31	45	3
1985-96	Oct. 1 - Jan. 31	45	3	2021-23	Sep. 13 - Jan 31	45	3
1997-01	Oct. 6 - Jan. 31	30	3				
2002-10	Oct. 1 - Jan. 31	30	3				
2011-20	Oct. 1 - Jan. 31	45	3				
2021-23	Sep. 13 - Jan 31	45	3				

[a] Saturday nearest September 22nd.

Appendix B. Estimates for the number of successful woodcock hunters and woodcock harvest in Canada (Gendron and Smith 2019).

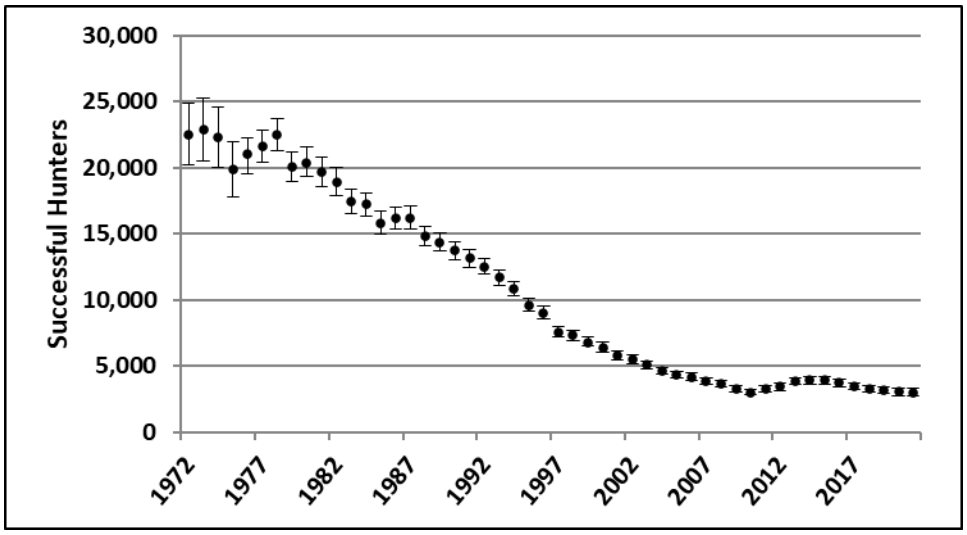

Figure B1. Estimated number of successful woodcock hunters in Canada and associated 95% confidence intervals, 1972–2021.

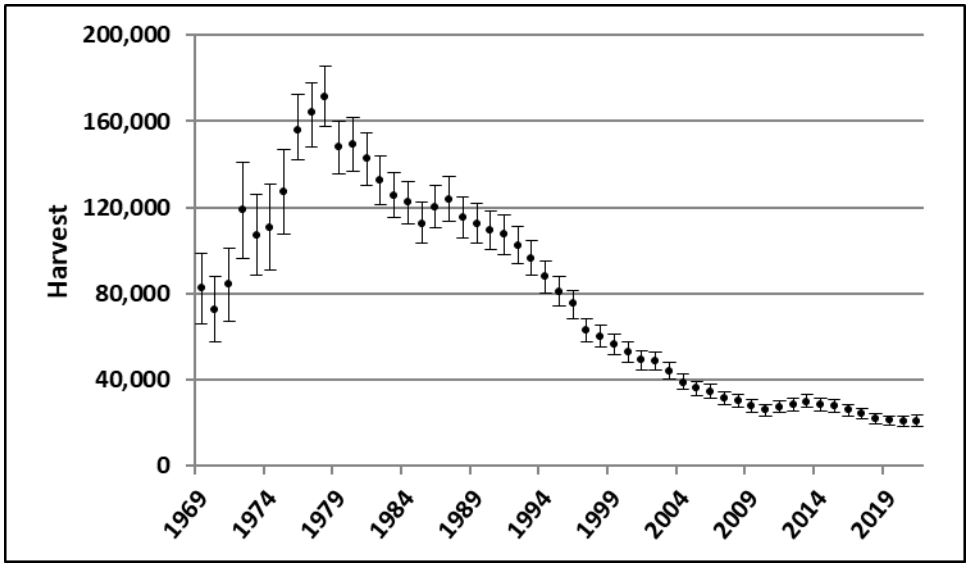

Figure B2. Estimated woodcock harvest in Canada and associated 95% confidence intervals, 1969–2021.

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