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American Woodcock Population Status 2010

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American Woodcock

Population Status 2010



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The cover photo is by Earl Johnson, MN Department of Natural Resources. The photo shows a one-hour old woodcock brood still in the nest. The nest was discovered during spring banding in Minnesota. Each year, many dedicated volunteer banders across the woodcock breeding range locate and band woodcock broods with the assistance of pointing dogs.

AMERICAN WOODCOCK POPULATION STATUS, 2010

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Abstract: Singing-ground Survey data for 2010 indicate that indices for singing American woodcock (*Scolopax minor*) males in the Eastern and Central Management Regions are not significantly different from 2009. There was no significant 10-year trend for woodcock heard in the Eastern Management Region during 2000-10. This marks the seventh consecutive year that the 10-year trend estimate was not significant in the Eastern Region. The 10-year trend in the Central Management Region showed a significant decline. Both regions have a long-term (1968-10) declining trend of -1.0 % per year. The 2009 recruitment index for the U.S. portion of the Eastern Region (1.5 immatures per adult female) was 8.6 % lower than the 2008 index and 11.5 % below the long-term regional index, while the recruitment index for the U.S. portion of the Central Region (1.2 immatures per adult female) was 20.3 % lower than the 2008 index and was 25.6 % lower than the long-term regional index. Estimates from the Harvest Information Program indicated that U.S. woodcock hunters in the Eastern Region spent 178,000 days afield and harvested 63,300 woodcock during the 2009-10 season, while in the Central Region, hunters spent 322,300 days afield and harvested 175,100 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 (FWS) is to increase populations of woodcock to levels consistent with the demands of consumptive and non-consumptive users (U. S. Fish and Wildlife Service 1990). Reliable annual population estimates, harvest estimates, and information on recruitment and distribution are essential for comprehensive woodcock management. Unfortunately, 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 Wing-collection Survey (WCS) provides annual indices of woodcock recruitment. The Harvest Information Program (HIP) utilizes a sampling frame of woodcock hunters to estimate harvest and 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 2010. 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. A history of woodcock hunting regulations is 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, as recommended by Owen et al. (1977; Fig. 1). Coon et al. (1977) reviewed the concept of management units 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 Wing-collection and Singing-ground surveys, as well as the Harvest Information Program, 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 Singing-ground Survey was developed to exploit the conspicuous courtship display of the male woodcock. Early studies demonstrated that counts of singing males provide indices to woodcock populations and could be used to monitor annual changes (Mendall and Aldous 1943, Goudy 1960, Duke 1966, and Whitcomb 1974). Before 1968, counts were conducted on non-randomly-located routes. Beginning in 1968, routes were relocated along lightly-traveled secondary roads in the center of randomly-chosen 10-minute

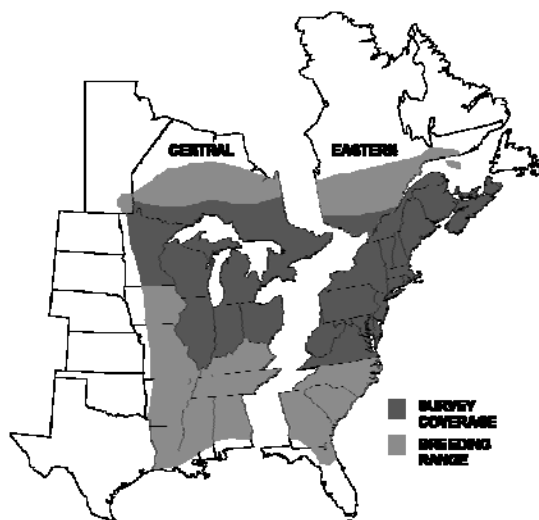


Fig. 1. Woodcock management regions, breeding range, and Singing-ground Survey coverage.

degree blocks within each state 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, 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 in order 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. In order to avoid expending unnecessary resources and funds, approximately one half of these routes are surveyed each year. The remaining routes are carried as "constant zero" routes. Routes for which no woodcock are heard for 2 consecutive years enter this constant zero status and are not run for the next 5 years. If woodcock are heard on a constant zero route when it is next run, the route reverts to normal status and is run again each year. Data from constant zero routes are included in the analysis only for the years they were actually surveyed. Sauer and Bortner (1991) reviewed

the implementation and analysis of the Singing-ground Survey in more detail.

Trends were estimated using a hierarchical model. Sauer et al. (2008) describe a hierarchical log-linear model for estimation of population change from SGS data. In practice, the hierarchical modeling approach provides trend and annual index values that are generally comparable to the estimates provided by the previously used route regression approach (see Link and Sauer 1994 for more information on the route regression approach). The hierarchical model, however, has a more rigorous and realistic theoretical basis than the weightings used in the route regression approach, and the indices and trends are directly comparable as trends are calculated directly from the indices.

With the hierarchical model, the log of the expected value of the counts is 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 of new observers, and overdispersion. In the hierarchical model, the parameters of interest are treated as random and are assumed to follow distributions that are governed by additional parameters. The hierarchical model is fit using Bayesian methods. Markov-chain Monte Carlo methods are used to iteratively produce sequences of parameter estimates which can be used to describe the distribution of the parameters of interest. After an initial "burn-in" period, means, medians, and credible (or Bayesian confidence) intervals for the parameters can be estimated from the replicates. Annual indices are defined as exponentiated year effects, and trends are defined as ratios of the year effects at the start and end of the interval of interest, taken to the appropriate power to estimate a yearly change (Sauer et al. 2008). Trend estimates are expressed as percent change per year, while indices are 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 (2009-10), 10-year (2000-10) and long-term (1968-2010) trends were evaluated for each region as well as for each state or province.

Credible Intervals (CI) are used to describe uncertainty around the estimates when fitting hierarchical models using Bayesian methods. If the CI does not overlap 0 for a trend estimate, the trend is considered significant. We present the median and 95th percentile credible intervals of 10,000 estimates (i.e., we simulated 10,000 replicates and thinned by 2), which were calculated after an initial 20,000 iterations to allow the series to converge. Refer to Sauer et al. (2008) and Link and Sauer (2002) for a detailed description of the statistical model and fitting process.

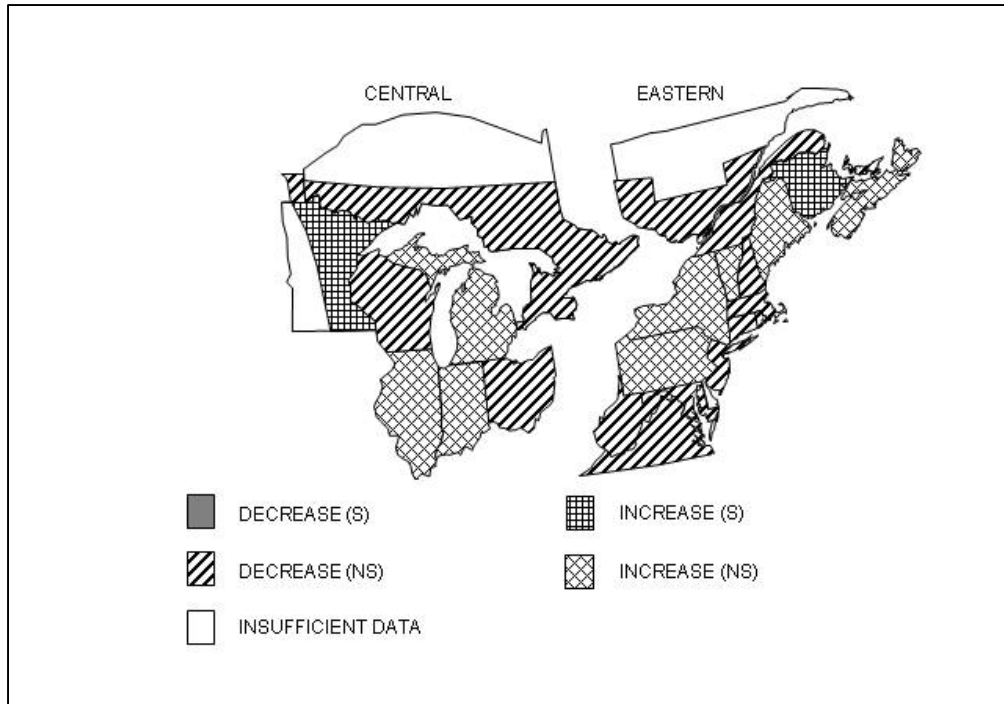


Fig. 2. Short-term trends in the number of American woodcock heard on the Singing-ground Survey, 2009-2010, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

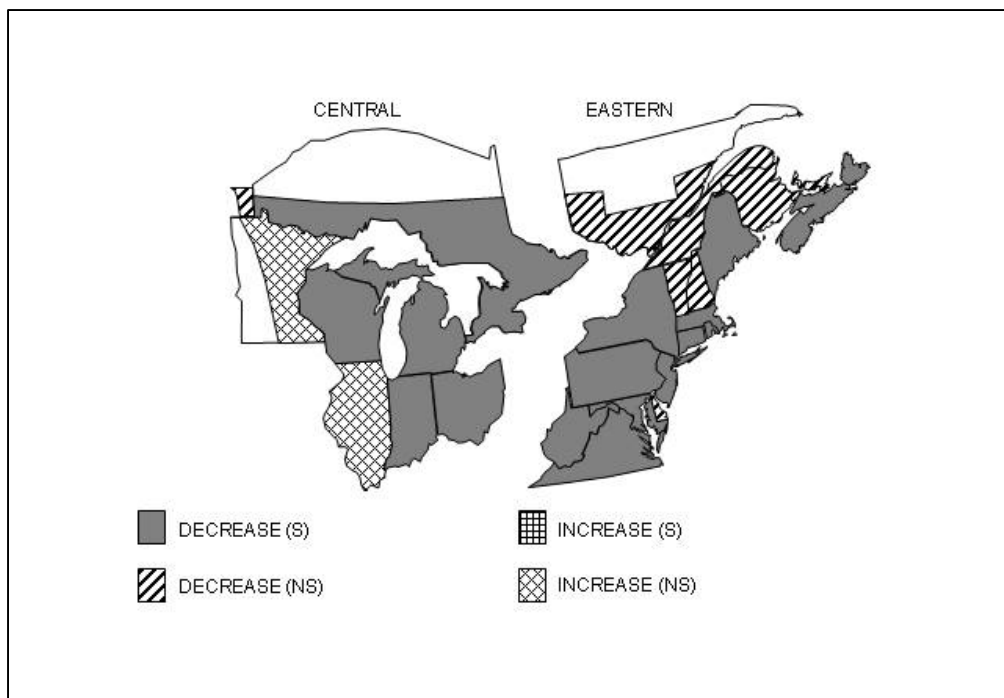


Fig. 3. Long-term trends in the number of American woodcock heard on the Singing-ground Survey, 1968-2010, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

The reported sample sizes are the number of routes on which trend estimates are based, which includes any route on which woodcock were ever encountered. Each route was to be surveyed during the peak time of daily singing activity. For editing purposes, “acceptable” times were between 22 and 58 minutes after sunset (or, between 15 and 51 minutes after sunset on overcast evenings). Due to observer error, 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. Therefore, only route observations with at least 9 acceptable stops were included in the analysis. Routes for which data were received after 2 June 2010 were not included in this analysis but will be included in future trend estimates.

Harvest Information Program

The Harvest Information Program (HIP) was cooperatively developed by the FWS and state wildlife agencies to provide reliable annual estimates of hunter activity and harvest for all migratory game birds (Elden et al. 2002). In the past, the annual FWS migratory bird harvest survey (Mail Questionnaire Survey) was based on a sampling frame that consisted solely of hunters who purchased a federal duck stamp. However, people that hunt only non-waterfowl species such as woodcock and doves were not required to purchase a duck stamp, and therefore were not included in that sampling frame. The HIP sampling frame consists of all migratory game bird hunters, thus providing more reliable estimates of woodcock hunter numbers and harvest than we have had in the past. 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 FWS. The FWS then selects 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. HIP survey estimates of woodcock harvest have been available for woodcock since 1999. Although estimates from 1999-2002 have been finalized, the estimates from 2003-09 should be considered preliminary as refinements are still being made in the sampling frame and estimation techniques. This year, we also included Canadian hunter and harvest estimates, which were obtained through the Canadian National Harvest Survey Program (Gendron and Collins 2008).

Wing-collection Survey

The primary objective of the Wing-collection Survey is to provide data on the reproductive success of woodcock. The survey is administered as a cooperative effort between woodcock hunters, the FWS, and state wildlife agencies. Participants in the 2009 survey included hunters who either: (1) participated in past surveys; (2) were a subset of hunters that indicated on the Harvest Information Program Survey that they hunted woodcock, or (3) contacted the FWS to volunteer to be included in the survey. Wing-collection Survey participants were provided with prepaid mailing envelopes and asked to submit one wing from each woodcock they bagged. Hunters were asked to record the date of the hunt and the state and county where the bird was shot. Hunters were not asked to submit envelopes for unsuccessful hunts. The age and sex of the birds were determined by examining plumage characteristics (Martin 1964, Sepik 1994) during the annual woodcock wingbee conducted by state, federal, and private biologists.

The ratio of immature birds per adult female in the harvest provides an index to recruitment of young into the population. The 2009 recruitment index for each state with ≥ 125 submitted wings was calculated as the number of immatures per adult female. The regional indices for 2009 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2008.

RESULTS AND DISCUSSION

Singing-ground Survey

Data for 818 routes were submitted by 2 June 2010 (Table 1). Short-term, 10-year, and long-term (1968 - 2010) trends were estimated using data from 638 routes in the Eastern Region and 639 routes in the Central Region. Short-term analysis indicated that the number of woodcock heard displaying during the 2010 Singing-ground Survey were not significantly different from last year for both management regions (Table 1, Fig. 2). 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 reflect the low numbers of routes surveyed by the same observer in both years. Ensuring that the observers participate for several years on the same route would greatly enhance the quality of the results.

The 10-year trend (2000-2010) was not significant for the Eastern Management Region (Table 1). This marks the seventh straight year the Eastern Region trend has remained stable. The 10-year trend for the

Central Region showed a significant decline of -1.2 %/year after being non-significant last year.

There were significant long-term (1968-2010) declines in the breeding population throughout most states and provinces in the Eastern and Central Regions (Table 1, Fig. 3). The long-term trend estimates were the same (-1.0 %/ year) for both management regions.

In the Eastern Region, the 2010 index was 2.7 singing-males per route, which was slightly higher than the 2009 index of 2.6 (Fig. 4). In the Central Region, the 2010 index was 2.7 singing-males per route, which was also slightly higher than the 2009 index of 2.6 singing-males per route (Fig. 4). Annual indices (1968-2010) by state, province, or region are available in Table 2.

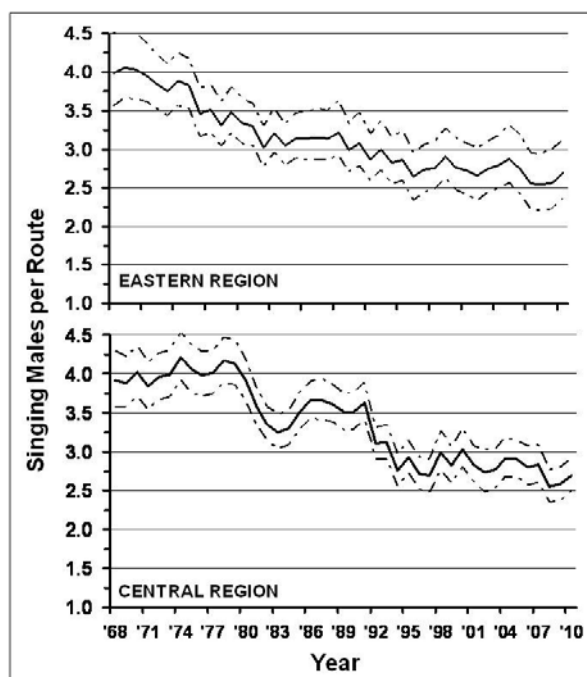


Fig. 4. Annual indices of the number of woodcock heard during the Singing-ground Survey, 1968-2010 as estimated using hierarchical modeling. The dashed lines represent the 95th percentile credible interval.

Wing-collection Survey

A total of 1,368 woodcock hunters (Table 3) from states with woodcock seasons sent in a total of 12,178 usable woodcock wings for the 2009 Wing-collection Survey (Table 4).

The 2009 recruitment index in the U.S. portion of the Eastern Region (1.5 immatures per adult female) was 8.6 % lower than the 2008 index (1.8), and 11.5 % lower than the long-term (1963-08) regional average (Table 4, Fig 5). In the Central Region, the 2009 recruitment index (1.2 immatures per adult female) was 20.3 % lower than the 2008 index (1.6) and was 25.6 %

lower than the long-term regional average (Table 4, Fig 5). Percent change for all comparisons was calculated using unrounded recruitment indices.

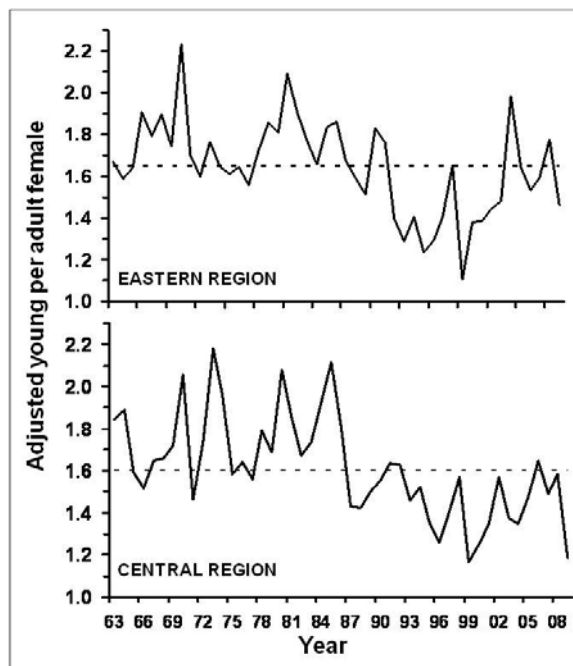


Fig. 5. Weighted annual indices of recruitment (U.S.), 1963-2009. The dashed line is the 1963-2008 average.

Harvest Information Program

Estimates of woodcock harvest, number of active hunters, days afield, and seasonal hunting success from the 2009-10 HIP survey are provided in Table 5. In the Eastern Region, woodcock hunters spent approximately 178,000 days afield (Figure 6) and harvested 63,300 birds (Figure 7) during the 2009-10 hunting season. Woodcock hunters in the Central Region spent 322,300 days afield (Figure 6) and harvested 175,100 birds (Figure 7) during the 2009-10 hunting season. Although HIP provides statewide estimates of woodcock hunter numbers, it is not possible to develop regional estimates due to the occurrence of some hunters being registered for HIP in more than one state. Therefore, regional estimates of seasonal hunting success rates cannot be determined on a per hunter basis. The point estimate for harvest was below the 1999-2009 average for the Eastern Region, while harvest in the Central Region was slightly greater than last year's harvest (Figure 7). All HIP estimates from 1999-2002 are final, while those from 2003-09 are preliminary.

Data from Canada show a long-term decline in both the number of successful woodcock hunters and harvest (Appendix B). The most recent data available

from 2008 indicate that $\approx 3,900$ successful hunters harvested $\approx 27,000$ woodcock (Appendix B).

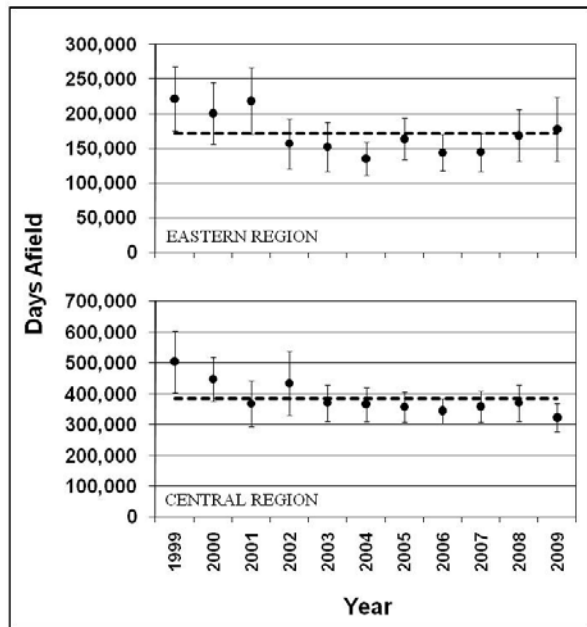


Fig. 6. Harvest Information Program Survey estimates of days spent afield by U.S. woodcock hunters, 1999-2009. The dashed line represents the 1999-2009 mean and error bars represent the 95% C.I. of the point estimate.

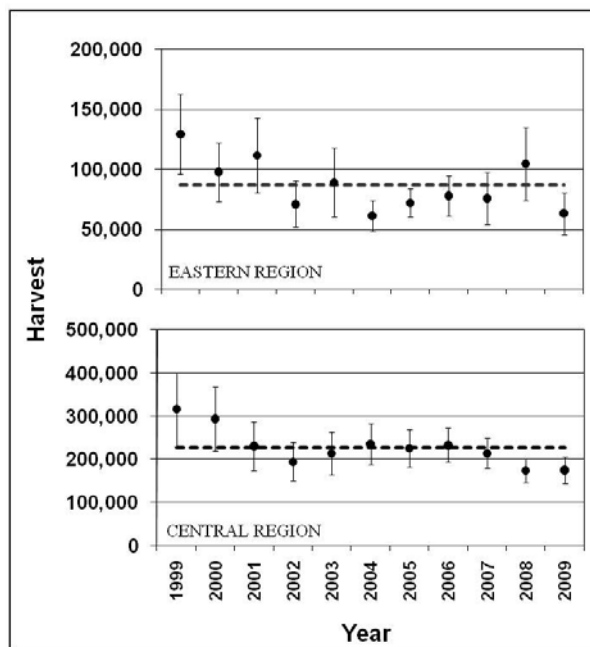


Fig. 7. Harvest Information Program Survey estimates of U.S. woodcock harvest, 1999-2009. The dashed line represents the 1999-2009 mean and error bars represent the 95% C.I. of the point estimate.

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Personnel from the FWS, Canadian Wildlife Service (CWS), U. S. Geological Survey (USGS), Bird Studies Canada (BSC), many state and provincial agencies and other individuals assisted in collecting the Singing-ground Survey data and processing wings at the woodcock wingbee. Special thanks to D. Badzinski (BSC), K. Connor (NB DNRE), B. Crenshaw (VT DFW), B. Crose (OH DNR), R. Dibblee (PEI WD), M. DiBona (DE DNREC), T. Engelmeyer (VA DGIF), L. Fendrick (OH DNR), V. Frawley (MI DNR), J. Garriss (NJ FW), B. Harvey (MD NR), J. Hayden (ON MNR), M. Huang (CT DEP), R. Marshalla (IL DNR), M. Murphy (NY DEC), G. Parsons (NS DNR), E. Robinson (NH FGD), D. Scarpitti (MA DFW), A. Stewart (MI DNR), B. Tefft (RI DFWS), E. Van Stam (BSC), B. Veverka (IN DNR), M. Weaver (PA GC), S. Wilson (WV DNR), B. Campbell, M. Gendron, J. Hughes, A. MacFarlane, J. B. Pollard, E. Reed, J. Rodrigue, and M. Schuster (CWS), and C. Dwyer, S. Kelly, and M. Mills (FWS), for help in coordinating the Singing-ground Survey. Special appreciation is extended to Greg Balkcom and Don McGowan (GA DNR) for coordinating local logistics and hosting the 2010 wingbee held in Covington, GA. Other individuals that participated in the wingbee were: A. Weik (Ruffed Grouse Society), M. Olinde (LA DWF), E. Johnson, (MN DNR), V. Frawley (MI DNR), E. Harper (KY DNR), I. Gregg (PA GC), L. Fendrick (OH DNR), D. McAuley and D. Goldberg (USGS), S. Bell, W. Brininger, R. Brown, T. Cooper, T. Edwards, K. Parker, L. Stevenson, and K. Sturm (USFWS), F. Bowers (USFWS – retired). We especially thank all woodcock hunters that sent in wings. The Branch of Harvest Surveys within the Division of Migratory Bird Management (USFWS) mailed Wing-collection Survey materials, organized wing submissions, assisted with data management, and provided Harvest Information Program estimates (special thanks to K. Richkus, H. Spriggs, K. Wilkins, and B. Raftovich). R. Maruthalingam (USFWS) assisted in maintaining the website and developing data management applications for the Singing-ground Survey. K. Magruder and L. Mills (USFWS) provided invaluable assistance with data management and entry. R. Rau (USFWS) developed and maintained the data entry website, provided guidance and historical perspective regarding Singing-ground Survey implementation, and provided assistance with data screening and management. J. Sauer (USGS) developed computer programs for calculating trends and indices from Singing-ground Survey data and conducted this year's analyses. M. Koneff, R. Rau, G. Zimmerman, J. Kelley, K. Richkus, K. Wilkins, and J. Sauer reviewed a draft of parts or all of this report and provided helpful comments.

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Table 1. Short-term (2009-10), 10-year (2000-2010), and long-term (1968-2010) trends (% change per year^a) in the number of American woodcock heard during the Singing-ground Survey as determined by using the hierarchical log-linear modeling technique (Sauer et al. 2008).

State, Province, or Region	Number of routes ^b	n ^c	2009-2010			2000-2010			1968-2010		
			% change	95% CI ^d		% change	95% CI ^d		% change	95% CI ^d	
CT	5	9	-3.78	-36.57	46.91	-3.76	-7.69	1.45	-3.80	-5.79	-1.75
DE ^e	0	2	--	--	--	--	--	--	-1.55	-7.71	4.42
ME	42	67	4.03	-14.12	26.20	-1.20	-3.18	0.94	-1.17	-1.75	-0.55
MD	6	21	-4.06	-25.44	21.26	-3.88	-6.65	-1.16	-3.71	-5.22	-2.15
MA	9	20	-6.09	-34.29	21.13	-2.52	-5.84	0.46	-2.29	-3.39	-1.19
NB	53	69	25.67	1.92	53.73	0.84	-1.36	3.10	-0.80	-1.67	0.02
NH	15	18	-0.63	-24.20	30.58	0.60	-1.93	4.04	-0.14	-1.20	1.01
NJ	7	18	-32.03	-68.19	8.97	-7.94	-14.32	-3.22	-6.26	-8.03	-4.57
NY	71	111	8.21	-6.28	27.53	0.44	-1.29	2.55	-0.96	-1.46	-0.43
NS	35	60	9.93	-7.50	40.95	-0.96	-3.04	1.09	-0.97	-1.72	-0.28
PA	34	58	4.35	-15.06	34.03	1.44	-1.39	5.93	-0.94	-1.76	-0.14
PEI	9	12	-4.04	-34.18	31.90	-1.71	-5.40	1.89	-1.44	-2.83	0.05
QUE	17	56	-2.85	-31.65	30.86	-0.41	-3.72	2.50	-0.30	-1.58	0.92
RI	1	2	-12.22	-62.46	96.41	-12.37	-21.53	-3.30	-11.89	-17.96	-6.23
VT	20	22	6.87	-26.12	56.75	-2.63	-6.41	1.01	-0.52	-1.61	0.61
VA	23	48	-1.06	-31.21	54.88	-5.90	-9.87	-2.27	-5.41	-6.55	-4.32
WV	18	45	-4.62	-27.35	17.13	-2.85	-5.40	-0.53	-2.67	-3.58	-1.79
Eastern	365	638	5.33	-7.72	18.00	-0.29	-1.48	0.87	-0.96	-1.37	-0.54
IL	46	26	33.33	-34.53	172.85	1.43	-6.49	10.30	1.23	-1.34	4.02
IN	11	40	4.52	-36.19	88.23	-2.69	-7.46	3.26	-3.92	-5.29	-2.56
MB ^f	17	23	-1.81	-29.23	34.96	-1.24	-4.34	2.34	-1.65	-3.75	0.48
MI	112	148	2.80	-9.72	17.61	-1.30	-2.73	0.16	-1.12	-1.52	-0.71
MN	74	103	21.00	3.03	42.55	0.69	-1.03	2.43	0.46	-0.19	1.18
OH	27	57	-2.49	-24.81	24.98	-0.86	-3.22	2.56	-1.80	-2.62	-1.00
ON	89	139	-4.24	-21.53	17.53	-2.97	-4.97	-0.96	-1.05	-1.59	-0.48
WI	77	103	-0.30	-16.07	18.14	-0.58	-2.47	1.40	-0.67	-1.21	-0.10
Central	453	639	4.39	-4.14	13.83	-1.19	-2.14	-0.27	-0.97	-1.23	-0.71
Continent	818	1277	4.85	-2.92	12.55	-0.75	-1.51	-0.01	-0.92	-1.17	-0.67

^a Median of route trends estimated used hierarchical modeling. To estimate the total percent change over several years, use: $(100((\% \text{ change}/100)+1)^y)-100$, 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 2010 for which data was received by 2 June, 2010.

^c Number of routes with > 2 years of data and at least 1 observed woodcock between 1968 and 2010.

^d 95% credible interval, if the interval overlaps zero, the trend is considered non-significant.

^e Short-term and 10-year trends not estimated since all routes were in CZ status during 2010.

^f Manitoba began participating in the Singing-ground Survey in 1990.

Table 2. Breeding population indices (singing-males per route) for American woodcock from the Singing-ground Survey, 1968-2010. These indices are based on the 1968-2010 trend that was estimated using hierarchical modeling techniques.

State, Province, or Region	Year															
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Eastern Region																
CT	3.29	3.15	3.22	2.89	2.98	2.73	2.71	2.68	2.25	2.24	1.97	2.01	1.94	1.89	1.98	1.80
DE	0.90	0.74	0.91	0.65	0.79	0.98	0.87	1.73	0.46	0.65	0.47	0.54	0.71	0.70	0.69	1.11
ME	5.59	5.51	6.08	5.51	5.44	5.64	5.86	6.08	5.66	4.76	4.61	5.08	4.35	5.01	3.86	4.30
MD	1.92	1.90	1.78	1.74	1.66	1.61	1.54	1.49	1.38	1.35	1.32	1.26	1.25	1.20	1.14	1.06
MA	3.42	3.38	3.44	3.43	3.08	3.39	3.19	2.75	2.72	2.73	2.63	2.74	2.43	2.58	2.34	2.19
NB	6.66	8.65	8.31	7.69	7.46	6.96	7.48	7.98	6.08	7.34	5.64	6.02	4.96	5.64	5.32	5.34
NH	3.59	3.61	3.79	3.43	3.86	3.30	3.73	3.54	3.51	3.54	3.45	3.37	3.68	3.58	3.13	3.22
NJ	5.31	4.99	5.11	6.27	4.70	5.57	5.17	4.29	3.28	3.28	2.67	3.16	2.40	2.22	2.08	2.23
NY	4.00	4.11	3.63	3.94	3.78	3.84	3.88	3.49	3.53	3.48	3.15	3.43	3.69	3.50	3.21	3.42
NS	4.05	3.70	3.28	3.71	3.48	3.63	3.72	3.57	3.46	3.43	3.58	3.26	3.24	3.06	2.95	3.11
PA	2.10	2.00	2.17	2.10	2.03	2.04	1.81	1.84	1.85	1.83	1.76	1.84	1.66	1.64	1.60	1.64
PEI	5.09	4.87	4.84	5.27	4.49	4.45	4.58	5.27	4.66	4.46	4.30	4.36	3.78	3.60	3.66	4.00
QUE	6.22	6.18	6.20	6.23	6.10	5.80	6.17	6.04	5.32	5.62	6.11	6.44	6.65	6.03	5.75	6.29
RI	3.57	2.87	2.57	2.74	2.21	1.97	1.62	1.39	1.23	1.09	0.88	0.81	0.72	0.61	0.60	0.50
VT	3.61	3.06	3.79	3.35	3.85	3.29	3.75	4.07	4.19	4.41	3.15	3.35	3.14	2.76	1.99	2.81
VA	1.71	1.61	1.61	1.37	1.27	1.09	1.32	1.17	1.13	1.08	0.92	0.90	0.78	0.84	0.82	0.75
WV	1.58	1.58	1.47	1.42	1.47	1.39	1.33	1.33	1.27	1.20	1.08	1.16	1.10	1.16	1.09	1.06
Region	3.99	4.06	4.04	3.96	3.84	3.75	3.88	3.82	3.46	3.51	3.31	3.48	3.34	3.30	3.02	3.21
Central Region																
IL	0.57	0.57	0.47	0.67	0.62	0.52	0.62	0.71	0.51	0.58	0.71	0.51	0.44	0.64	0.44	1.07
IN	1.78	1.25	1.19	0.94	1.36	1.22	1.09	0.92	0.97	0.90	0.90	1.11	0.86	1.00	0.68	0.75
MB	8.20	8.04	7.90	7.69	7.59	7.41	7.26	7.11	6.99	6.88	6.73	6.63	6.47	6.31	6.20	6.09
MI	6.73	6.60	6.65	6.26	6.30	6.51	7.20	7.19	6.85	6.41	6.82	6.72	6.37	5.70	5.94	5.08
MN	4.02	3.38	3.34	3.69	3.43	3.85	4.44	3.96	4.02	4.12	4.32	3.94	4.53	4.02	3.91	3.58
OH	1.87	1.83	1.91	1.78	1.77	1.61	1.75	1.55	1.73	1.68	1.51	1.43	1.44	1.55	1.34	1.41
ON	7.98	8.90	9.35	8.60	9.39	9.13	9.14	8.69	8.89	9.09	9.40	9.62	9.02	8.12	6.91	6.85
WI	3.47	3.51	4.00	3.75	3.73	3.90	3.96	4.02	3.68	4.08	4.16	4.32	3.53	3.00	3.16	3.05
Region	3.92	3.88	4.02	3.84	3.96	3.99	4.21	4.06	3.98	4.01	4.17	4.13	3.91	3.57	3.35	3.25
Continent																
Continent	3.96	3.98	4.03	3.90	3.90	3.87	4.05	3.94	3.72	3.76	3.73	3.81	3.62	3.44	3.19	3.23

Table 2. Continued

State, Province, or Region	Year															
	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Eastern Region																
CT	1.68	1.64	1.66	1.48	1.59	1.35	1.32	1.31	1.21	1.11	1.13	1.14	1.11	1.01	0.97	0.99
DE	0.54	0.58	0.65	0.64	0.63	0.62	0.86	0.43	0.45	0.59	0.58	0.57	0.62	0.61	0.95	0.47
ME	4.32	4.43	4.72	4.99	4.61	4.72	3.77	4.24	3.70	3.96	3.66	3.75	3.18	3.40	3.38	3.69
MD	1.04	1.00	0.94	0.91	0.87	0.85	0.82	0.79	0.73	0.73	0.70	0.67	0.65	0.62	0.59	0.57
MA	2.32	2.28	2.20	2.17	2.12	1.99	1.95	1.95	1.82	1.76	1.76	1.73	1.68	1.70	1.63	1.84
NB	4.86	5.08	4.25	4.69	5.41	6.46	5.46	5.08	4.89	5.86	5.96	5.56	4.85	5.47	5.34	6.16
NH	3.15	3.28	4.00	3.48	3.44	3.40	3.21	3.47	3.21	3.20	3.23	3.56	3.49	3.45	3.42	3.61
NJ	2.23	2.04	1.85	2.05	1.59	1.52	1.44	1.36	1.18	1.05	0.92	1.05	0.99	0.80	0.86	0.88
NY	3.03	3.37	3.11	3.03	3.22	2.89	3.19	3.21	2.99	2.92	2.61	2.71	2.58	2.60	2.64	2.68
NS	2.97	3.08	3.14	2.86	3.03	3.00	2.81	2.99	2.96	2.98	2.74	2.85	2.86	2.72	2.76	2.97
PA	1.67	1.59	1.65	1.59	1.55	1.51	1.61	1.76	1.49	1.55	1.36	1.52	1.47	1.42	1.54	1.45
PEI	3.99	3.93	4.09	3.55	3.90	3.98	3.61	3.53	3.46	3.31	3.14	3.25	3.45	3.36	3.19	3.02
QUE	5.79	6.28	6.49	6.47	6.20	6.53	5.96	6.21	6.03	6.24	5.91	6.01	5.47	5.66	5.80	5.98
RI	0.45	0.37	0.33	0.29	0.25	0.22	0.20	0.17	0.15	0.13	0.12	0.10	0.09	0.08	0.07	0.06
VT	2.69	2.45	2.68	3.12	3.36	3.30	3.04	3.16	2.25	2.57	2.46	2.46	2.34	2.47	2.73	3.12
VA	0.93	0.58	0.62	0.60	0.53	0.49	0.50	0.46	0.48	0.44	0.40	0.35	0.34	0.36	0.30	0.31
WV	1.01	0.96	0.95	0.93	0.89	0.88	0.88	0.82	0.81	0.78	0.76	0.78	0.72	0.71	0.68	0.68
Region	3.05	3.14	3.14	3.15	3.14	3.22	2.99	3.08	2.87	3.00	2.83	2.87	2.64	2.73	2.76	2.91
Central Region																
IL	0.60	0.90	0.79	1.29	0.55	0.79	0.53	0.87	0.62	0.76	0.62	0.54	0.70	0.60	0.73	0.78
IN	0.71	0.65	0.77	0.73	0.64	0.58	0.75	0.70	0.62	0.53	0.52	0.49	0.46	0.44	0.54	0.47
MB	5.98	5.85	5.75	5.63	5.53	5.41	5.31	5.19	5.27	5.46	5.45	5.51	4.84	3.57	4.19	4.18
MI	5.68	5.78	6.01	5.63	5.95	5.72	5.74	6.25	4.97	5.06	4.48	4.93	4.71	4.56	5.32	4.51
MN	3.46	3.80	3.98	3.96	4.35	3.66	4.33	4.15	3.56	3.61	3.29	3.44	3.27	2.94	3.32	3.40
OH	1.40	1.29	1.25	1.23	1.31	1.15	1.37	1.26	1.24	1.16	1.15	1.12	1.11	0.98	1.10	0.95
ON	6.87	7.70	7.92	7.81	7.85	7.90	7.45	7.56	7.05	6.79	5.84	6.43	5.23	5.94	6.24	5.74
WI	3.31	3.24	3.66	3.70	3.48	3.52	3.35	3.38	2.73	2.86	2.54	2.62	2.57	2.44	2.59	2.90
Region	3.30	3.51	3.66	3.66	3.61	3.51	3.51	3.63	3.11	3.12	2.76	2.93	2.71	2.69	2.99	2.82
Continent	3.18	3.33	3.40	3.41	3.38	3.37	3.25	3.35	2.99	3.06	2.79	2.90	2.68	2.71	2.88	2.87

Table 2. Continued

State, Province, or Region	Year										
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Eastern Region											
CT	0.90	0.84	0.80	0.79	0.76	0.74	0.70	0.68	0.67	0.64	0.62
DE	0.68	0.45	0.50	0.50	0.50	0.48	0.43	0.43	0.41	0.46	0.45
ME	3.80	3.38	3.15	3.42	3.47	3.57	3.51	3.25	3.29	3.26	3.38
MD	0.56	0.55	0.50	0.49	0.47	0.45	0.45	0.42	0.41	0.39	0.38
MA	1.65	1.54	1.55	1.50	1.57	1.42	1.41	1.30	1.37	1.38	1.27
NB	5.68	6.07	5.78	6.29	6.29	6.83	6.13	5.44	5.31	4.92	6.18
NH	3.19	3.28	3.25	3.52	3.52	3.49	3.33	2.88	2.96	3.44	3.41
NJ	0.77	0.73	0.62	0.66	0.52	0.50	0.50	0.50	0.44	0.50	0.33
NY	2.53	2.47	2.43	2.52	2.65	2.48	2.51	2.37	2.27	2.45	2.65
NS	2.93	2.79	2.64	2.62	2.77	2.70	2.56	2.56	2.46	2.41	2.67
PA	1.21	1.39	1.36	1.36	1.38	1.41	1.29	1.27	1.37	1.33	1.40
PEI	3.16	3.02	2.67	2.69	2.67	2.85	2.92	2.80	2.54	2.80	2.66
QUE	5.79	5.67	5.71	5.68	5.86	6.22	5.88	5.55	5.57	5.71	5.52
RI	0.05	0.05	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01
VT	3.22	2.52	2.28	2.46	2.51	2.70	2.76	2.29	2.09	2.30	2.46
VA	0.29	0.25	0.24	0.24	0.23	0.21	0.20	0.19	0.19	0.16	0.16
WV	0.66	0.62	0.61	0.61	0.57	0.55	0.54	0.54	0.53	0.52	0.49
Region	2.77	2.72	2.65	2.74	2.80	2.88	2.74	2.55	2.54	2.56	2.69
Central Region											
IL	0.67	0.80	0.68	1.23	1.37	0.62	0.95	0.66	0.66	0.59	0.78
IN	0.42	0.46	0.36	0.34	0.40	0.40	0.33	0.32	0.32	0.30	0.32
MB	4.33	4.37	3.61	4.12	3.79	4.41	3.74	3.90	3.69	3.91	3.84
MI	4.74	4.46	4.55	4.71	4.74	4.63	4.34	4.27	4.02	4.04	4.16
MN	3.82	3.55	3.01	3.09	3.15	3.50	3.37	3.39	3.08	3.38	4.09
OH	0.98	0.97	0.93	0.89	1.10	1.00	0.97	0.80	0.81	0.93	0.90
ON	6.85	6.00	6.29	5.55	6.05	6.31	6.04	6.39	5.45	5.30	5.07
WI	2.75	2.65	2.31	2.47	2.51	2.81	2.61	2.99	2.56	2.61	2.60
Region	3.03	2.83	2.73	2.77	2.92	2.90	2.80	2.83	2.55	2.58	2.69
Continent											
	2.91	2.78	2.69	2.76	2.86	2.89	2.77	2.69	2.54	2.57	2.69

Table 3. The number of U.S. hunters by state that submitted woodcock wings in the 2008 and 2009 Wing-collection Surveys.

State of residence	Number of Hunters who submitted woodcock wings ^a	
	2008-09 Season	2009-10 Season
AL	1	1
AR	0	1
CT	23	26
DE	2	0
FL	0	1
GA	5	5
IL	8	3
IN	23	15
IA	6	7
KS	0	0
KY	2	0
LA	20	16
ME	148	184
MD	13	12
MA	62	51
MI	323	309
MN	112	92
MS	2	1
MO	22	16
NE	0	0
NH	70	72
NJ	23	19
NY	143	132
NC	5	8
ND	0	0
OH	12	13
OK	0	0
PA	64	62
RI	1	2
SC	11	11
TN	3	3
TX	1	1
VT	48	51
VA	15	9
WV	13	17
WI	232	228
Total	1,413	1,368

^a Number of hunters that submitted envelopes in current year. This number may include a small number of hunters that we sent envelopes to in prior years and who subsequently submitted wings from birds shot in current survey year.

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 2009 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2008.

State or	Wings received							
Region of harvest	Total		Adult females		Immatures		Recruitment index	
	1963-08	2009	1963-08	2009	1963-08	2009	1963-08	2009
Eastern Region								
CT	13,931	115	3,079	24	8,555	80	2.8	
DE	458	0	64	0	320	0	5.0	
FL	663	15	151	2	412	10	2.7	
GA	3,123	18	963	6	1,346	8	1.4	
ME	80,641	1,561	23,804	480	40,327	761	1.7	1.6
MD	4,190	49	1,049	8	2,335	35	2.2	
MA	22,505	302	6,919	99	11,028	135	1.6	1.4
NH	32,114	693	10,424	229	14,823	333	1.4	1.5
NJ	25,951	169	5,988	46	15,351	97	2.6	2.1
NY	58,184	1,071	19,540	379	26,641	433	1.4	1.1
NC	3,407	108	1,039	35	1,678	45	1.6	
PA	30,818	353	9,772	123	14,206	149	1.5	1.2
RI	2,408	32	458	9	1,607	12	3.5	
SC	2,904	132	894	38	1,334	62	1.5	1.6
VT	24,583	725	8,016	231	11,325	340	1.4	1.5
VA	4,922	73	1,256	20	2,709	33	2.2	
WV	5,892	87	1,775	27	2,970	34	1.7	
Region	316,694	5,503	95,191	1,756	156,967	2,567	1.7	1.5
Central Region								
AL	919	5	248	3	427	2	1.7	
AR	529	1	168	0	218	0	1.3	
IL	1,453	18	334	3	821	11	2.5	
IN	7,935	106	2,029	24	4,362	63	2.1	
IA	1,193	17	385	8	546	6	1.4	
KS	46	3	9	0	24	2		
KY	1,147	0	279	0	596	0	2.1	
LA	31,420	231	7,033	55	20,342	152	2.9	2.8
MI	121,441	2,809	39,612	1,068	59,939	1,125	1.5	1.1
MN	35,195	887	12,210	410	15,486	299	1.3	0.7
MS	1,751	26	497	7	890	16	1.8	
MO	3,746	96	984	17	1,841	49	1.9	
NE	13	0	5	0	6	0		
ND	3	0	3	0	0	0		
OH	14,576	84	4,456	34	6,875	32	1.5	
OK	172	0	38	0	91	0	2.4	
TN	1,156	32	297	10	591	18	2.0	
TX	1,003	15	266	10	509	4	1.9	
WI	75,541	2,345	25,013	954	36,169	866	1.4	0.9
Region	299,239	6,675	93,866	2,603	149,733	2,645	1.6	1.2

Table 5. Preliminary estimates of woodcock harvest, hunter numbers, days afield, and hunter success from the 2009-10 Harvest Information Program (note: all estimates rounded to the nearest 100 for harvest, hunters, and days afield).

	Harvest		Active woodcock hunters		Days afield		Season harvest per hunter	
	Total	+/- 95% CI ^a	Total	+/- 95% CI	Total	+/- 95% CI	Total	+/- 95% CI
Eastern								
CT	1,000	37	900	26	5,100	31	1.05	45
DE	200	138	300	84	700	92	0.70	161
FL	8,700	105	3,000	62	14,800	75	2.90	122
GA	0	0	3,600	196	10,800	196	0.00	0
ME	8,300	61	3,100	52	22,100	76	2.69	80
MD	600	47	800	117	1,900	108	0.77	126
MA	2,400	34	1,100	29	6,500	40	2.30	45
NH	8,400	32	3,200	42	17,000	33	2.66	53
NJ	3,400	67	900	87	3,900	63	3.74	109
NY	7,700	28	4,500	24	17,700	26	1.71	37
NC	9,300	129	4,700	83	27,000	113	2.00	154
PA	7,400	71	7,000	33	32,500	41	1.06	78
RI	600	76	300	80	1,000	91	1.94	111
SC	1,400	85	1,200	121	3,900	136	1.12	148
VT	1,500	91	1,200	38	7,500	49	1.23	99
VA	1,600	36	600	101	3,300	114	2.49	108
WV	600	70	400	57	2,200	77	1.50	90
Region	63,300	28	na^b		178,000	26	na^b	
Central								
AL	5,900	117	2,100	163	6,500	108	2.85	201
AR	6,600	112	3,000	94	8,100	128	2.20	146
IL	5,300	142	1,800	98	6,200	91	2.90	173
IN	1,700	79	1,100	63	4,000	80	1.51	101
IA	700	155	900	102	1,800	121	0.79	186
KS	< 50	121	< 50	121	< 50	122	3.00	171
KY	0	0	< 50	182	<50	182	0.00	0
LA	24,700	70	4,300	44	20,800	59	5.72	83
MI	80,900	22	26,400	15	146,200	21	3.06	27
MN	16,000	48	9,700	37	38,300	44	1.64	60
MS	1,300	153	1,000	74	3,700	89	1.22	170
MO	900	86	200	42	1,200	49	4.88	96
NE	100	190	< 50	134	100	134	2.50	233
OH	1,200	63	1,600	82	7,200	94	0.71	103
OK	200	149	< 50	98	100	130	9.33	178
TN	400	102	200	69	1,000	78	1.71	124
TX	0	0	0	0	0	0	0	0
WI	29,200	24	19,400	22	77,100	24	1.51	32
Region	175,100	17	na^b		322,300	14	na^b	
U.S. Total	238,400	15	na^b		500,300	13	na^b	

^a 95% Confidence Intervals are expressed as a % of the point estimate.

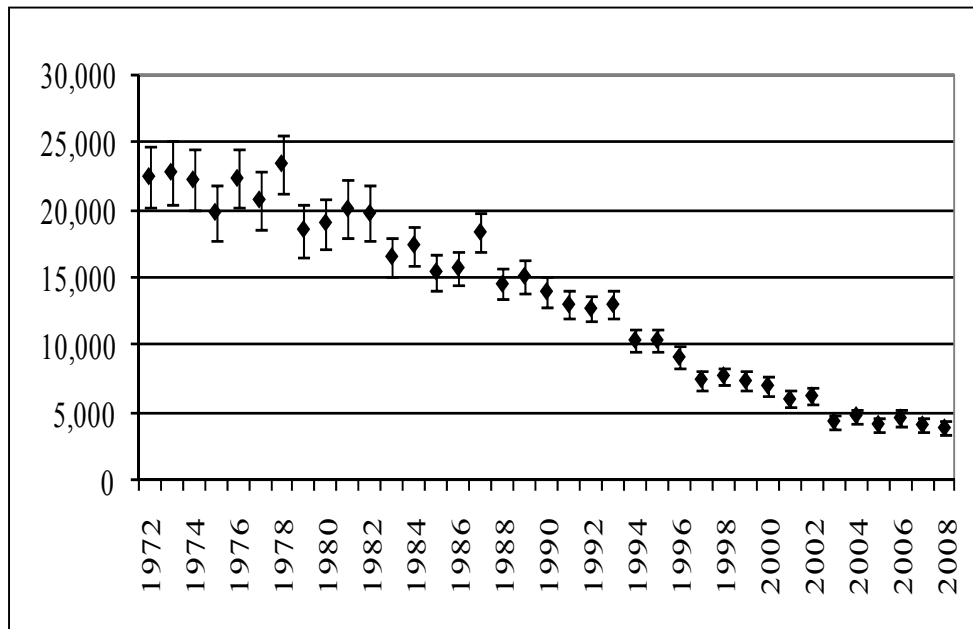
^b Regional estimates of hunter numbers and hunter success cannot be obtained due to the occurrence of individual hunters being registered in the Harvest Information Program in more than one state.

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, 1918-2009.

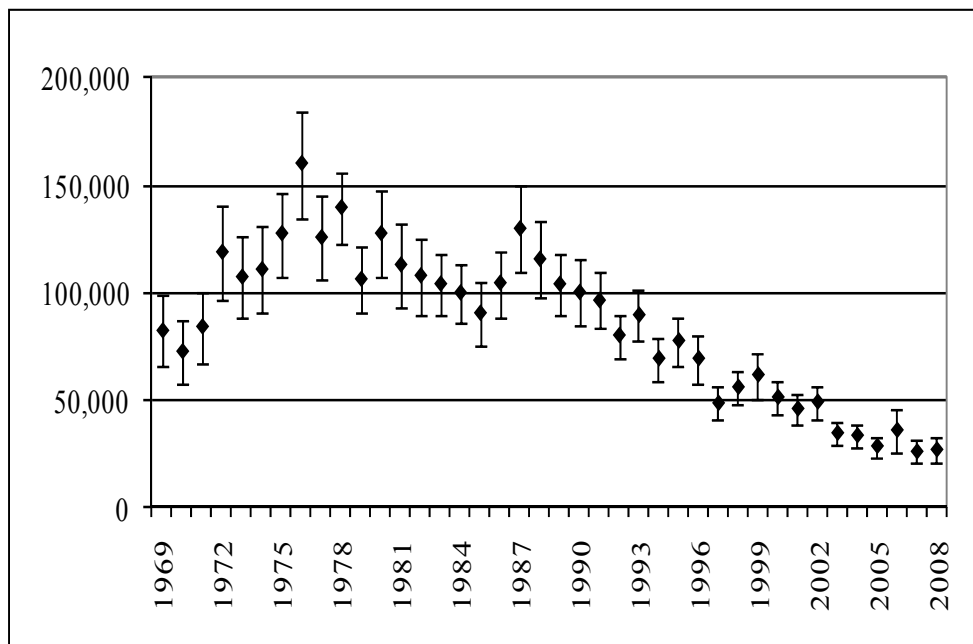
Eastern Region				Central Region			
Year (s)	Outside dates	Season length	Daily bag limit	Year (s)	Outside dates	Season length	Daily bag limit
1918-26	Oct. 1 - Dec. 31	60	6	1918-26	Oct. 1 - Dec. 31	60	6
1927	Oct. 1 - Dec. 31	60	4	1927	Oct. 1 - Dec. 31	60	4
1928-39	Oct. 1 - Dec. 31	30	4	1928-39	Oct. 1 - 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	1997-2009	Sep. 22 ^a - Jan. 31	45	3
1985-96	Oct. 1 - Jan. 31	45	3				
1997-01	Oct. 6 - Jan. 31	30	3				
2002-09	Oct. 1 - Jan. 31	30	3				

^a Saturday nearest September 22 (September 19th for the 2010 season).

Appendix B. Estimates for Canadian woodcock harvest and the number of successful woodcock hunters in Canada (Gendron and Collins 2008). Data from the 2009 hunting season were not available before this report was completed.



Estimated number of successful woodcock hunters in Canada and associated 95% confidence intervals, 1972-2008



Estimated woodcock harvest in Canada and associated 95% confidence intervals, 1969-2008.

U.S. Fish and Wildlife Service
Division of Migratory Bird Management
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