2009

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AMERICAN WOODCOCK POPULATION STATUS, 2009

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Abstract: Singing-ground Survey data for 2009 indicated that indices for singing American woodcock (*Scolopax minor*) males in the Eastern and Central Management Regions are not significantly different from 2008. There was no significant 10-year trend for woodcock heard in either management region during 1999-2009. This represents the sixth consecutive year that the 10-year trend estimate did not indicate a significant decline in the Eastern Region. The 10-year trend in the Central Region returned to stability after showing a significant decline last year. Both regions have a long-term (1968-09) declining trend of -1.1 % per year. The 2008 recruitment index for the U.S. portion of the Eastern Region (1.8 immatures per adult female) was 11.1 % greater than the 2007 index and 7.6 % above the long-term regional index, while the recruitment index for the U.S. portion of the Central Region (1.6 immatures per adult female) was 6.3 % greater than the 2007 index and was 1.1 % lower than the long-term regional index. Estimates from the Harvest Information Program indicated that U.S. woodcock hunters in the Eastern Region spent 169,000 days afield and harvested 104,700 woodcock during the 2008-09 season, while in the Central Region, hunters spent 369,800 days afield and harvested 174,300 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 2009. 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

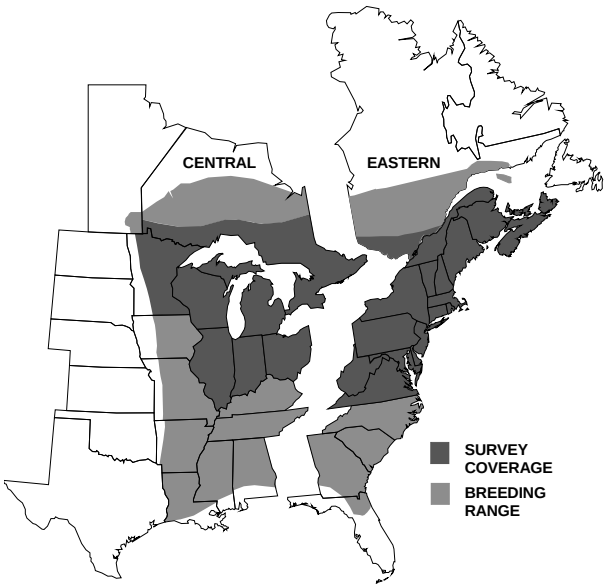

Fig. 1. Woodcock management regions, breeding range, and Singing-ground Survey coverage.

roads in the center of randomly-chosen 10-minute 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 trends, a random effect for each unique combination of route and observer, a year effect, a start-up effect on the route for first year counts of new observers, and overdispersion. In the hierarchical model, most of 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. Once the sequences converge, means, medians, and credible (or Bayesian confidence) intervals for the parameters can be estimated from the replicates. Annual indices are defined as exponentiated year and trend 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 (2008-09), 10-year (1999-09) and long-term (1968-09) 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 180,000 iterations

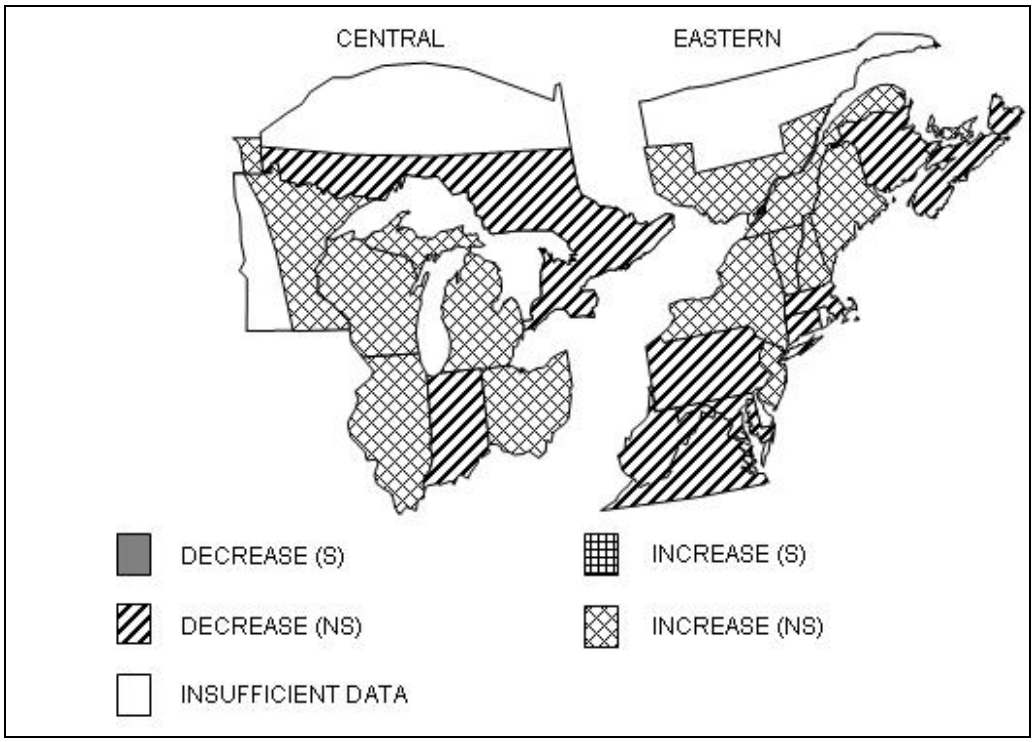

Fig. 2. Short-term trends in the number of American woodcock heard on the Singing-ground Survey, 2008-2009, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

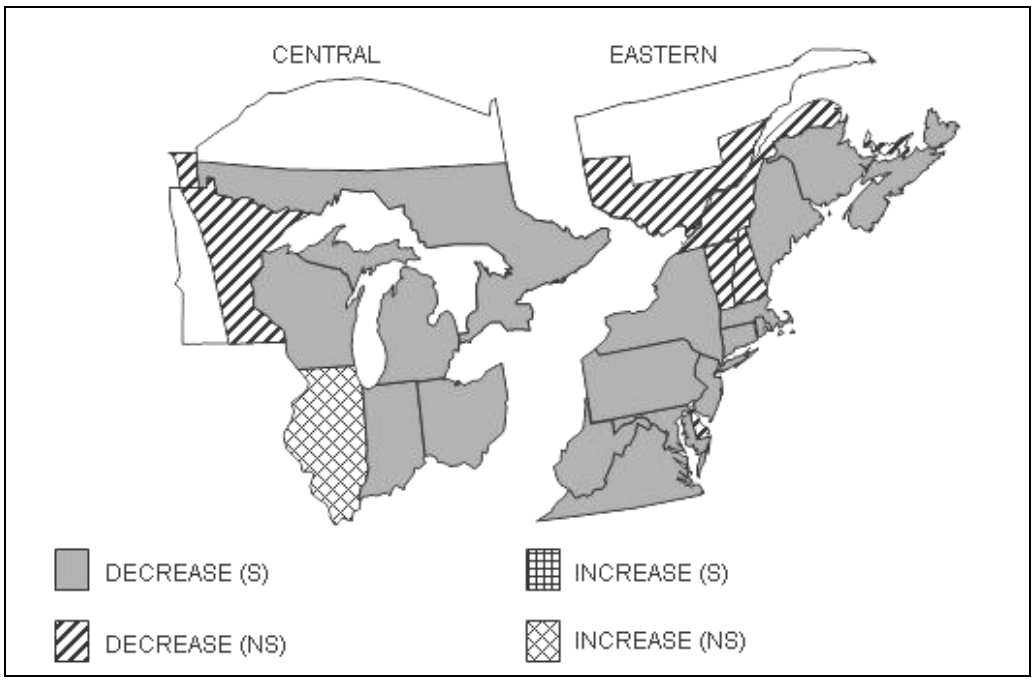

Fig. 3. Long-term trends in the number of American woodcock heard on the Singing-ground Survey, 1968-2009, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero.

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.

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 1 June 2009 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 2003-08 should be considered preliminary as refinements are still being made in the sampling frame and estimation techniques.

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 2008 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. Information from wings from the 2008-09 hunting season received through 1 March 2009 was included in analyses. Although not included in this analysis, wings received after 1 March 2009 were processed for inclusion in the permanent database.

The ratio of immature birds per adult female in the harvest provides an index to recruitment of young into the population. The 2008 recruitment index for each state with $\geq$ 125 submitted wings was calculated as the number of immatures per adult female. The regional indices for 2008 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2007.

RESULTS AND DISCUSSION

Singing-ground Survey

Data for 780 routes were submitted by 1 June 2009 (Table 1). Short-term, 10-year, and long-term 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 2009 Singing-ground Survey were not significantly different from last year for both management regions (Table 1, Fig. 2). Point estimates for both regions indicated an increase in the number of singing males from last year; however, the trends were not significant. 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 (1999-2009) was not significant for either management region (Table 1). This marks the sixth straight year the Eastern Region trend has remained stable. The 10-year trend for the Central Region returned to stable status after showing a significant decline last year.

There were significant long-term 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 (-1.1 %/ year) for both management regions.

In the Eastern Region, the 2009 index using hierarchical methods was 2.6 singing-males per route, which was slightly higher than the 2008 index of 2.5 (Fig. 4). In the Central Region, the 2009 index was 2.6 singing-males per route, which was also slightly higher than the 2008 index of 2.5 singing-males per route (Fig. 4). For annual indices (1968-2009) by state, province, or region see Table 2.

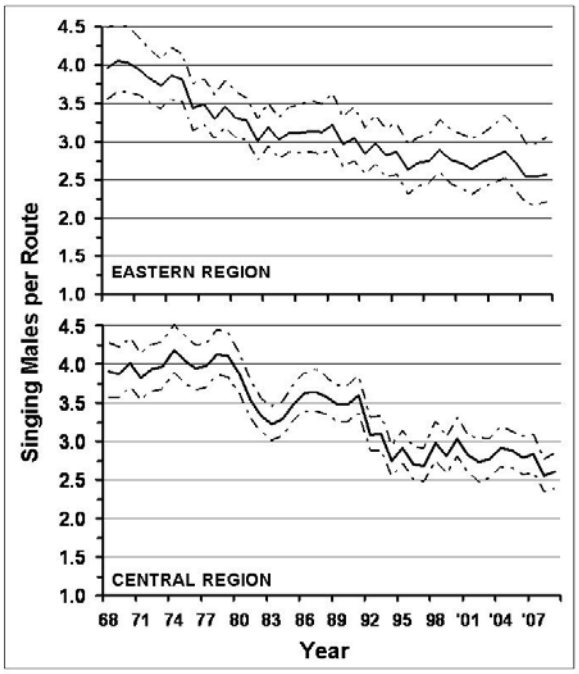

Fig. 4. Annual indices of the number of woodcock heard on the Singing-ground Survey, 1968-2009 as estimated using hierarchical modeling. The dashed lines represent the 95th percentile credible interval.

Wing-collection Survey

A total of 1,413 woodcock hunters (Table 3) from states with woodcock seasons sent in a total of 12,072 usable woodcock wings for the 2008 Wing-collection Survey (Table 4).

The 2008 recruitment index in the U.S. portion of the Eastern Region (1.8 immatures per adult female) was 11.1 % higher than the 2007 index (1.6), and 7.6 % higher than the long-term (1963-07) regional average (Table 4, Fig 5). In the Central Region, the 2008 recruitment index (1.6 immatures per adult female) was 6.3 % higher than the 2007 index (1.5) and was 1.1 % lower than the long-term regional average (Table 4, Fig 5). Percent change for all comparisons was calculated using unrounded recruitment indices.

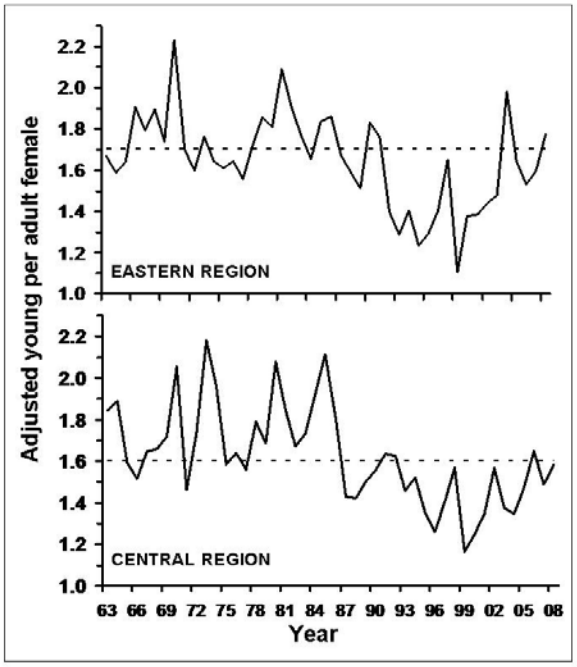

Fig. 5. Weighted annual indices of recruitment (U.S.), 1963-2008. The dashed line is the 1963-2007 average.

Harvest Information Program

Estimates of woodcock harvest, number of active hunters, days afield, and seasonal hunting success from the 2008-09 HIP survey are provided in Table 5. In the Eastern Region, woodcock hunters spent approximately 169,000 days afield (Figure 6) and harvested 104,700 birds (Figure 7) during the 2008-09 hunting season. Woodcock hunters in the Central Region spent 369,800 days afield (Figure 6) and harvested 174,300 birds (Figure 7) during the 2008-09 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. Harvest in the Eastern Region was above the 1999-2008 average for the Eastern Region,

while harvest in the Central Region was the lowest since the inception of the HIP survey for woodcock in 1999 (Figure 7). All HIP estimates from 1999-2002 are final, while those from 2003-08 are preliminary.

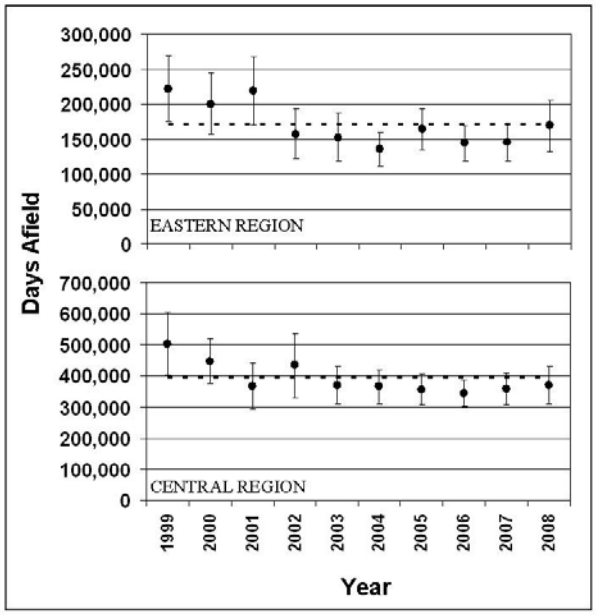

Fig. 6. Estimated days afield hunting woodcock as estimated by the HIP survey, 1999-2008. The dashed line represents the 1999-2008 mean and error bars represent the 95% C.I. of the point estimate.

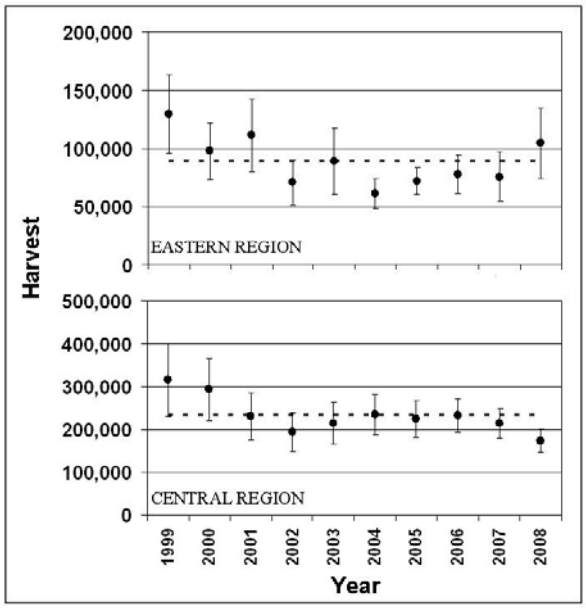

Fig. 7. Estimated woodcock harvest as estimated by the HIP survey, 1999-2008. The dashed line represents the 1999-2008 mean and error bars represent the 95% C.I. of the point estimate.

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Table 1. Short-term (2008-09), 10-year (1999-2009), and long-term (1968-2009) 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]	2008-2009				1999-2009			1968-2009		
		n[c]	% change	95%	CI[d]	% change	95%	CI[d]	% change	95%	CI[d]
CT	5	9	-4.89	-39.79	39.98	-4.37	-9.51	-0.21	-3.94	-6.07	-1.81
DE[e]	0	2	--	--	--	--	--	--	-1.76	-7.77	4.53
ME	53	67	0.13	-17.58	21.77	-1.02	-3.03	1.16	-1.28	-1.87	-0.67
MD	5	21	-4.35	-25.40	21.31	-3.79	-6.32	-0.78	-3.83	-5.41	-2.23
MA	9	20	-1.47	-27.12	37.90	-2.96	-6.72	-0.10	-2.21	-3.32	-1.04
NB	53	69	-8.02	-25.55	12.66	-2.34	-4.57	-0.06	-1.45	-2.32	-0.61
NH	16	18	14.98	-10.17	66.47	-0.59	-3.67	2.32	-0.21	-1.37	1.04
NJ	6	18	7.15	-29.51	98.28	-5.81	-10.50	-0.41	-5.48	-7.16	-3.66
NY	72	111	5.89	-7.25	24.86	-1.05	-2.50	0.60	-1.30	-1.78	-0.79
NS	37	60	-3.02	-20.70	14.89	-1.91	-4.39	-0.20	-1.28	-2.12	-0.57
PA	34	58	-0.28	-19.63	27.07	-0.68	-2.85	2.32	-1.12	-1.94	-0.29
PEI	8	12	12.98	-17.55	91.61	-0.69	-4.14	4.50	-1.34	-2.84	0.28
QUE	15	56	2.68	-23.83	45.49	-0.26	-3.78	2.89	-0.05	-1.46	1.25
RI[e]	0	2	--	--	--	--	--	--	-11.70	-17.76	-6.01
VT	13	22	15.94	-23.21	81.61	-2.70	-6.70	1.22	-0.64	-1.89	0.67
VA	25	48	-15.67	-51.61	17.16	-6.18	-11.00	-2.79	-5.40	-6.68	-4.26
WV	24	45	-1.62	-22.28	29.39	-2.54	-4.87	0.19	-2.55	-3.48	-1.59
Eastern	**375**	**638**	**1.16**	**-10.19**	**16.14**	**-1.17**	**-2.47**	**0.17**	**-1.09**	**-1.56**	**-0.60**
IL	45	26	1.72	-51.90	111.96	-1.69	-10.45	6.90	0.86	-1.79	3.72
IN	17	40	-4.55	-45.94	64.56	-4.24	-9.81	0.88	-4.19	-5.69	-2.82
MB[f]	18	23	4.69	-23.15	51.71	-1.11	-4.58	3.11	-1.93	-4.31	0.59
MI	109	148	1.39	-11.69	16.37	-0.98	-2.44	0.49	-1.18	-1.61	-0.75
MN	78	103	10.70	-4.97	30.53	0.18	-1.56	1.98	-0.05	-0.70	0.67
OH	28	57	12.29	-10.59	58.40	-0.49	-2.97	3.25	-1.93	-2.77	-1.02
ON	32	139	-1.54	-20.54	22.39	-0.59	-2.79	1.79	-0.86	-1.50	-0.22
WI	78	103	1.15	-15.30	20.94	-1.08	-3.00	0.89	-0.69	-1.25	-0.12
Central	**405**	**639**	**2.39**	**-6.57**	**12.26**	**-0.74**	**-1.75**	**0.27**	**-1.07**	**-1.35**	**-0.77**
Continent	**780**	**1277**	**1.79**	**-5.55**	**10.60**	**-0.95**	**-1.79**	**-0.11**	**-1.03**	**-1.31**	**-0.74**

[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 2009 for which data was received by 1 June, 2009.

[c] Number of routes with > 2 years of data and at least 1 observed woodcock between 1968 and 2009.

[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 2009.

[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, 1968-2009. These indices are based on the 1968-2009 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	3.35	3.21	3.26	2.93	3.02	2.76	2.73	2.69	2.25	2.24	1.95	2.00	1.93	1.88	1.97	1.78
DE	0.91	0.76	0.93	0.66	0.80	0.97	0.88	1.69	0.47	0.66	0.48	0.55	0.70	0.70	0.69	1.07
ME	5.62	5.53	6.09	5.53	5.44	5.63	5.86	6.07	5.64	4.74	4.60	5.04	4.32	4.97	3.83	4.27
MD	1.92	1.90	1.78	1.74	1.65	1.59	1.53	1.48	1.36	1.34	1.30	1.25	1.24	1.18	1.12	1.04
MA	3.45	3.42	3.50	3.51	3.12	3.45	3.23	2.75	2.73	2.74	2.64	2.77	2.44	2.61	2.34	2.17
NB	6.73	8.79	8.35	7.73	7.48	6.98	7.50	7.97	6.07	7.30	5.61	5.96	4.91	5.54	5.27	5.28
NH	3.67	3.67	3.88	3.48	3.95	3.33	3.80	3.59	3.55	3.59	3.48	3.40	3.73	3.61	3.13	3.24
NJ	5.27	4.98	5.04	6.02	4.60	5.36	4.94	4.18	3.28	3.27	2.70	3.10	2.44	2.26	2.13	2.23
NY	4.00	4.09	3.68	3.91	3.77	3.80	3.82	3.50	3.50	3.46	3.18	3.38	3.58	3.42	3.18	3.33
NS	3.96	3.67	3.31	3.65	3.46	3.58	3.65	3.51	3.41	3.37	3.50	3.22	3.19	3.03	2.94	3.06
PA	2.11	2.01	2.17	2.10	2.03	2.04	1.82	1.84	1.85	1.82	1.75	1.83	1.66	1.64	1.60	1.63
PEI	4.97	4.78	4.74	5.28	4.33	4.29	4.49	5.31	4.60	4.38	4.20	4.28	3.60	3.41	3.46	3.91
QUE	6.08	6.07	6.07	6.14	6.02	5.73	6.11	6.00	5.26	5.56	6.10	6.43	6.67	6.02	5.73	6.31
RI	3.53	2.85	2.55	2.73	2.20	1.97	1.63	1.40	1.24	1.09	0.89	0.83	0.73	0.61	0.61	0.50
VT	3.61	3.05	3.83	3.35	3.87	3.29	3.74	4.11	4.23	4.44	3.14	3.35	3.13	2.71	1.93	2.76
VA	1.68	1.59	1.59	1.35	1.26	1.09	1.31	1.16	1.12	1.07	0.92	0.90	0.78	0.84	0.82	0.75
WV	1.59	1.59	1.47	1.41	1.49	1.40	1.34	1.34	1.27	1.21	1.08	1.17	1.11	1.17	1.10	1.07
Region	**3.97**	**4.06**	**4.03**	**3.94**	**3.82**	**3.73**	**3.86**	**3.81**	**3.44**	**3.49**	**3.30**	**3.46**	**3.31**	**3.28**	**3.01**	**3.19**
Central Region																
IL	0.56	0.57	0.47	0.66	0.62	0.53	0.61	0.70	0.50	0.58	0.71	0.51	0.44	0.64	0.44	1.06
IN	1.79	1.25	1.20	0.95	1.36	1.23	1.09	0.92	0.98	0.90	0.90	1.10	0.87	1.00	0.69	0.75
MB	9.80	9.55	9.32	9.06	8.84	8.70	8.44	8.25	8.10	7.90	7.70	7.50	7.29	7.12	6.93	6.78
MI	6.72	6.57	6.63	6.23	6.28	6.50	7.17	7.16	6.82	6.37	6.79	6.70	6.36	5.69	5.93	5.06
MN	4.04	3.46	3.42	3.71	3.46	3.84	4.34	3.92	3.96	4.04	4.22	3.88	4.40	3.94	3.83	3.53
OH	1.89	1.85	1.92	1.78	1.77	1.61	1.75	1.55	1.72	1.67	1.50	1.42	1.43	1.53	1.33	1.39
ON	7.89	8.82	9.30	8.53	9.32	9.07	9.07	8.63	8.80	9.00	9.33	9.57	8.98	8.09	6.88	6.82
WI	3.44	3.48	3.97	3.71	3.69	3.86	3.91	3.99	3.64	4.03	4.13	4.28	3.48	2.96	3.13	3.00
Region	**3.90**	**3.87**	**4.01**	**3.82**	**3.94**	**3.97**	**4.18**	**4.04**	**3.95**	**3.98**	**4.13**	**4.11**	**3.87**	**3.54**	**3.33**	**3.23**
Continent	**3.94**	**3.97**	**4.02**	**3.88**	**3.88**	**3.85**	**4.02**	**3.93**	**3.69**	**3.73**	**3.72**	**3.78**	**3.59**	**3.41**	**3.17**	**3.21**

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	1.66	1.62	1.64	1.46	1.58	1.32	1.29	1.28	1.18	1.08	1.09	1.11	1.09	0.98	0.94	0.96
DE	0.53	0.58	0.65	0.63	0.62	0.60	0.82	0.42	0.44	0.56	0.55	0.55	0.60	0.58	0.90	0.46
ME	4.29	4.39	4.69	4.95	4.54	4.66	3.72	4.20	3.66	3.90	3.61	3.69	3.13	3.36	3.33	3.63
MD	1.02	0.97	0.92	0.89	0.86	0.83	0.80	0.76	0.71	0.71	0.68	0.65	0.63	0.60	0.57	0.55
MA	2.33	2.29	2.21	2.18	2.14	1.99	1.95	1.95	1.81	1.76	1.75	1.73	1.68	1.71	1.63	1.86
NB	4.79	5.02	4.18	4.62	5.34	6.38	5.39	5.01	4.82	5.80	5.91	5.50	4.78	5.41	5.30	6.11
NH	3.18	3.29	4.06	3.48	3.45	3.39	3.20	3.45	3.19	3.17	3.20	3.53	3.45	3.43	3.38	3.58
NJ	2.20	2.04	1.85	2.02	1.61	1.54	1.45	1.37	1.21	1.09	0.97	1.07	1.01	0.83	0.87	0.89
NY	3.01	3.27	3.05	2.97	3.12	2.84	3.07	3.07	2.89	2.82	2.57	2.65	2.52	2.54	2.55	2.57
NS	2.93	3.01	3.06	2.82	2.95	2.92	2.76	2.89	2.87	2.87	2.67	2.75	2.75	2.62	2.66	2.82
PA	1.65	1.58	1.63	1.57	1.53	1.49	1.57	1.70	1.46	1.51	1.33	1.47	1.42	1.38	1.49	1.40
PEI	3.89	3.84	4.03	3.42	3.83	3.94	3.53	3.42	3.36	3.20	3.01	3.14	3.39	3.28	3.11	2.91
QUE	5.83	6.34	6.56	6.59	6.31	6.67	6.06	6.32	6.15	6.37	6.05	6.16	5.59	5.84	5.96	6.18
RI	0.45	0.37	0.33	0.29	0.26	0.23	0.20	0.17	0.16	0.14	0.12	0.10	0.09	0.08	0.07	0.06
VT	2.64	2.39	2.62	3.08	3.33	3.27	3.00	3.11	2.19	2.52	2.40	2.40	2.28	2.42	2.68	3.08
VA	0.92	0.59	0.62	0.60	0.54	0.50	0.51	0.46	0.48	0.44	0.41	0.36	0.35	0.37	0.31	0.31
WV	1.02	0.97	0.96	0.94	0.91	0.89	0.89	0.83	0.82	0.79	0.77	0.80	0.73	0.73	0.69	0.69
Region	**3.03**	**3.12**	**3.12**	**3.14**	**3.13**	**3.22**	**2.97**	**3.05**	**2.85**	**2.98**	**2.83**	**2.87**	**2.63**	**2.72**	**2.75**	**2.90**
Central Region																
IL	0.61	0.89	0.79	1.31	0.56	0.79	0.53	0.87	0.63	0.76	0.63	0.55	0.71	0.61	0.74	0.79
IN	0.71	0.65	0.77	0.72	0.63	0.58	0.75	0.69	0.62	0.53	0.52	0.49	0.45	0.43	0.53	0.46
MB	6.59	6.46	6.32	6.15	6.02	5.90	5.71	5.56	5.52	5.76	5.69	5.79	5.03	3.70	4.30	4.32
MI	5.67	5.78	5.99	5.62	5.93	5.70	5.73	6.22	4.95	5.05	4.47	4.92	4.70	4.55	5.33	4.50
MN	3.41	3.73	3.89	3.87	4.23	3.59	4.19	4.03	3.49	3.53	3.24	3.36	3.21	2.90	3.24	3.32
OH	1.38	1.27	1.24	1.21	1.28	1.13	1.34	1.22	1.21	1.13	1.11	1.08	1.07	0.95	1.06	0.92
ON	6.87	7.68	7.90	7.80	7.82	7.90	7.46	7.54	7.06	6.81	5.87	6.47	5.29	5.99	6.30	5.81
WI	3.27	3.19	3.62	3.66	3.44	3.48	3.30	3.34	2.69	2.82	2.50	2.59	2.54	2.41	2.55	2.87
Region	**3.28**	**3.48**	**3.63**	**3.64**	**3.58**	**3.48**	**3.48**	**3.60**	**3.08**	**3.10**	**2.74**	**2.91**	**2.70**	**2.68**	**2.98**	**2.81**
Continent	**3.16**	**3.30**	**3.38**	**3.39**	**3.35**	**3.35**	**3.23**	**3.32**	**2.97**	**3.04**	**2.79**	**2.89**	**2.67**	**2.70**	**2.87**	**2.86**

Table 2. Continued

State, Province, or Region	Year									
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Eastern Region										
CT	0.87	0.81	0.77	0.75	0.72	0.71	0.67	0.66	0.65	0.61
DE	0.65	0.44	0.49	0.48	0.47	0.47	0.42	0.40	0.39	0.43
ME	3.73	3.32	3.10	3.36	3.40	3.50	3.43	3.16	3.27	3.28
MD	0.54	0.53	0.49	0.47	0.45	0.43	0.42	0.41	0.39	0.37
MA	1.67	1.55	1.56	1.52	1.61	1.44	1.42	1.28	1.38	1.37
NB	5.63	6.04	5.73	6.28	6.27	6.79	6.11	5.36	5.26	4.83
NH	3.15	3.22	3.20	3.48	3.49	3.43	3.28	2.81	2.90	3.37
NJ	0.79	0.74	0.64	0.66	0.54	0.52	0.52	0.51	0.45	0.49
NY	2.45	2.39	2.34	2.41	2.50	2.36	2.37	2.26	2.18	2.31
NS	2.78	2.65	2.54	2.52	2.62	2.56	2.43	2.45	2.39	2.31
PA	1.18	1.34	1.31	1.31	1.32	1.34	1.24	1.22	1.31	1.31
PEI	3.08	2.92	2.51	2.56	2.57	2.77	2.85	2.73	2.37	2.75
QUE	5.99	5.85	5.90	5.90	6.11	6.49	6.14	5.80	5.81	6.02
RI	0.06	0.05	0.05	0.04	0.03	0.03	0.03	0.02	0.02	0.02
VT	3.17	2.46	2.23	2.42	2.47	2.67	2.71	2.21	2.01	2.34
VA	0.29	0.26	0.25	0.25	0.24	0.22	0.20	0.20	0.20	0.16
WV	0.67	0.64	0.62	0.63	0.58	0.57	0.55	0.55	0.54	0.53
Region	**2.77**	**2.72**	**2.65**	**2.74**	**2.79**	**2.88**	**2.74**	**2.55**	**2.54**	**2.58**
Central Region										
IL	0.69	0.81	0.70	1.25	1.39	0.64	0.95	0.68	0.65	0.67
IN	0.41	0.46	0.36	0.34	0.40	0.40	0.32	0.31	0.31	0.30
MB	4.47	4.48	3.65	4.19	3.80	4.43	3.76	3.91	3.69	3.89
MI	4.74	4.46	4.57	4.71	4.74	4.63	4.34	4.28	4.03	4.08
MN	3.71	3.45	2.96	3.03	3.08	3.39	3.29	3.32	3.05	3.38
OH	0.94	0.93	0.89	0.85	1.05	0.96	0.93	0.77	0.78	0.88
ON	7.03	6.04	6.37	5.63	6.12	6.36	6.08	6.45	5.57	5.48
WI	2.72	2.61	2.28	2.44	2.47	2.77	2.57	2.95	2.54	2.57
Region	**3.04**	**2.82**	**2.73**	**2.76**	**2.91**	**2.88**	**2.79**	**2.82**	**2.55**	**2.61**
Continent	**2.90**	**2.77**	**2.69**	**2.75**	**2.85**	**2.88**	**2.77**	**2.69**	**2.55**	**2.59**

Table 3. The number of U.S. hunters by state that submitted woodcock wings in the 2007 and 2008 Wing-collection Surveys.

State of residence	Number of Hunters that Submitted woodcock wings[a]	
	2007-08 Season	2008-09 Season
AL	2	1
AR	1	0
CT	31	23
DE	4	2
FL	0	0
GA	4	5
IL	5	8
IN	26	23
IA	6	6
KS	0	0
KY	3	2
LA	28	20
ME	145	148
MD	11	13
MA	74	62
MI	332	323
MN	140	112
MS	3	2
MO	20	22
NE	0	0
NH	77	70
NJ	21	23
NY	133	143
NC	5	5
ND	1	0
OH	17	12
OK	0	0
PA	84	64
RI	2	1
SC	8	11
TN	4	3
TX	0	1
VT	54	48
VA	20	15
WV	23	13
WI	278	232
Total	**1,562**	**1,413**

[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 2008 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2007.

State or Region of harvest	Wings received						Recruitment index	
	Total		Adult females		Immatures			
	1963-07	2008	1963-07	2008	1963-07	2008	1963-07	2008
Eastern Region								
CT	13,778	153	3,042	37	8,464	91	2.8	2.5
DE	454	4	63	1	317	3	5.0	
FL	663	0	151	0	412	0	2.7	
GA	3,103	20	959	4	1,335	11	1.4	
ME	79,404	1,237	23,480	324	39,648	679	1.7	2.1
MD	4,130	60	1,039	10	2,300	35	2.2	
MA	22,107	398	6,797	122	10,840	188	1.6	1.5
NH	31,582	532	10,252	172	14,566	257	1.4	1.5
NJ	25,740	211	5,937	51	15,221	130	2.6	2.5
NY	57,375	809	19,265	275	26,261	380	1.4	1.4
NC	3,328	79	1,006	33	1,644	34	1.6	
PA	30,437	381	9,654	118	14,033	173	1.5	1.5
RI	2,376	32	454	4	1,587	20	3.5	
SC	2,817	87	860	34	1,300	34	1.5	
VT	24,020	563	7,835	181	11,069	256	1.4	1.4
VA	4,786	136	1,213	43	2,651	58	2.2	1.3
WV	5,833	59	1,766	9	2,935	35	1.7	
Region	**311,933**	**4,761**	**93,773**	**1,418**	**154,583**	**2,384**	**1.7**	**1.8**
Central Region								
AL	917	2	247	1	427	0	1.7	
AR	529	0	168	0	218	0	1.3	
IL	1,423	30	328	6	800	21	2.4	
IN	7,782	153	1,979	50	4,289	73	2.2	1.5
IA	1,157	36	368	17	534	12	1.5	
KS	46	0	9	0	24	0		
KY	1,142	5	277	2	593	3	2.1	
LA	31,125	295	6,976	57	20,145	197	2.9	3.5
MI	118,296	3,145	38,535	1,077	58,444	1,495	1.5	1.4
MN	34,214	981	11,820	390	15,089	397	1.3	1.0
MS	1,734	17	495	2	880	10	1.8	
MO	3,587	159	937	47	1,758	83	1.9	1.8
NE	13	0	5	0	6	0		
ND	3	0	3	0	0	0		
OH	14,481	95	4,423	33	6,835	40	1.5	
OK	172	0	38	0	91	0	2.4	
TN	1,096	60	280	17	560	31	2.0	
TX	991	12	262	4	503	6	1.9	
WI	73,220	2,321	24,213	800	35,123	1,046	1.5	1.3
Region	**291,928**	**7,311**	**91,363**	**2,503**	**146,319**	**3,414**	**1.6**	**1.6**

Table 5. Preliminary estimates of woodcock harvest, hunter numbers, days afield, and hunter success from the 2008-09 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	
Eastern	**Total**	**+/- 95% CI[a]**	**Total**	**+/- 95% CI**	**Total**	**+/- 95% CI**	**Total**	**+/- 95% CI**
CT	1,600	88	900	36	3,600	49	1.8	95
DE	400	73	400	113	1,300	137	1.2	135
FL	7,900	135	2,400	125	14,600	158	3.4	184
GA	10,000	171	3,100	129	7,000	129	3.2	214
ME	18,800	49	5,400	27	26,100	33	3.5	55
MD	2,400	100	1,800	81	9,300	119	1.4	129
MA	2,300	36	1,200	26	5,600	32	2.0	44
NH	5,600	24	1,600	30	9,400	30	3.4	38
NJ	1,600	73	500	78	2,100	71	3.2	107
NY	10,000	35	4,500	27	18,200	26	2.2	45
NC	9,100	131	2,400	109	7,900	94	3.8	171
PA	19,200	71	9,000	31	35,000	35	2.1	78
RI	100	92	100	90	600	134	1.5	129
SC	7,300	112	3,600	69	15,600	101	2.1	132
VT	6,300	97	1,400	33	9,200	58	4.5	103
VA	1,600	80	1,400	111	2,700	96	1.1	137
WV	500	90	500	72	1,000	71	1.0	115
Region	**104,700**	**29**	**na[b]**		**169,000**	**22**	**na[b]**	
Central								
AL	2,300	159	1,000	178	3,100	175	2.3	239
AR	3,100	190	5,100	86	24,200	108	0.6	209
IL	4,300	100	2,100	90	6,100	103	2.0	135
IN	800	31	900	69	2,400	63	0.9	76
IA	1,600	93	1,600	74	4,300	99	1.0	119
KS	2,000	196	600	138	2,800	161	3.5	239
KY	1,500	159	2,500	130	9,400	153	0.6	205
LA	13,300	101	6,000	55	16,200	65	2.2	115
MI	78,900	17	34,600	13	156,000	17	2.3	21
MN	19,900	67	8,700	37	37,900	43	2.3	76
MS	400	71	600	160	1,800	146	0.7	175
MO	2,600	157	2,800	82	7,300	99	1.0	177
NE	0		900	196	4,400	196	0.0	
OH	2,300	68	2,900	69	10,300	70	0.8	98
OK	0		700	189	8,400	194	0.0	
TN	600	135	100	95	400	130	6.3	165
TX	4,700	196	4,700	196	9,300	196	1.0	277
WI	36,000	27	14,200	24	65,400	35	2.5	36
Region	**174,300**	**16**	**na[b]**		**369,800**	**16**	**na[b]**	
U.S. Total	**279,000**	**15**	**na[b]**		**538,800**	**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, 1918-2008.

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	*Sep. 20 - Jan. 31	45	3
1985-96	Oct. 1 - Jan. 31	45	3	1998	*Sep. 19 - Jan. 31	45	3
1997-01	Oct. 6 - Jan. 31	30	3	1999	*Sep. 25 - Jan. 31	45	3
2002-08	Oct. 1 - Jan. 31	30	3	2000	*Sep. 23 - Jan. 31	45	3
				2001	*Sep. 22 - Jan. 31	45	3
				2002	*Sep. 21 - Jan. 31	45	3
				2003	*Sep. 20 - Jan. 31	45	3
				2004	*Sep. 25 - Jan. 31	45	3
				2005	*Sep. 24 - Jan. 31	45	3
				2006	*Sep. 23 - Jan. 31	45	3
				2007	*Sep. 22 - Jan. 31	45	3
				2008	*Sep. 20 - Jan. 31	45	3

* Saturday nearest September 22.

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