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American Woodcock

Population Status, 2012

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The cover photo is by Jake Nelson. Picture taken while conducting woodcock research at Tamarac National Wildlife Refuge in Minnesota.

AMERICAN WOODCOCK POPULATION STATUS, 2012

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Abstract: Singing-ground Survey data for 2012 indicate that indices for singing American woodcock (*Scolopax minor*) males in the Eastern and Central Management Regions are not significantly different from 2011. There was no significant 10-year trend for woodcock heard in the Eastern or Central Management Regions during 2002-12. This marks the ninth consecutive year that the 10-year trend estimate was not significant in the Eastern Region and the second year that the 10-year trend in the Central Management Region was non-significant. Both regions have a long-term (1968-12) declining trend of -0.8 % per year. The 2011 recruitment index for the U.S. portion of the Eastern Region (1.68 immatures per adult female) was 13.7% greater than the 2010 index and 2.5% greater than the long-term regional index, while the recruitment index for the U.S. portion of the Central Region (1.53 immatures per adult female) was 0.8% lower than the 2010 index and was 2.6% lower than the long-term regional index. Estimates from the Harvest Information Program indicated that U.S. woodcock hunters in the Eastern Region spent 156,000 days afield and harvested 77,000 woodcock during the 2011-12 season, while in the Central Region, hunters spent 350,500 days afield and harvested 231,700 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 2012. 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, 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

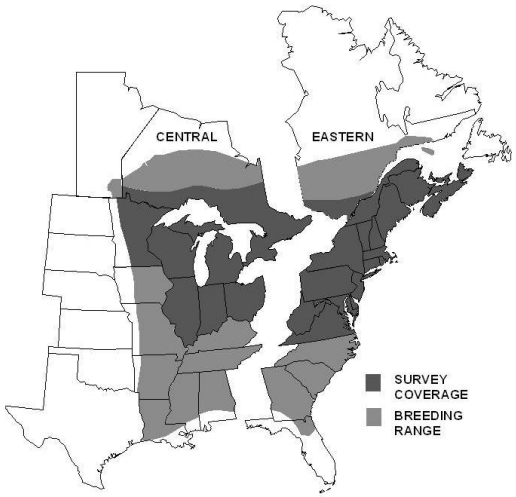

Fig. 1. Woodcock management regions, breeding range, and Singing-ground Survey coverage.

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 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 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 (2011-12), 10-year (2002-12) and long-term (1968-2012) 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.

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 6 June 2012 were not included in this analysis but will be included in future trend estimates.

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 2011 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 for 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 gender of 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 2011 recruitment index for each state with $\geq$ 125 submitted wings was calculated as the number of immatures per adult female. The regional indices for 2011 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2010.

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 2003-12 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 2011).

RESULTS AND DISCUSSION

Singing-ground Survey

Data for 815 routes were submitted by 6 June 2012 (Table 1). Short-term, 10-year, and long-term (1968-2012) trends were estimated using data from 733 routes in the Eastern Region and 721 routes in the Central Region. Short-term analysis indicated that the number of woodcock heard singing during the 2012 Singing-ground Survey was 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 observers participate for several years on the same route would greatly enhance the quality of the results.

The 10-year trend (2002-2012) was not significant for either Management Region (Table 1). This marks the ninth straight year that the trend in the Eastern Region has remained stable, while it is the second year the trend has remained stable in the Central Region.

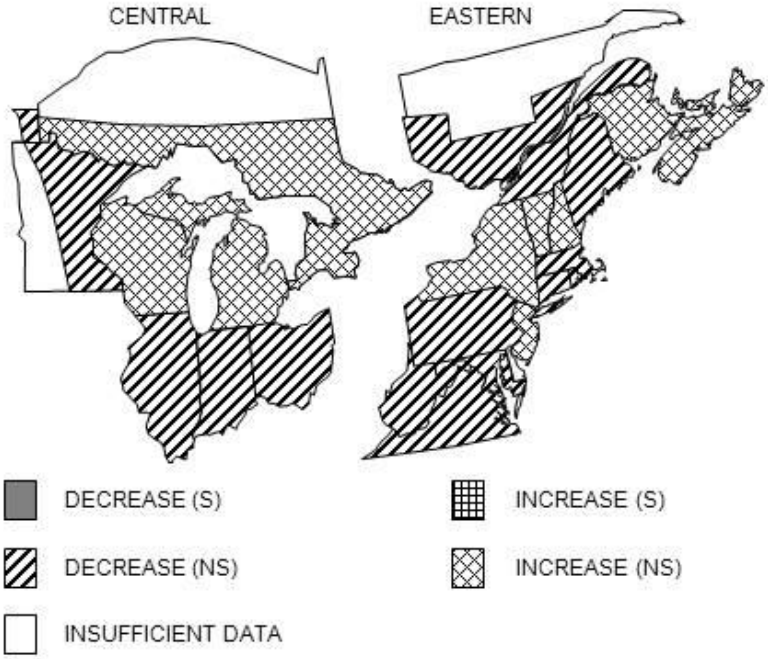

Fig. 2. Short-term trends in the number of American woodcock heard on the Singing-ground Survey, 2011-2012, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. Note, no state or province has a significant short-term trend this year.

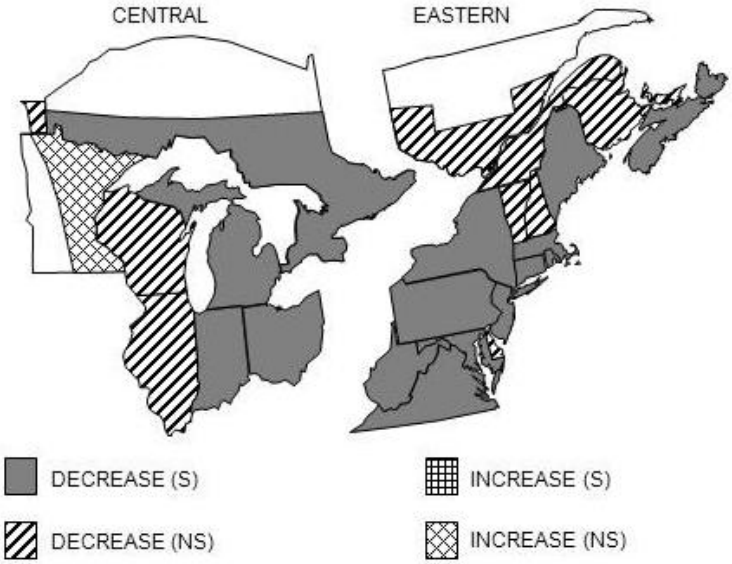

Fig. 3. Long-term trends in the number of American woodcock heard on the Singing-ground Survey, 1968-2012, as determined by the hierarchical modeling method. A significant trend (S) does not include zero in the 95% credible interval, while a non-significant (NS) trend does include zero. Note, no state or province has a significant long-term increase.

Many states and/or provinces in both management regions have experienced significant long-term (1968-2012) declines as measured by the Singing-ground Survey (Table 1, Fig. 3). The long-term trend estimates, rounded to the nearest tenth of a percent, were the same (-0.8 %/ year) for both management regions.

In the Eastern Region, the 2012 index was 2.77 singing males per route, which is 1.5% greater than the 2011 index of 2.73 (Fig. 4). In the Central Region, the 2012 index was 2.74 singing males per route, which was 1.2% greater than the 2011 index of 2.71 (Fig. 4). Annual indices (1968-2012) by state, province, or region are available in Table 2.

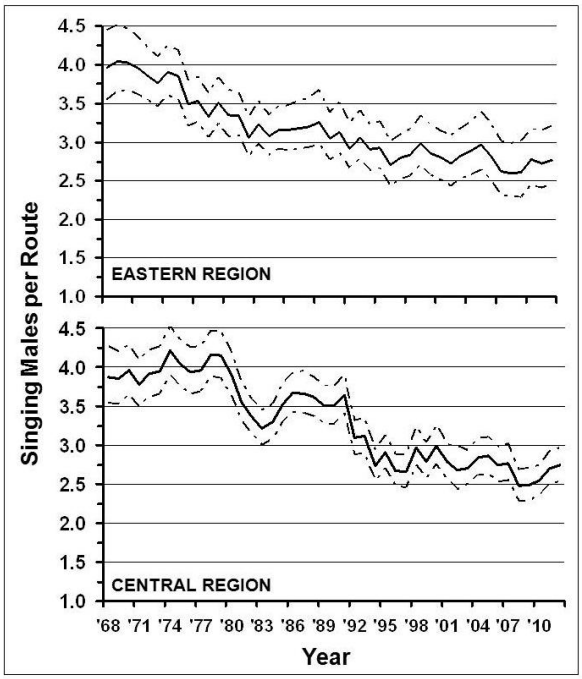

Fig. 4. Annual indices of the number of woodcock heard during the Singing-ground Survey, 1968-2012 as estimated using hierarchical modeling. The dashed lines represent the 95th percentile credible interval.

Wing-collection Survey

A total of 1,369 woodcock hunters (Table 3) from states with woodcock seasons sent in a total of 14,145 usable woodcock wings for the 2011 Wing-collection Survey (Table 4).

The 2011 recruitment index in the U.S. portion of the Eastern Region (1.68 immatures per adult female) was 13.7% greater than the 2010 index (1.48), and 2.5% greater than the long-term (1963-10) regional average of 1.64 (Table 4, Fig 5). In the Central Region, the 2011 recruitment index (1.53 immatures per adult female) was 0.8% less than the 2010 index (1.55) and was 2.6% lower than the long-term regional average of 1.58 (Table 4, Fig 5). Percent change for all comparisons was calculated using unrounded recruitment indices.

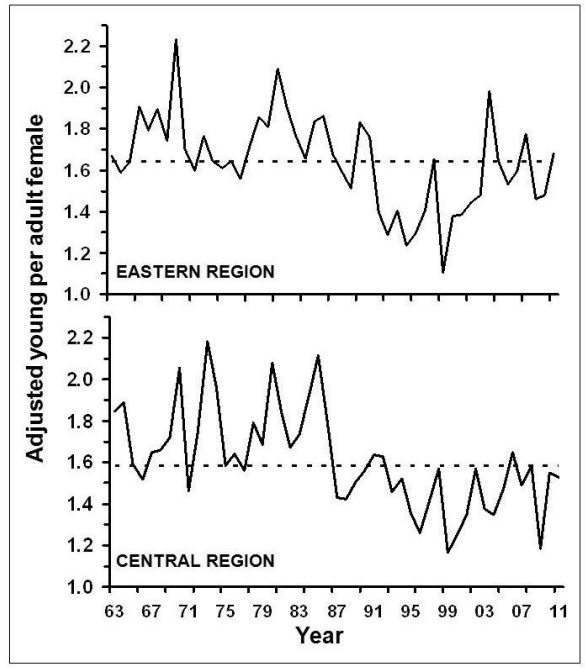

Fig. 5. Weighted annual indices of recruitment (U.S.), 1963-2011. The dashed line is the 1963-2010 average.

Harvest Information Program

Estimates of woodcock harvest, number of active hunters, days afield, and seasonal hunting success from the 2011-12 HIP survey are provided in Table 5. In the Eastern Management Region, woodcock hunters spent an estimated 156,000 days afield (Figure 6) and harvested 77,000 birds (Figure 7) during the 2011-12 hunting season. Harvest in 2011 was 11.5% less than the long-term (1999-2011) average and 22.8% less than last year in the Eastern Region. Woodcock hunters in the Central Region spent an estimated 350,500 days afield (Figure 6) and harvested 231,700 birds (Figure 7) during the 2011-12 hunting season. Harvest in 2011 was 1.5% greater than the long-term (1999-2011) average and 0.6% less than last year in the Central Region. 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. All HIP estimates from 1999-2002 are final, while those from 2003-2011 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 indicate that 2,021 successful hunters harvested 15,271

woodcock during the 2010 season in Canada (Appendix B).

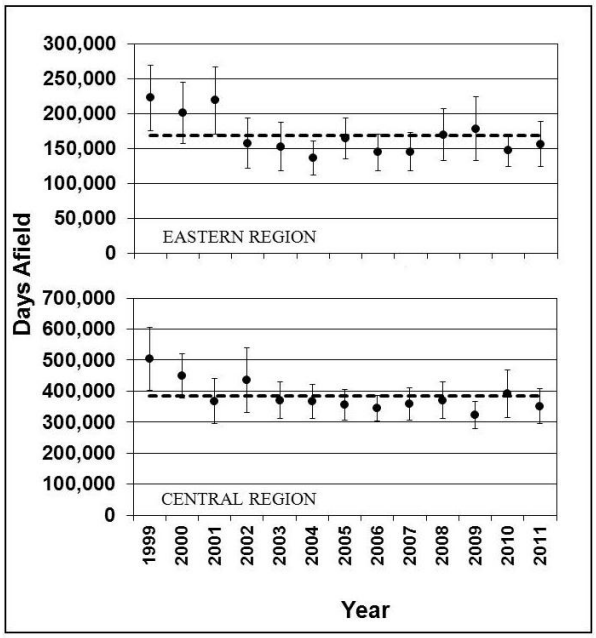

Fig. 6. Harvest Information Program Survey estimates of days spent afield by U.S. woodcock hunters, 1999-2011. The dashed line represents the 1999-2011 average and error bars represent the 95% C.I. of the point estimate.

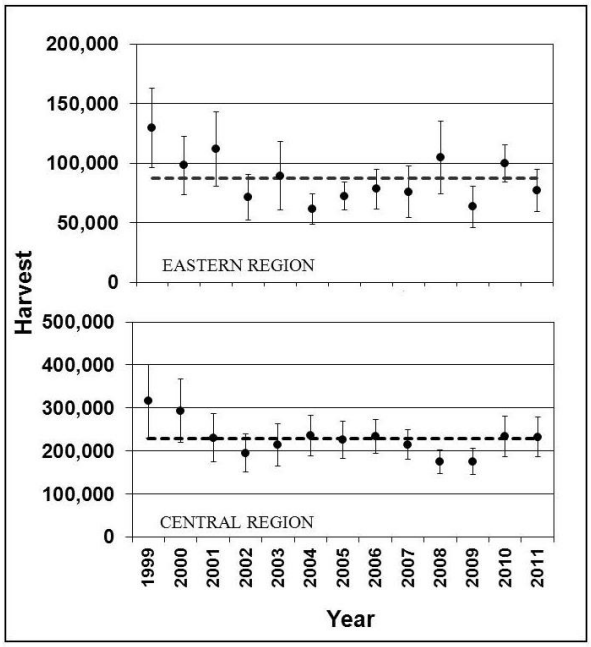

Fig. 7. Harvest Information Program Survey estimates of U.S. woodcock harvest, 1999-2011. The dashed line represents the 1999-2011 average and error bars represent the 95% C.I. of the point estimate.

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Table 1. Short-term (2011-12), 10-year (2002-2012), and long-term (1968-2012) 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]	2011-2012				2002-2012			1968-2012		
		n[c]	% change	95%	CI[d]	% change	95%	CI[d]	% change	95%	CI[d]
CT	6	11	-2.60	-37.79	57.27	-1.09	-5.11	7.78	-2.69	-4.68	-0.60
DE[e]	0	3	-------	--------	--------	-------	--------	--------	-2.73	-8.64	3.36
ME	52	71	-1.07	-17.83	19.09	0.48	-1.49	2.82	-1.14	-1.68	-0.61
MD	6	25	-2.58	-21.54	32.93	-4.20	-6.66	-1.19	-4.22	-5.75	-2.72
MA	15	21	-4.38	-29.83	24.29	-2.74	-5.85	-0.06	-2.47	-3.52	-1.43
NB	53	70	5.30	-12.96	27.89	0.89	-1.27	3.19	-0.61	-1.44	0.17
NH	14	18	8.96	-14.14	52.47	0.34	-2.31	3.55	-0.12	-1.19	0.99
NJ	4	19	9.35	-35.40	104.09	-3.75	-8.85	3.70	-5.39	-6.97	-3.59
NY	72	115	2.47	-11.19	19.35	0.35	-1.32	2.35	-1.00	-1.48	-0.50
NS	37	62	10.59	-6.80	40.41	0.48	-1.44	3.14	-0.70	-1.42	-0.01
PA	36	79	-7.56	-29.64	14.83	-1.53	-4.12	0.93	-1.35	-2.12	-0.59
PEI	11	13	9.51	-18.71	66.94	0.99	-2.57	7.54	-1.05	-2.41	0.49
QUE	18	67	-1.02	-26.35	29.08	0.04	-2.79	3.13	-0.08	-1.30	1.15
RI	2	3	-12.16	-70.95	157.84	-12.79	-25.53	-3.22	-11.58	-17.57	-6.08
VT	19	24	7.09	-22.30	49.33	0.36	-3.18	4.34	-0.53	-1.57	0.55
VA	11	75	-9.61	-43.17	29.71	-5.00	-8.62	-0.72	-5.28	-6.39	-4.18
WV	20	57	-1.85	-20.55	24.62	-2.09	-4.01	0.94	-2.37	-3.19	-1.55
Eastern	**376**	**733**	**1.55**	**-8.71**	**12.45**	**0.17**	**-0.91**	**1.35**	**-0.79**	**-1.18**	**-0.39**
IL	39	45	-38.68	-76.88	52.90	-7.59	-17.72	2.59	-1.20	-3.87	1.71
IN	16	60	-3.16	-45.00	71.12	-3.06	-8.06	2.88	-4.32	-5.76	-2.96
MB[f]	13	30	-6.30	-35.42	32.23	3.73	-0.48	8.76	-0.10	-2.21	2.14
MI	99	151	1.75	-11.05	15.61	-0.09	-1.55	1.48	-0.86	-1.25	-0.46
MN	77	120	-2.03	-16.28	14.42	2.16	0.40	4.10	0.25	-0.38	0.92
OH	34	72	-1.42	-23.85	28.52	-0.54	-3.09	3.19	-1.68	-2.48	-0.87
ON	88	155	0.59	-14.46	18.52	-1.29	-3.74	1.12	-0.80	-1.31	-0.26
WI	73	118	9.34	-7.92	30.25	2.96	0.86	5.18	-0.22	-0.76	0.34
Central	**439**	**721**	**1.28**	**-6.07**	**9.41**	**0.20**	**-0.91**	**1.25**	**-0.77**	**-1.03**	**-0.50**
Continent	**815**	**1454**	**1.40**	**-4.87**	**7.95**	**0.19**	**-0.58**	**0.97**	**-0.78**	**-1.01**	**-0.53**

[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 2012 for which data was received by 6 June, 2012.

[c] Number of routes with at least one year of non-zero data between 1968 and 2012.

[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 2012.

[f] 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, 1968-2012. These indices are based on 1968-2012 trends that were estimated using hierarchical modeling techniques. Blanks indicate no data were available for that year.

State, Province, or Region	Year															
	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983
Eastern Region																
CT		2.80	2.92	2.59	2.79	2.55	2.53	2.58	2.03	2.05	1.74	1.85	1.81	1.80	2.01	1.75
DE	0.99	0.81	1.01	0.68	0.85	1.03	0.92	1.84	0.46	0.67	0.47	0.53	0.68	0.66	0.65	1.10
ME	6.11	5.99	6.60	5.98	5.92	6.11	6.34	6.57	6.14	5.20	5.04	5.52	4.75	5.47	4.24	4.68
MD	1.97	1.94	1.81	1.76	1.67	1.60	1.53	1.48	1.35	1.32	1.28	1.23	1.21	1.15	1.08	1.01
MA		3.43	3.47	3.48	3.15	3.40	3.21	2.80	2.75	2.74	2.66	2.75	2.46	2.60	2.36	2.20
NB		8.85	8.67	7.98	7.83	7.28	7.83	8.30	6.37	7.66	5.85	6.31	5.25	6.01	5.64	5.64
NH		3.90	4.12	3.71	4.18	3.56	4.04	3.83	3.80	3.85	3.75	3.66	3.98	3.88	3.39	3.50
NJ	4.53	4.30	4.53	5.85	4.21	5.15	4.75	3.92	2.76	2.78	2.28	2.81	2.09	1.93	1.79	1.90
NY	4.19	4.33	3.81	4.13	3.96	4.02	4.08	3.66	3.70	3.67	3.32	3.60	3.88	3.69	3.39	3.62
NS	4.15	3.78	3.37	3.81	3.60	3.75	3.86	3.70	3.61	3.57	3.76	3.42	3.38	3.22	3.10	3.28
PA	1.95	1.83	2.02	1.94	1.89	1.90	1.67	1.70	1.71	1.68	1.62	1.70	1.52	1.51	1.47	1.49
PEI		5.16	5.15	5.77	4.73	4.71	4.92	5.86	5.07	4.83	4.62	4.72	3.98	3.77	3.84	4.33
QUE			5.83	5.87	5.79	5.49	5.85	5.74	5.14	5.37	5.84	6.18	6.32	5.74	5.50	5.97
RI		1.96	1.71	2.20	1.67	1.48	1.20	1.01	0.89	0.79	0.62	0.59	0.53	0.43	0.46	0.37
VT		3.24	3.95	3.56	4.05	3.49	3.94	4.27	4.36	4.52	3.35	3.55	3.36	2.96	2.16	2.96
VA		1.40	1.39	1.21	1.12	0.97	1.16	1.02	0.97	0.93	0.82	0.79	0.69	0.74	0.72	0.65
WV	1.52	1.52	1.41	1.37	1.42	1.34	1.29	1.30	1.23	1.18	1.07	1.15	1.09	1.14	1.08	1.04
Region	**3.96**	**4.05**	**4.03**	**3.96**	**3.86**	**3.77**	**3.91**	**3.85**	**3.49**	**3.53**	**3.33**	**3.51**	**3.35**	**3.34**	**3.06**	**3.23**
Central Region																
IL			0.23	0.44	0.39	0.29	0.42	0.34	0.21	0.29	0.46	0.31	0.24	0.43	0.28	0.82
IN	1.50	1.05	1.02	0.82	1.18	1.07	0.94	0.78	0.80	0.75	0.76	0.94	0.73	0.85	0.58	0.60
MB																
MI	7.36	7.20	7.23	6.79	6.83	7.07	7.88	7.87	7.49	6.99	7.48	7.40	7.01	6.25	6.53	5.57
MN		2.97	2.89	3.25	3.07	3.47	4.02	3.59	3.65	3.72	3.93	3.59	4.11	3.67	3.56	3.22
OH			1.62	1.49	1.51	1.38	1.50	1.32	1.49	1.41	1.29	1.22	1.23	1.33	1.16	1.18
ON	8.01	8.99	9.46	8.66	9.46	9.16	9.28	8.81	8.94	9.17	9.50	9.80	9.14	8.21	7.05	6.95
WI	3.42	3.44	3.94	3.72	3.70	3.89	3.94	4.03	3.64	4.05	4.17	4.34	3.51	2.98	3.14	3.02
Region	**3.88**	**3.85**	**3.96**	**3.78**	**3.91**	**3.95**	**4.21**	**4.04**	**3.94**	**3.96**	**4.16**	**4.15**	**3.89**	**3.55**	**3.36**	**3.21**
Continent	**3.92**	**3.96**	**4.00**	**3.88**	**3.89**	**3.86**	**4.06**	**3.95**	**3.72**	**3.75**	**3.74**	**3.83**	**3.63**	**3.44**	**3.21**	**3.22**

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	1.65	1.64	1.73	1.50	1.73	1.35	1.37	1.40	1.28	1.15	1.21	1.29	1.28	1.13	1.09	1.18
DE	0.50	0.54	0.58	0.57	0.56	0.54	0.73	0.35	0.37	0.49	0.47	0.45	0.49	0.48	0.76	0.36
ME	4.74	4.85	5.15	5.44	5.02	5.16	4.13	4.64	4.06	4.33	4.01	4.10	3.50	3.75	3.71	4.03
MD	0.98	0.93	0.87	0.84	0.81	0.78	0.75	0.71	0.66	0.65	0.62	0.59	0.58	0.55	0.51	0.49
MA	2.33	2.28	2.20	2.17	2.12	2.00	1.96	1.93	1.82	1.77	1.76	1.72	1.68	1.68	1.62	1.78
NB	5.13	5.39	4.51	4.97	5.75	6.84	5.80	5.40	5.19	6.26	6.41	5.96	5.19	5.83	5.76	6.60
NH	3.42	3.56	4.36	3.79	3.73	3.68	3.48	3.77	3.48	3.48	3.50	3.87	3.79	3.76	3.72	3.96
NJ	1.97	1.83	1.63	1.87	1.41	1.36	1.28	1.22	1.04	0.93	0.79	0.93	0.89	0.68	0.76	0.80
NY	3.21	3.57	3.29	3.20	3.42	3.06	3.40	3.42	3.18	3.10	2.78	2.89	2.74	2.78	2.81	2.86
NS	3.14	3.26	3.34	3.03	3.22	3.19	3.01	3.18	3.17	3.21	2.95	3.07	3.10	2.94	2.98	3.23
PA	1.54	1.47	1.52	1.45	1.41	1.37	1.47	1.61	1.37	1.42	1.23	1.37	1.33	1.28	1.41	1.32
PEI	4.34	4.28	4.51	3.82	4.31	4.47	3.96	3.85	3.79	3.64	3.42	3.59	3.89	3.75	3.56	3.33
QUE	5.56	5.88	6.09	6.18	6.01	6.25	5.76	6.01	5.83	6.00	5.78	5.83	5.36	5.50	5.68	5.82
RI	0.33	0.27	0.24	0.22	0.19	0.17	0.15	0.13	0.11	0.10	0.09	0.08	0.07	0.06	0.05	0.05
VT	2.88	2.65	2.87	3.31	3.58	3.48	3.24	3.36	2.42	2.75	2.63	2.62	2.52	2.65	2.93	3.35
VA	0.81	0.52	0.55	0.53	0.47	0.43	0.44	0.41	0.42	0.39	0.36	0.31	0.30	0.32	0.27	0.27
WV	1.01	0.97	0.96	0.93	0.90	0.88	0.89	0.83	0.82	0.79	0.78	0.80	0.74	0.74	0.70	0.70
Region	**3.08**	**3.16**	**3.16**	**3.18**	**3.20**	**3.26**	**3.04**	**3.13**	**2.92**	**3.06**	**2.90**	**2.93**	**2.71**	**2.79**	**2.83**	**2.99**
Central Region																
IL	0.39	0.73	0.61	1.09	0.35	0.55	0.29	0.58	0.37	0.51	0.32	0.25	0.32	0.26	0.34	0.41
IN	0.59	0.55	0.65	0.60	0.52	0.47	0.61	0.58	0.53	0.44	0.42	0.39	0.36	0.35	0.43	0.37
MB									5.23	5.46	5.44	5.70	4.87	3.21	4.09	4.06
MI	6.24	6.37	6.62	6.20	6.56	6.32	6.35	6.94	5.49	5.58	4.95	5.45	5.21	5.04	5.91	4.97
MN	3.14	3.46	3.59	3.60	3.94	3.28	3.89	3.74	3.20	3.26	2.96	3.05	2.93	2.62	3.00	3.08
OH	1.22	1.12	1.09	1.08	1.14	0.98	1.22	1.10	1.09	1.01	1.00	0.96	0.98	0.85	0.97	0.83
ON	7.03	7.87	8.04	7.91	8.00	8.09	7.63	7.73	7.20	6.95	5.99	6.55	5.34	6.08	6.36	5.87
WI	3.31	3.24	3.70	3.74	3.49	3.55	3.38	3.40	2.74	2.88	2.53	2.62	2.56	2.44	2.60	2.94
Region	**3.30**	**3.53**	**3.67**	**3.66**	**3.62**	**3.51**	**3.51**	**3.64**	**3.10**	**3.11**	**2.73**	**2.91**	**2.67**	**2.66**	**2.97**	**2.79**
Continent	**3.19**	**3.34**	**3.41**	**3.43**	**3.41**	**3.39**	**3.28**	**3.39**	**3.01**	**3.09**	**2.82**	**2.92**	**2.69**	**2.73**	**2.90**	**2.89**

Table 2. Continued

State, Province, or Region	Year												
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Eastern Region													
CT	1.04	0.97	0.90	0.90	0.88	0.87	0.82	0.82	0.83	0.79	0.76	0.86	0.84
DE	0.54	0.35	0.39	0.36	0.37	0.36	0.29	0.29	0.29	0.31	0.31	0.30	0.29
ME	4.16	3.73	3.46	3.75	3.81	3.88	3.79	3.50	3.53	3.42	3.58	3.68	3.64
MD	0.48	0.47	0.43	0.42	0.40	0.38	0.37	0.35	0.34	0.32	0.31	0.29	0.28
MA	1.62	1.52	1.51	1.47	1.52	1.38	1.37	1.27	1.33	1.31	1.23	1.20	1.14
NB	6.15	6.52	6.20	6.78	6.77	7.44	6.65	5.88	5.60	5.17	6.71	6.44	6.79
NH	3.48	3.57	3.55	3.85	3.87	3.81	3.61	3.13	3.23	3.73	3.72	3.35	3.69
NJ	0.70	0.65	0.54	0.59	0.46	0.41	0.42	0.43	0.37	0.43	0.27	0.34	0.37
NY	2.70	2.64	2.58	2.68	2.83	2.64	2.68	2.52	2.40	2.59	2.78	2.61	2.67
NS	3.19	3.04	2.88	2.85	3.01	2.94	2.79	2.80	2.70	2.65	2.95	2.72	3.04
PA	1.09	1.26	1.24	1.23	1.25	1.28	1.17	1.14	1.24	1.22	1.29	1.15	1.06
PEI	3.55	3.37	2.87	2.96	2.99	3.10	3.33	3.19	2.72	2.98	2.79	2.91	3.24
QUE	5.66	5.54	5.60	5.60	5.75	6.06	5.78	5.48	5.50	5.64	5.48	5.71	5.62
RI	0.04	0.04	0.03	0.03	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
VT	3.44	2.69	2.46	2.65	2.70	2.90	2.93	2.45	2.25	2.49	2.61	2.39	2.56
VA	0.26	0.22	0.22	0.22	0.20	0.19	0.18	0.17	0.17	0.14	0.14	0.15	0.13
WV	0.68	0.65	0.63	0.64	0.60	0.58	0.57	0.57	0.56	0.55	0.52	0.52	0.52
Region	**2.86**	**2.80**	**2.72**	**2.82**	**2.88**	**2.96**	**2.82**	**2.63**	**2.60**	**2.61**	**2.78**	**2.73**	**2.77**
Central Region													
IL	0.32	0.39	0.30	0.68	0.71	0.23	0.47	0.24	0.25	0.20	0.25	0.22	0.14
IN	0.33	0.36	0.28	0.27	0.31	0.31	0.26	0.25	0.24	0.24	0.26	0.21	0.21
MB	4.36	4.45	3.47	4.30	3.89	4.86	4.00	4.26	3.99	4.33	4.36	5.38	5.02
MI	5.26	4.93	5.03	5.21	5.23	5.10	4.75	4.68	4.38	4.39	4.50	4.91	4.99
MN	3.46	3.16	2.68	2.73	2.81	3.13	2.99	2.99	2.73	2.96	3.43	3.39	3.31
OH	0.86	0.84	0.82	0.78	0.99	0.89	0.87	0.69	0.73	0.83	0.80	0.79	0.78
ON	6.87	6.11	6.34	5.67	6.15	6.45	6.21	6.50	5.55	5.33	5.01	5.55	5.58
WI	2.77	2.68	2.31	2.47	2.52	2.84	2.62	2.99	2.52	2.57	2.63	2.83	3.10
Region	**2.99**	**2.79**	**2.69**	**2.71**	**2.84**	**2.86**	**2.74**	**2.77**	**2.47**	**2.49**	**2.54**	**2.71**	**2.74**
Continent	**2.93**	**2.80**	**2.71**	**2.77**	**2.86**	**2.91**	**2.78**	**2.70**	**2.54**	**2.55**	**2.66**	**2.72**	**2.76**

Table 3. The number of U.S. hunters by state that submitted woodcock wings for the 2010-11 and 2011-12 Wing-collection Surveys.

State of residence	Number of Hunters who submitted woodcock wings[a]	
	2010-11 Season	2011-12 Season
AL	2	1
AR	2	1
CT	26	26
DE	2	1
FL	0	0
GA	3	3
IL	2	2
IN	18	12
IA	5	4
KS	0	0
KY	1	3
LA	21	16
ME	158	152
MD	12	11
MA	47	57
MI	304	294
MN	93	95
MS	1	1
MO	16	13
NE	0	0
NH	78	77
NJ	19	24
NY	142	123
NC	6	7
ND	0	0
OH	15	18
OK	0	0
PA	59	60
RI	2	2
SC	9	7
TN	3	3
TX	3	2
VT	67	78
VA	10	15
WV	18	23
WI	210	238
Total	**1,354**	**1,369**

[a] Number of hunters that submitted envelopes in current year. 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 current survey year. In addition, some hunters hunted in more than one state.

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 2011 were weighted by the relative contribution of each state to the cumulative number of adult female and immature wings received during 1963-2010.

State or Region of harvest	Wings received							
	Total		Adult females		Immatures		Recruitment index	
	1963-10	2011	1963-10	2011	1963-10	2011	1963-10	2011
Eastern Region								
CT	14,256	234	3,147	58	8,761	130	2.8	2.2
DE	466	10	64	3	326	7	5.1	
FL	678	0	153	0	422	0	2.8	
GA	3,162	26	981	13	1,361	5	1.4	
ME	83,748	1,322	24,772	394	41,832	660	1.7	1.7
MD	4,323	124	1,084	24	2,417	81	2.2	
MA	23,189	380	7,165	137	11,314	170	1.6	1.2
NH	33,637	707	10,943	220	15,515	383	1.4	1.7
NJ	26,336	233	6,084	45	15,581	147	2.6	3.3
NY	60,589	1,049	20,408	383	27,585	430	1.4	1.1
NC	3,635	127	1,121	53	1,770	51	1.6	1.0
PA	31,593	556	10,029	164	14,557	277	1.5	1.7
RI	2,444	5	467	2	1,623	2	3.5	
SC	3,191	89	978	39	1,471	31	1.5	
VT	25,998	777	8,530	234	11,927	358	1.4	1.5
VA	5,067	186	1,299	68	2,777	66	2.1	1.0
WV	6,103	160	1,840	47	3,067	82	1.7	1.7
Region	**328,415**	**5,985**	**99,065**	**1,884**	**162,306**	**2,880**	**1.6**	**1.7**
Central Region								
AL	954	3	262	0	438	2	1.7	
AR	536	3	170	0	222	3	1.3	
IL	1,476	17	338	8	835	6	2.5	
IN	8,223	116	2,100	27	4,532	67	2.2	
IA	1,270	20	411	6	579	6	1.4	
KS	49	0	9	0	26	0		
KY	1,152	9	281	4	598	1	2.1	
LA	32,041	410	7,180	76	20,743	279	2.9	3.7
MI	127,375	3,081	41,700	1,062	62,525	1,449	1.5	1.4
MN	37,227	1,532	13,016	580	16,292	568	1.3	1.0
MS	1,787	19	505	2	912	14	1.8	
MO	3,989	117	1,046	36	1,959	52	1.9	
NE	13	0	5	0	6	0		
ND	3	0	3	0	0	0		
OH	14,796	118	4,543	39	6,956	45	1.5	
OK	172	0	38	0	91	0	2.4	
TN	1,214	35	314	11	620	20	2.0	
TX	1,038	14	287	6	521	7	1.8	
WI	80,408	2,666	26,842	1007	38,203	1,146	1.4	1.1
Region	**313,723**	**8,160**	**99,050**	**2,864**	**156,058**	**3,665**	**1.6**	**1.5**

Table 5. Preliminary estimates of woodcock harvest, hunter numbers, days afield, and hunter success from the 2011-12 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	1,800	40	1,100	24	5,300	35	1.62	47
DE[c]	500	130	100	131	800	152	4.08	184
FL	300	131	100	110	300	122	2.67	171
GA	6,000	150	2,600	112	10,300	165	2.33	188
ME	11,900	48	4,100	35	30,500	56	2.87	60
MD	2,100	130	2,400	80	4,800	81	0.85	153
MA	4,000	33	1,900	24	8,500	29	2.06	41
NH	7,500	42	2,600	34	15,000	49	2.93	54
NJ	1,900	63	1,000	50	2,600	50	1.91	81
NY	11,600	46	4,200	31	19,200	40	2.74	55
NC	5,900	136	500	93	7,300	146	11.50	165
PA	14,200	58	7,500	33	34,400	37	1.91	67
RI	100	190	100	0	500	53	2.00	190
SC	1,000	80	1,900	166	3,000	109	0.53	184
VT	5,200	41	1,600	28	8,300	29	3.18	50
VA	2,500	51	1,600	79	4,500	81	1.60	94
WV	500	43	200	83	600	53	2.99	93
Region	**77,000**	**23**	**na[b]**		**156,000**	**21**	**na[b]**	
Central								
AL	1,600	146	2,500	131	7,500	156	0.65	196
AR	600	115	200	111	1,000	140	3.00	160
IL	3,700	195	2,900	108	8,800	131	1.29	223
IN	1,800	102	1,100	79	4,100	86	1.60	129
IA	200	193	1,000	176	1,600	128	0.20	262
KS	0		0	127	0	143	0.00	
KY	200	86	0	63	200	96	4.00	107
LA	24,400	102	6,600	58	18,400	67	3.71	117
MI	106,900	28	28,400	15	144,000	18	3.76	31
MN	44,200	42	17,000	29	76,900	46	2.60	51
MS[c]	400	105	100	65	500	81	3.25	124
MO	900	91	200	36	1,100	55	4.82	98
OH	2,300	74	3,100	98	10,200	96	0.74	123
OK	0	184	0	99	200	139	0.67	209
TN[c]	600	120	1,600	177	5,400	156	0.37	214
TX[c]	1,300	195	200	113	1,400	125	5.50	225
WI	42,600	31	15,200	25	69,000	30	2.80	39
Region	**231,700**	**20**	**na[b]**		**350,500**	**16**	**na[b]**	
Total	**308,700**	**16**	**na[b]**		**506,500**	**12**	**na[b]**	

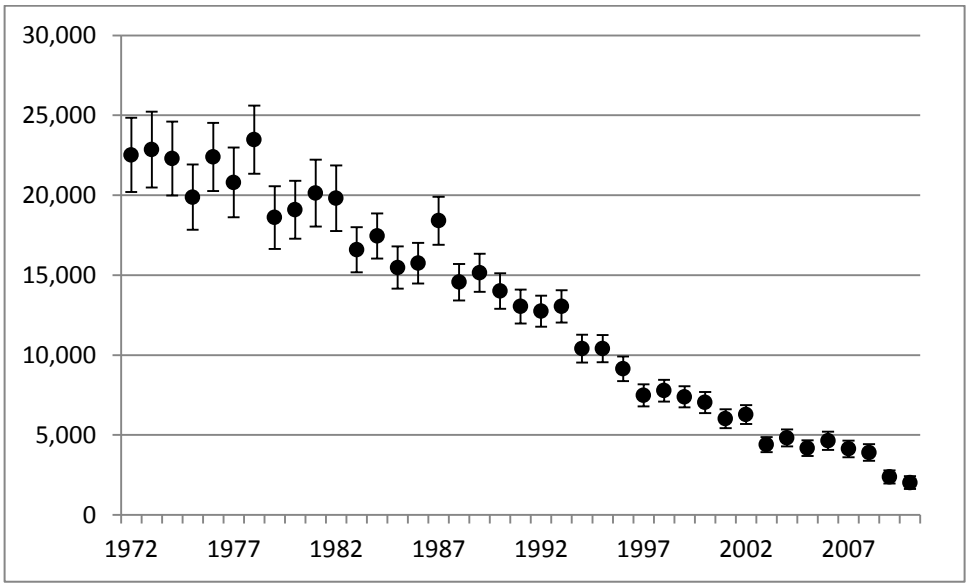
[a] All 95% Confidence Intervals are expressed as a % of the point estimate.
[b] Regional estimates of hunter numbers and hunter success cannot be obtained due to the occurrence of individual hunters being registered in the Harvest Information Program in more than one state.
[c] Sample was insufficient for reliable estimation based upon 2011 data, therefore the 1999-2011 average is used.

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 - 2011.

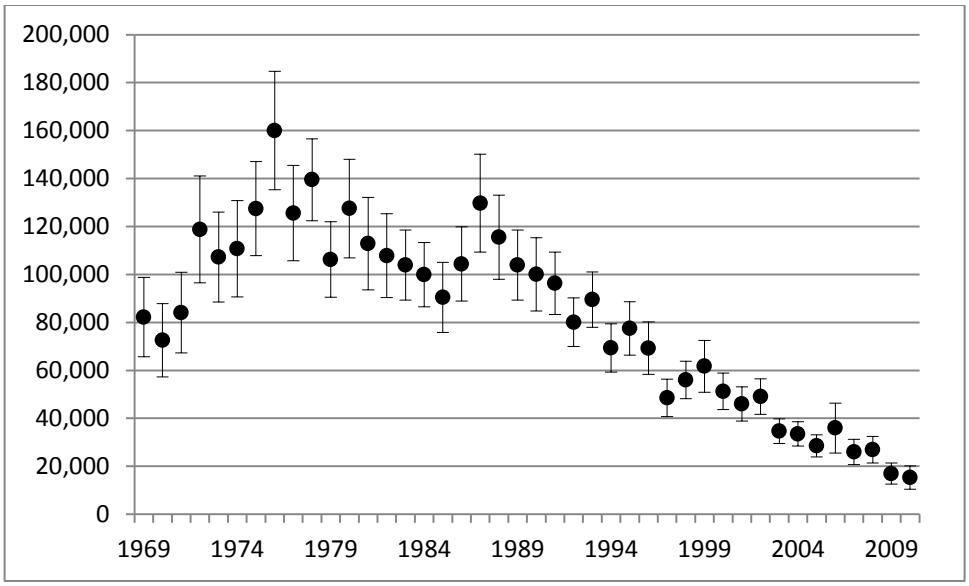
Eastern Region				Central Region			
Year (s)	Outside dates	Season length	Daily bag limit	Year (s)	Outside dates	Season length	Daily bag limit
1918-26	Oct. 1 - Dec. 31	60	6	1918-26	Oct. 1 - Dec. 31	60	6
1927	Oct. 1 - Dec. 31	60	4	1927	Oct. 1 - Dec. 31	60	4
1928-39	Oct. 1 - Dec. 31	30	4	1928-39	Oct. 1 - 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	1997-2011	Sep. 22[a] - Jan. 31	45	3
1985-96	Oct. 1 - Jan. 31	45	3				
1997-01	Oct. 6 - Jan. 31	30	3				
2002-10	Oct. 1 - Jan. 31	30	3				
2011	Oct. 1 - Jan. 31	45	3				

[a] Saturday nearest September 22 was September 24th for the 2011 season.

Appendix B. Estimates for the number of successful woodcock hunters and woodcock harvest in Canada (Gendron and Smith 2011). Data from the 2011 hunting season were not available before this report was completed.



Estimated number of successful woodcock hunters in Canada and associated 95% confidence intervals, 1972-2010.



Estimated woodcock harvest in Canada and associated 95% confidence intervals, 1969-2010.

U.S. Fish and Wildlife Service
Division of Migratory Bird Management
http://www.fws.gov

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