MIGRATORY BIRD POPULATIONS

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# 2005 MINNESOTA WATERFOWL BREEDING POPULATION SURVEY

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**ABSTRACT**

The number of breeding waterfowl in a portion of Minnesota has been estimated each year since 1968 as a part of the overall inventory of North American breeding waterfowl. The survey consists of aerial observations supplemented by more intensive ground counts on selected routes to determine the proportion of birds counted by the aerial crew. Procedures used are similar to those used elsewhere across the waterfowl breeding grounds. The 2005 aerial survey portion was flown from 3-29 May. Pond numbers increased 22% compared to 2004 and were similar to the long-term average. Estimated numbers of temporary (Type 1) wetlands increased 224% from 2004 but remained below (-58%) the long-term average. The mallard breeding population (238,500) declined significantly (-36%, P = 0.03) from 2004 (375,313). Mallard numbers were well below the 10-year average (-30%) but similar to the long-term average (223,368). The blue-winged teal breeding population (194,125) decreased significantly (-45%; P = 0.02) compared to 2004 (353,209) and was below the 10-year (-19%) and long-term (-15%) averages. Populations of "other" ducks (199,355), excluding scaup, decreased 29% and remained below the 10-year average (-21%) but above the long-term average (+12%). Wood ducks (35%), ring-necked ducks (30%), gadwalls (8%), and redheads (5%) accounted for most (78%) of the total population of "other" ducks. The estimate of total duck abundance (632,000), which excludes scaup, decreased 37% compared to 2004 and was 24% below the 10-year average but unchanged from the long-term average (630,000). Canada goose numbers (uncorrected for visibility) decreased 15% compared to 2004 but were 4% above the 10-year average and 109% above the long-term average. Declines in duck numbers, particularly blue-winged teal, were expected this year, in part because conditions during spring 2004 may have delayed migration of blue-winged teal through the state and resulted in some migrant teal being counted last year. Survey timing in 2005 may have also contributed to lower estimates of duck abundance. Weather delays resulted in most (70%) of the survey being flown after 15 May when leaf-out and other factors may have led to lower estimates of duck abundance.

**METHODS**

The aerial survey is based on a sampling design that includes three survey strata (Table 1, Figure 1). The strata cover 39% of the state area and are defined by density of lake basins (>10 acres) exclusive of the infertile northeastern lake region. The strata include the following:

Stratum I: high density, 21 or more lake basins per township.
Stratum II: moderate density, 11 to 20 lake basins per township.
Stratum III: low density, 2 to 10 lake basins per township.

Areas with less than two basins per township are not surveyed. Strata boundaries were based upon "An Inventory of Minnesota Lakes" (Minnesota Conserv. Dept. 1968:12). Standard procedures for the survey follow those outlined in "Standard Operating

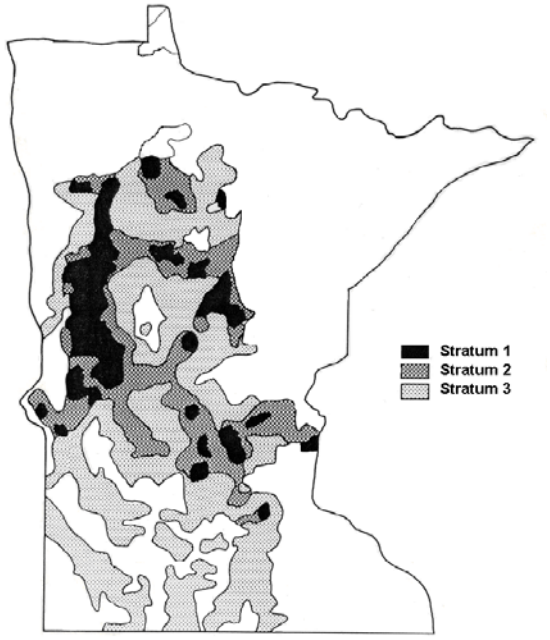


**Figure 1. Location of waterfowl breeding population survey strata in Minnesota.**

Breeding Ground Populations and Habitat Surveys in North America" (USFWS/CWS 1987). Changes in survey methodology were described in the 1989 Minnesota Waterfowl Breeding Population Survey report. Pond and waterfowl data for 1968-74 were calculated from Jessen (1969-72) and Maxson and Pace (1989).

All aerial transects in Strata I-III (Table 1) were flown using a Cessna 185 (N105NR). Wetlands were counted on the observer's side of the plane (0.125 mile wide transect) only; a correction factor obtained in 1989 was used to adjust previous data (1968-88) that was obtained when the observer counted wetlands on both sides of the plane (0.25 mile wide transect).

During the 2005 survey, we used the U.S. Fish and Wildlife Service computer program RECORD to capture data in the airplane (Jack Hodges, US Fish and Wildlife Service, Migratory Bird Management—Juneau, AK). We mounted 2 laptop computers in the rear of the plane and connected them to the plane GPS. Data were recorded and stored as WAV files through the plane intercom system (pilot) or a remote microphone/mouse system (observer). When the microphones were keyed, an associated GPS location was captured in a POS file so that each wetland or waterfowl observation would have an approximate GPS location associated with it. The TRANSCRIBE portion of the software, which allows users to transcribe WAV files and summarize data, was used for data entry.

Visibility correction factors (VCFs) were derived from intensive ground surveys on 14 selected routes flown by the aerial crew. Many of these routes use a county road as the mid-point of the transect boundary which aids in navigation and helps ensure the aerial and ground crews survey the same area. Ground routes each originally included approximately 100 wetland areas; however, drainage has reduced the number of wetlands on most of the routes. All observations from both ground crews and aerial crews were used to calculate the VCFs.

The SAS computer program was modified in 1992 to obtain standard errors for mallard and blue-winged teal breeding population estimates. These calculations were based upon SAS computer code written by Graham Smith, USFWS-Office of Migratory Bird Management. Estimates for 2004 and 2005 were compared using two-tailed Z-tests.

**SURVEY CHRONOLOGY**

The 2005 aerial survey portion began on 3 May in southern Minnesota and concluded in northern Minnesota on 29 May. The survey was completed in 12 days of flight time. Transects were flown on 3-4, 6, 8, 15-16, 20, 23-24, 26-27, and 29 May. Aerial flights began no earlier than 7 AM each day and were completed by 12 PM each day except on 29 May when 7 transects were flown between 4-8 PM. Most delays were due to low ceilings, high winds (>20 mph) or precipitation events. Most (70%) of the survey was completed after 15 May; the survey spanned the longest period (27 days) on record and the completion date (29 May) was the 2nd latest recorded since 1968.

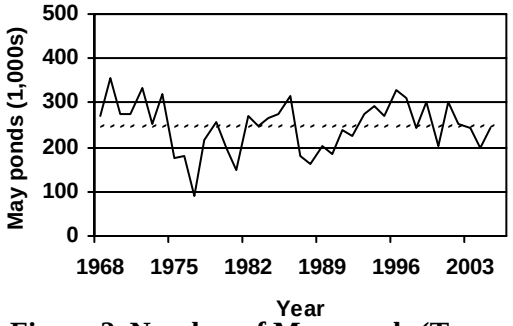


**Figure 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2005.**

**WEATHER AND HABITAT CONDITIONS**

Wetland conditions in spring 2005 were much improved from 2004. Ice out on most lakes across the state occurred 5-10 days earlier than

average. April temperatures averaged 5.2°F above normal statewide and regional temperatures ranged from 3.2°F above average in northeast Minnesota to 5.9°F above average in the northwest and south central Minnesota (http://climate.umn.edu/cawap/monsum/0504.txt). April precipitation was near average statewide and ranged from 0.92 inches below normal in northeast to 0.56 inches above normal in the central portion of the state. May temperatures averaged about 3.2°F below normal statewide. May precipitation was 0.77 inches above normal statewide and ranged from 0.36 inches below normal in southeast Minnesota to 1.93 inches above normal in north central Minnesota (*http://climate.umn.edu/cawap/monsum/0505.txt*). Additional temperature and precipitation data during the survey period are provided in Appendix A.
In late April 2005, statewide topsoil moisture indices were rated as 4% very short or short, 84% adequate, and 12% surplus moisture. On May 29, statewide indices were rated as 1% short, 63% adequate and 36% surplus moisture. (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, *http://www.nass.usda.gov/mn/*). For comparison, in late April 2004 statewide topsoil moistures indices were rated as 42% very short or short, 57% adequate, and 1% surplus moisture.

Planting dates for row crops were later in 2005 than previous years. By May 1, 41% of the corn acres had been planted statewide compared to 64% in 2004 and 47% for the previous 5-year average. Rain events later in May delayed the initial cutting of alfalfa hay across the state. By June 5, only 9% of alfalfa hay had been cut compared to 12% in 2004 and a 5-year average of 28% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, *http://www.nass.usda.gov/mn/*).

Wetland numbers (Type II-V) increased 22% from 2004 and were 8% below the 10-year average (Table 2) and 2% below the long-term average (Table 2; Figure 2). The number of temporary (Type 1) wetlands increased 224% from 2004 but remained 42% below the 10-year average and 58% below the long-term average.

Leaf-out dates were considerably earlier than 2004, which made visibility from the air extremely difficult, particularly along transects in the forested portion of the state.

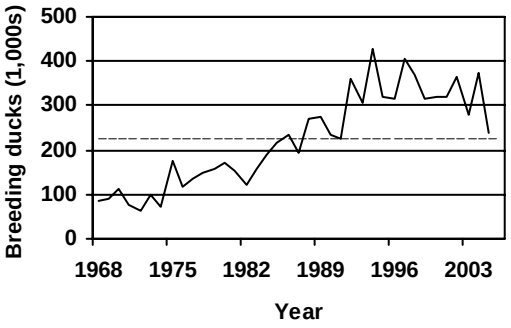


**Figure 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2005.**

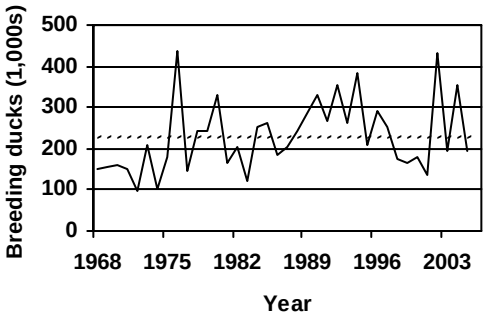


**Figure 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2005.**

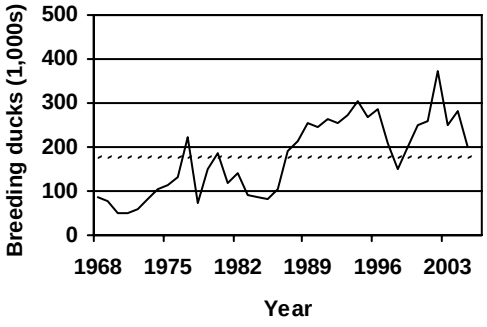


**Figure 5. Other duck (excluding scaup) populations (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2005.**

**WATERFOWL POPULATIONS**

The number of ducks, Canada geese, and coots, by stratum, are shown in Tables 3-5; total numbers are presented in Table 6. These estimates are not corrected for visibility bias.

The 2005 waterfowl breeding population estimate of mallards was 238,500 (SE = 28,595), which was 36% lower and significantly different (Z = 2.13, P = 0.03) than 2004 (Table 7, Figure 3). Mallard numbers were below (-30%) the 10-year average but 7% higher than the long-term average. Mallard abundance in 2005 was the lowest recorded since 1991.

The estimated blue-winged teal population was 194,125 (SE = 37,358), which was significantly less than 2004 (Z = 2.35, P = 0.02). Blue-winged teal numbers were 19% below the 10-year average and 15% below the long-term average (Table 7, Figure 4).

Other duck numbers (excluding scaup) declined 29% to 199,355 and were 12% above the long-term average and below the 10-year average (-21%) (Table 7, Figure 5). Scaup numbers were 46% lower than in 2004. The total duck population, excluding scaup, was 631,980, which was 37% lower than 2004, 24% below the 10-year average and unchanged from the long-term average (Table 7, Figure 6). This was the lowest total duck estimate since 1987.

Visibility Correction Factors (VCFs) were higher in 2005 for mallards (+22%), blue-winged teal (+7%), and "other" ducks (+45%) compared to 2004 (Table 7). Mallard VCFs were 36% higher than the long-term average and the 3rd highest on record. The blue-winged teal VCF was unchanged from the long-term average. The VCF for "other" ducks was 36% above long-term averages. Some differences were expected due to a change in pilots in 2005 and early leaf-out conditions, which decreased visibility on many transects.

Canada goose numbers (uncorrected for visibility) decreased 15% compared to 2004 and were 109% above the long-term average (Table 7, Figure 7). The VCF for Canada geese was 2.02, 28% higher than 2004 and 16% below the long-term average. The population estimate of Canada geese adjusted for visibility increased 8% (Table 7, Figure 8).

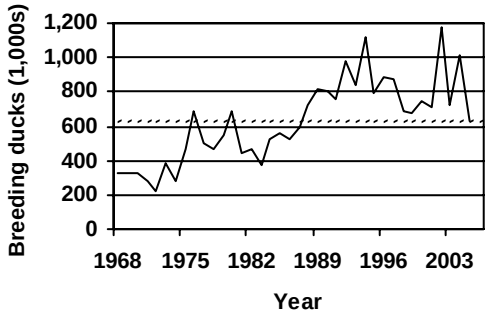


**Figure 6. Total duck (excluding scaup) population estimate and long-term average (dashed line) in Minnesota, 1968-2005.**

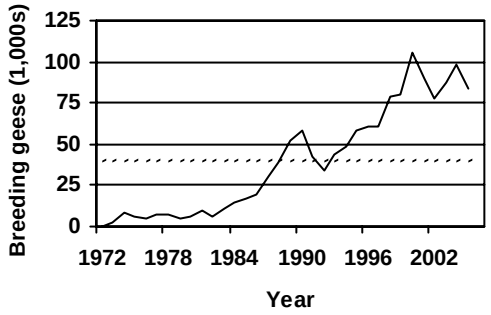


**Figure 7. Canada goose population estimates (not adjusted for visibility bias) and long-term average in Minnesota, 1972-2005.**

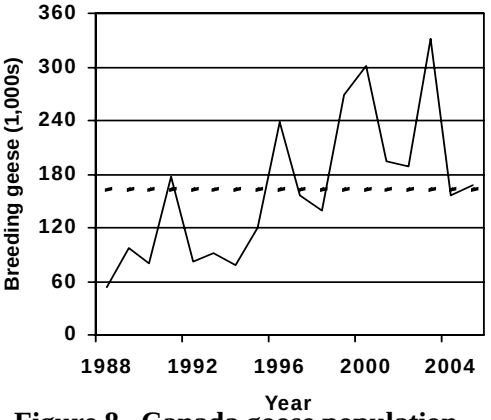


**Figure 8. Canada goose population estimates (adjusted for visibility bias) and long-term average in Minnesota, 1988-2005.**

The estimated coot population was 11,640, which was 74% below the long-term average.

## SUMMARY

Wetland conditions were improved from 2004 but similar to long-term averages. Mallard abundance (238,500) declined significantly from 2004 (375,313) (P=0.02) but remained near the long-term average (223,000). Blue-winged teal abundance (194,125) declined significantly from 2004 (353,209) (P=0.02) and was below the long-term average (229,000). Duck abundance for most other species declined relative to 2004. Canada goose numbers, unadjusted for visibility bias, decreased 15% from 2004 but were 4% above the 10-year average.

## ACKNOWLEDGMENTS

Special thanks to the pilot and all the efforts of the ground crews from both the Minnesota Department of Natural Resources (MNDNR) and the U.S. Fish and Wildlife Service (USFWS) Tom Pfingsten, Conservation Officer Pilot, MNDNR, Division of Enforcement; Steve Cordts, Waterfowl Staff Specialist, MNDNR, Division of Wildlife; Sean Kelly, Asst. Chief, Migratory Bird & Refuge Biology, USFWS, Region III, Twin Cities; Wayne Brininger, Wildlife Biologist, USFWS, Tamarac National Wildlife Refuge; Jeanne Holler, Wildlife Biologist, USFWS, Sherburne National Wildlife Refuge; Rich Papasso, Refuge Operations Specialist, USFWS, Big Stone National Wildlife Refuge; Tony Rondeau, Wildlife Biologist, USFWS, HAPET, Fergus Falls; Sally Zodrow, Biological Science Technician, USFWS, Sherburne National Wildlife Refuge; Kim Bousquet, USFWS, Big Stone National Wildlife Refuge; Lowell Deede, USFWS, Tamarac National Wildlife Refuge; Dawn Johnson, USFWS, HAPET, Fergus Falls; Jim Kelley, USFWS, Region III, Twin Cities; Bob Russell, USFWS, Region III, Twin Cities; Lori Wolff, USFWS, Private Lands Office, St. Cloud; Bob Bengson, USFWS; Mary Soler, USFWS; Paul Soler, USFWS

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Table 1. Survey design for Minnesota, May 2005.[1]

| | Stratum | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | Total |
| **Survey design** | | | | |
| Square miles in stratum | 5,075 | 7,970 | 17,671 | 30,716 |
| Square miles in sample - waterfowl | 182.75 | 136.375 | 203.125 | 522.25 |
| Square miles in sample - ponds | 91.375 | 68.1875 | 101.5625 | 261.125 |
| Linear miles in sample | 731.0 | 545.5 | 812.5 | 2,089.0 |
| Number of transects in sample | 39 | 36 | 40 | 115 |
| Minimum transect length (miles) | 5 | 6 | 7 | 5 |
| Maximum transect length (miles) | 36 | 35 | 39 | 39 |
| Expansion Factor - waterfowl | 27.770 | 58.442 | 86.996 | |
| Expansion Factor - ponds | 55.540 | 116.884 | 173.991 | |
| **Current year coverage** | | | | |
| Square miles in sample - waterfowl | 182.75 | 136.375 | 203.125 | 522.25 |
| Square miles in sample - ponds | 91.375 | 68.1875 | 101.5625 | 261.125 |
| Linear miles in sample | 731.0 | 545.5 | 812.5 | 2,089.0 |
| Number of transects in sample | 39 | 36 | 40 | 115 |
| Minimum transect length (miles) | 5 | 6 | 7 | 5 |
| Maximum transect length (miles) | 36 | 35 | 39 | 39 |
| Expansion Factor - waterfowl | 27.770 | 58.442 | 86.996 | |
| Expansion Factor - ponds | 55.540 | 116.884 | 173.991 | |

[1] Also, 8 additional air-ground transects (total linear miles = 202.5, range - 10-60 miles) were flown to use in calculating the VCF

Table 2. Estimated number of May ponds (Type 1 and Types II-V) during Minnesota waterfowl breeding population survey, 1968-2005.

| Year | Type I | Number of ponds [1] |
|---|---|---|
| 1968 | | 272,000 |
| 1969 | | 358,000 |
| 1970 | | 276,000 |
| 1971 | | 277,000 |
| 1972 | | 333,000 |
| 1973 | | 251,000 |
| 1974 | | 322,000 |
| 1975 | | 175,000 |
| 1976 | | 182,000 |
| 1977 | | 91,000 |
| 1978 | | 215,000 |
| 1979 | | 259,000 |
| 1980 | | 198,000 |
| 1981 | | 150,000 |
| 1982 | | 269,000 |
| 1983 | | 249,000 |
| 1984 | | 264,000 |
| 1985 | | 274,000 |
| 1986 | | 317,000 |
| 1987 | | 178,000 |
| 1988 | | 160,000 |
| 1989 | | 203,000 |
| 1990 | | 184,000 |
| 1991 | 82,862 | 237,000 |
| 1992 | 10,019 | 225,000 |
| 1993 | 199,870 | 274,000 |
| 1994 | 123,958 | 294,000 |
| 1995 | 140,432 | 272,000 |
| 1996 | 147,859 | 330,000 |
| 1997 | 30,751 | 310,000 |
| 1998 | 20,560 | 243,000 |
| 1999 | 152,747 | 301,000 |
| 2000 | 5,090 | 204,000 |
| 2001 | 66,444 | 303,000 |
| 2002 | 30,602 | 254,000 |
| 2003 | 34,005 | 244,000 |
| 2004 | 9,494 | 198,000 |
| 2005 | 30,764 | 241,000 |
| 10-year average (1996-2005) | 52,832 | 262,800 |
| Long-term average (1968-2005) | 72,364 | 247,026 |
| **Change from:** | | |
| 2004 | +224% | +22% |
| 10-year average | -42% | -8% |
| Long-term average | -58% | -2% |

[1] Type II-V, correction factor from 1989 (123,000/203,000=0.606) used to adjust 1968-88 pond numbers. Ponds counted on 0.125 mile wide transect after 1988.

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1987-2005.

| | Year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| **Dabblers:** | | | | | | | | | | | | | | | | | | | |
| Mallard | 30,713 | 32,769 | 26,659 | 29,686 | 25,854 | 28,770 | 23,327 | 22,160 | 20,494 | 25,104 | 26,992 | 33,157 | 26,576 | 26,604 | 28,742 | 29,297 | 25,937 | 29,381 | 19,050 |
| Black Duck | 1,440 | 0 | 0 | 0 | 56 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 |
| Gadwall | 499 | 916 | 722 | 2,694 | 2,721 | 2,777 | 778 | 444 | 1,055 | 1,083 | 611 | 1,111 | 1,777 | 833 | 1,333 | 944 | 1,250 | 2,111 | 1,166 |
| American Wigeon | 0 | 111 | 83 | 222 | 0 | 56 | 0 | 0 | 194 | 0 | 0 | 56 | 56 | 56 | 111 | 0 | 56 | 555 | 167 |
| Green-winged Teal | 0 | 0 | 0 | 0 | 56 | 0 | 111 | 278 | 0 | 278 | 56 | 333 | 0 | 278 | 56 | 278 | 222 | 444 | 56 |
| Blue-winged Teal | 22,654 | 17,467 | 14,218 | 23,771 | 15,940 | 15,274 | 10,358 | 9,164 | 7,609 | 6,720 | 6,387 | 8,220 | 6,998 | 11,247 | 7,387 | 14,218 | 9,664 | 23,771 | 9,303 |
| Northern Shoveler | 831 | 278 | 722 | 778 | 1,777 | 1,000 | 111 | 278 | 111 | 1,277 | 1,500 | 500 | 555 | 1,055 | 305 | 1,277 | 278 | 1,166 | 333 |
| Northern Pintail | 111 | 500 | 222 | 444 | 389 | 222 | 611 | 167 | 167 | 167 | 111 | 111 | 167 | 167 | 389 | 56 | 111 | 56 | 0 |
| Wood Duck | 14,789 | 11,580 | 8,303 | 14,468 | 10,775 | 10,941 | 11,636 | 7,359 | 6,831 | 6,498 | 9,497 | 12,302 | 5,582 | 10,219 | 6,720 | 2,888 | 4,499 | 8,081 | 5,498 |
| Dabbler Subtotal | 71,037 | 63,621 | 50,929 | 72,063 | 57,568 | 59,040 | 46,932 | 39,906 | 36,461 | 41,127 | 45,154 | 55,790 | 41,711 | 50,459 | 45,043 | 48,958 | 42,017 | 65,565 | 35,629 |
| **Divers:** | | | | | | | | | | | | | | | | | | | |
| Redhead | 1,800 | 1,277 | 2,638 | 3,305 | 2,555 | 3,499 | 1,416 | 1,972 | 639 | 722 | 778 | 944 | 500 | 583 | 1,444 | 750 | 333 | 805 | 666 |
| Canvasback | 1,357 | 722 | 2,888 | 1,972 | 2,305 | 2,111 | 2,777 | 3,166 | 3,860 | 1,166 | 1,333 | 1,777 | 2,971 | 1,222 | 2,027 | 1,833 | 1,333 | 666 | 972 |
| Scaup | 1,883 | 2,860 | 14,024 | 8,970 | 9,858 | 23,854 | 6,748 | 19,661 | 7,192 | 13,829 | 3,416 | 9,247 | 1,750 | 7,415 | 5,832 | 2,444 | 2,055 | 5,971 | 4,110 |
| Ring-necked Duck | 499 | 528 | 1,500 | 1,638 | 1,777 | 4,721 | 2,222 | 3,582 | 1,583 | 3,166 | 2,694 | 2,749 | 2,360 | 4,776 | 2,444 | 2,777 | 1,361 | 5,165 | 1,722 |
| Goldeneye | 0 | 56 | 167 | 56 | 0 | 222 | 111 | 222 | 111 | 167 | 0 | 111 | 56 | 56 | 333 | 111 | 0 | 222 | 222 |
| Bufflehead | 0 | 56 | 583 | 0 | 333 | 722 | 0 | 444 | 56 | 278 | 0 | 56 | 111 | 56 | 111 | 222 | 111 | 389 | 167 |
| Ruddy Duck | 323 | 666 | 722 | 1,500 | 361 | 500 | 1,250 | 639 | 167 | 139 | 528 | 11,052 | 972 | 0 | 83 | 1,305 | 417 | 305 | 1,222 |
| Hooded Merganser | 0 | 0 | 0 | 139 | 0 | 444 | 222 | 111 | 278 | 611 | 555 | 389 | 722 | 500 | 722 | 555 | 333 | 278 | 333 |
| Large Merganser | 0 | 0 | 0 | 0 | 56 | 111 | 0 | 56 | 0 | 0 | 56 | 0 | 0 | 0 | 111 | 0 | 972 | 0 | 111 |
| Diver Subtotal | 5,862 | 6,165 | 22,522 | 17,580 | 17,245 | 36,184 | 14,746 | 29,853 | 13,886 | 20,078 | 9,360 | 26,325 | 9,442 | 14,608 | 13,107 | 9,997 | 6,915 | 13,801 | 9,525 |
| **Total Ducks** | 76,899 | 69,786 | 73,451 | 89,643 | 74,813 | 95,224 | 61,678 | 69,759 | 50,347 | 61,205 | 54,514 | 82,115 | 51,153 | 65,067 | 58,150 | 58,955 | 48,932 | 79,366 | 45,154 |
| **Other:** | | | | | | | | | | | | | | | | | | | |
| Coot | 1,163 | 3,777 | 22,799 | 27,326 | 11,108 | 11,386 | 1,166 | 528 | 611 | 3,055 | 5,054 | 555 | 83 | 3,999 | 1,722 | 2,888 | 2,666 | 21,411 | 2,444 |
| Canada Goose | 8,059 | 12,024 | 14,663 | 16,523 | 9,803 | 10,914 | 13,135 | 12,802 | 14,413 | 12,774 | 10,330 | 16,967 | 19,495 | 22,160 | 24,882 | 24,104 | 22,160 | 23,160 | 22,938 |

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1987-2005.

| | Year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| **Dabblers:** | | | | | | | | | | | | | | | | | | | |
| Mallard | 50,260 | 41,085 | 42,896 | 39,682 | 39,215 | 45,585 | 37,111 | 42,896 | 42,896 | 48,507 | 54,643 | 53,942 | 52,247 | 49,559 | 44,650 | 43,773 | 34,715 | 44,474 | 26,883 |
| Black Duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 0 | 0 |
| Gadwall | 0 | 584 | 1,344 | 2,805 | 1,870 | 2,045 | 1,286 | 1,403 | 1,052 | 935 | 468 | 584 | 1,519 | 3,039 | 1,636 | 701 | 584 | 3,565 | 584 |
| American Wigeon | 0 | 3,507 | 0 | 234 | 701 | 351 | 0 | 117 | 0 | 468 | 351 | 818 | 0 | 468 | 0 | 0 | 0 | 2,513 | 117 |
| Green-winged Teal | 234 | 117 | 117 | 0 | 0 | 0 | 351 | 117 | 0 | 935 | 234 | 351 | 117 | 117 | 117 | 468 | 234 | 234 | 0 |
| Blue-winged Teal | 29,455 | 30,039 | 25,189 | 31,208 | 24,663 | 26,766 | 18,818 | 19,227 | 10,636 | 13,851 | 13,792 | 13,208 | 10,578 | 19,637 | 9,701 | 21,390 | 15,955 | 30,624 | 11,513 |
| Northern Shoveler | 701 | 1,695 | 2,338 | 2,104 | 3,857 | 1,636 | 1,286 | 935 | 818 | 1,636 | 2,571 | 701 | 2,104 | 4,675 | 1,052 | 2,221 | 1,403 | 1,753 | 234 |
| Northern Pintail | 818 | 468 | 701 | 701 | 701 | 234 | 351 | 468 | 234 | 117 | 234 | 468 | 117 | 117 | 117 | 0 | 117 | 0 | 0 |
| Wood Duck | 10,052 | 14,494 | 10,578 | 14,903 | 8,065 | 11,221 | 9,468 | 9,409 | 6,662 | 8,708 | 11,338 | 10,520 | 19,753 | 13,792 | 7,831 | 5,143 | 4,558 | 8,766 | 3,273 |
| Dabbler subtotal | 91,520 | 91,989 | 83,163 | 91,637 | 79,072 | 87,838 | 68,671 | 74,572 | 62,298 | 75,157 | 83,631 | 80,592 | 86,435 | 91,404 | 65,221 | 73,696 | 57,566 | 91,929 | 42,604 |
| **Divers:** | | | | | | | | | | | | | | | | | | | |
| Redhead | 701 | 1,169 | 1,636 | 4,325 | 1,519 | 3,097 | 2,279 | 3,799 | 1,403 | 1,110 | 1,987 | 935 | 1,636 | 2,805 | 2,455 | 234 | 584 | 1,110 | 292 |
| Canvasback | 0 | 935 | 584 | 234 | 117 | 0 | 584 | 1,052 | 0 | 234 | 701 | 117 | 117 | 935 | 0 | 468 | 1,052 | 234 | 0 |
| Scaup | 5,552 | 3,857 | 25,598 | 25,189 | 13,383 | 22,208 | 877 | 14,085 | 7,831 | 21,916 | 18,935 | 4,032 | 3,331 | 6,779 | 3,039 | 5,961 | 2,279 | 7,188 | 2,981 |
| Ring-necked Duck | 1,461 | 2,104 | 3,214 | 2,513 | 2,104 | 2,922 | 3,156 | 3,331 | 1,403 | 7,714 | 3,565 | 2,279 | 2,221 | 5,610 | 3,799 | 6,370 | 2,455 | 5,377 | 1,929 |
| Goldeneye | 234 | 468 | 935 | 351 | 818 | 351 | 584 | 701 | 701 | 1,753 | 818 | 234 | 935 | 584 | 468 | 234 | 234 | 351 | 117 |
| Bufflehead | 0 | 0 | 701 | 234 | 0 | 526 | 117 | 234 | 0 | 117 | 117 | 0 | 0 | 0 | 0 | 1,169 | 117 | 468 | 351 |
| Ruddy Duck | 0 | 2,162 | 3,390 | 1,227 | 4,558 | 1,227 | 3,390 | 409 | 117 | 58 | 117 | 0 | 468 | 0 | 0 | 1,870 | 2,688 | 0 | 351 |
| Hooded Merganser | 0 | 234 | 0 | 0 | 0 | 351 | 584 | 468 | 117 | 234 | 468 | 117 | 701 | 935 | 1,403 | 701 | 701 | 234 | 234 |
| Large Merganser | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 117 | 0 | 0 | 234 | 351 |
| Diver subtotal | 7,948 | 10,929 | 36,058 | 34,073 | 22,499 | 30,799 | 11,571 | 24,079 | 11,572 | 33,136 | 26,708 | 7,714 | 9,409 | 17,765 | 11,281 | 17,007 | 10,110 | 15,196 | 6,606 |
| **Total Ducks** | 99,468 | 102,918 | 119,221 | 125,710 | 101,571 | 118,637 | 80,242 | 98,651 | 73,870 | 108,293 | 110,339 | 88,306 | 95,844 | 109,169 | 76,502 | 90,703 | 67,676 | 107,125 | 49,210 |
| **Other:** | | | | | | | | | | | | | | | | | | | |
| Coot | 1,169 | 2,338 | 3,740 | 11,630 | 5,552 | 11,162 | 5,201 | 1,461 | 526 | 7,013 | 5,026 | 643 | 234 | 1,110 | 468 | 4,909 | 1,519 | 8,007 | 584 |
| Canada Goose | 4,675 | 5,143 | 10,227 | 11,279 | 8,591 | 7,305 | 9,409 | 12,565 | 12,682 | 13,559 | 16,364 | 19,812 | 18,585 | 25,831 | 24,604 | 20,688 | 22,091 | 28,461 | 20,688 |

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1987-2005.

| | Year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| **Dabblers:** | | | | | | | | | | | | | | | | | | | |
| Mallard | 84,908 | 81,689 | 54,807 | 71,511 | 63,246 | 69,771 | 63,333 | 73,425 | 79,166 | 79,862 | 78,993 | 101,873 | 90,390 | 81,690 | 72,642 | 72,121 | 55,156 | 84,561 | 36,539 |
| Black Duck | 0 | 0 | 0 | 174 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 174 | 0 |
| Gadwall | 0 | 1,914 | 5,220 | 8,787 | 2,262 | 2,436 | 1,218 | 2,610 | 3,306 | 3,306 | 2,436 | 3,045 | 2,436 | 2,610 | 10,701 | 3,306 | 1,566 | 6,960 | 2,001 |
| American Wigeon | 0 | 1,827 | 174 | 957 | 696 | 522 | 348 | 1,218 | 0 | 1,044 | 348 | 696 | 0 | 522 | 174 | 1,218 | 174 | 1,566 | 1,044 |
| Green-winged Teal | 1,566 | 0 | 522 | 0 | 348 | 0 | 348 | 174 | 0 | 957 | 348 | 174 | 0 | 1,218 | 1,392 | 522 | 174 | 0 | 174 |
| Blue-winged Teal | 50,371 | 53,677 | 50,893 | 52,198 | 50,893 | 51,067 | 35,494 | 41,932 | 29,492 | 36,625 | 25,316 | 26,360 | 18,530 | 29,405 | 20,618 | 56,374 | 21,140 | 39,758 | 27,578 |
| Northern Shoveler | 3,306 | 3,654 | 6,264 | 23,663 | 5,568 | 11,048 | 1,914 | 2,784 | 5,307 | 12,701 | 11,049 | 4,176 | 4,002 | 20,444 | 10,701 | 6,264 | 870 | 3,828 | 348 |
| Northern Pintail | 174 | 3,219 | 696 | 696 | 1,914 | 870 | 1,218 | 696 | 174 | 870 | 522 | 870 | 870 | 696 | 522 | 0 | 174 | 348 | 174 |
| Wood Duck | 30,449 | 21,662 | 23,141 | 25,055 | 17,747 | 24,185 | 25,229 | 23,228 | 16,355 | 27,926 | 14,268 | 23,837 | 20,531 | 25,055 | 17,225 | 13,572 | 12,702 | 20,705 | 7,482 |
| Dabbler subtotal | 170,774 | 167,642 | 141,717 | 183,041 | 142,674 | 159,899 | 129,102 | 146,067 | 133,800 | 163,291 | 133,280 | 161,031 | 136,759 | 161,640 | 133,975 | 153,377 | 91,956 | 157,900 | 75,340 |
| **Divers:** | | | | | | | | | | | | | | | | | | | |
| Redhead | 696 | 609 | 2,175 | 3,219 | 2,610 | 6,438 | 1,827 | 2,958 | 7,134 | 1,044 | 1,044 | 2,001 | 3,480 | 2,523 | 3,654 | 1,305 | 174 | 1,740 | 1,479 |
| Canvasback | 0 | 174 | 174 | 1,044 | 696 | 0 | 348 | 696 | 174 | 1,392 | 0 | 3,306 | 174 | 3,915 | 522 | 696 | 1,131 | 2,784 | 0 |
| Scaup | 2,871 | 3,828 | 32,276 | 5,916 | 17,486 | 20,009 | 4,176 | 23,924 | 13,397 | 29,840 | 8,787 | 15,137 | 8,961 | 18,182 | 6,873 | 4,611 | 783 | 17,747 | 5,307 |
| Ring-necked Duck | 2,349 | 1,566 | 2,088 | 2,088 | 3,480 | 3,654 | 2,871 | 5,568 | 1,044 | 12,875 | 3,654 | 2,958 | 1,479 | 8,178 | 8,526 | 7,395 | 1,479 | 5,133 | 10,179 |
| Goldeneye | 174 | 522 | 870 | 609 | 696 | 1,044 | 696 | 783 | 1,479 | 1,914 | 522 | 696 | 696 | 1,044 | 1,566 | 3,132 | 1,305 | 696 | 1,044 |
| Bufflehead | 0 | 0 | 1,392 | 0 | 552 | 696 | 348 | 696 | 0 | 1,044 | 174 | 348 | 0 | 0 | 0 | 1,218 | 783 | 2,088 | 0 |
| Ruddy Duck | 2,175 | 1,566 | 1,305 | 1,218 | 9,396 | 6,786 | 1,218 | 2,175 | 2,349 | 1,740 | 348 | 0 | 174 | 0 | 696 | 18,878 | 87 | 2,262 | 870 |
| Hooded Merganser | 0 | 174 | 0 | 174 | 348 | 348 | 348 | 696 | 1,044 | 1,566 | 696 | 696 | 1,218 | 957 | 174 | 2,175 | 174 | 1,740 | 1,218 |
| Large Merganser | 0 | 0 | 0 | 0 | 0 | 348 | 0 | 174 | 174 | 0 | 0 | 0 | 0 | 0 | 0 | 522 | 0 | 0 | 261 |
| Diver subtotal | 8,265 | 8,439 | 40,280 | 14,268 | 35,264 | 39,323 | 11,832 | 37,670 | 26,795 | 51,415 | 15,225 | 25,142 | 16,182 | 34,799 | 22,011 | 39,932 | 5,916 | 34,190 | 20,358 |
| **Total Ducks** | 179,039 | 176,081 | 181,997 | 197,309 | 177,938 | 199,222 | 140,934 | 183,737 | 160,595 | 214,706 | 148,505 | 186,173 | 152,941 | 196,439 | 155,986 | 193,309 | 97,872 | 192,090 | 95,698 |
| **Other:** | | | | | | | | | | | | | | | | | | | |
| Coot | 1,914 | 59,940 | 24,794 | 11,918 | 47,587 | 62,463 | 12,179 | 12,788 | 3,828 | 182,953 | 24,620 | 5,133 | 14,702 | 67,684 | 3,132 | 14,007 | 7,134 | 77,427 | 8,613 |
| Canada Goose | 17,225 | 21,923 | 27,056 | 30,623 | 23,837 | 15,746 | 21,314 | 23,228 | 30,971 | 34,537 | 33,755 | 42,368 | 41,933 | 57,940 | 39,932 | 33,407 | 43,412 | 46,717 | 39,758 |

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1987-2005.

| | Year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Species | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
| **Dabblers:** | | | | | | | | | | | | | | | | | | | |
| Mallard | 165,881 | 155,543 | 124,362 | 140,879 | 128,315 | 144,126 | 123,771 | 138,481 | 142,556 | 153,473 | 160,628 | 188,972 | 169,213 | 157,853 | 146,034 | 145,191 | 115,974 | 158,416 | 82,472 |
| Black Duck | 1,440 | 0 | 0 | 174 | 56 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 174 | 56 |
| Gadwall | 499 | 3,414 | 7,286 | 14,286 | 6,853 | 7,258 | 3,282 | 4,457 | 5,413 | 5,324 | 3,515 | 4,740 | 5,733 | 6,482 | 13,670 | 4,951 | 3,400 | 12,635 | 3,752 |
| American Wigeon | 0 | 5,445 | 257 | 1,413 | 1,397 | 929 | 348 | 1,335 | 194 | 1,512 | 699 | 1,570 | 56 | 1,045 | 285 | 1,218 | 230 | 4,634 | 1,327 |
| Green-winged Teal | 1,800 | 117 | 639 | 0 | 404 | 0 | 810 | 569 | 0 | 2,170 | 638 | 858 | 117 | 1,613 | 1,564 | 1,267 | 630 | 678 | 230 |
| Blue-winged Teal | 102,480 | 101,183 | 90,300 | 107,177 | 91,496 | 93,107 | 64,670 | 70,323 | 47,737 | 57,196 | 45,495 | 47,788 | 36,106 | 60,288 | 37,706 | 91,982 | 46,759 | 94,152 | 48,394 |
| Northern Shoveler | 4,838 | 5,627 | 9,324 | 26,545 | 11,202 | 13,684 | 3,311 | 3,997 | 6,236 | 15,614 | 15,120 | 5,377 | 6,661 | 26,175 | 12,058 | 9,762 | 2,550 | 6,747 | 915 |
| Northern Pintail | 1,103 | 4,187 | 1,619 | 1,841 | 3,004 | 1,326 | 2,180 | 1,331 | 575 | 1,154 | 867 | 1,449 | 1,153 | 979 | 1,028 | 56 | 402 | 404 | 174 |
| Wood Duck | 55,290 | 47,736 | 42,022 | 54,426 | 36,587 | 46,347 | 46,333 | 39,996 | 29,848 | 43,132 | 35,103 | 46,659 | 45,866 | 49,067 | 31,777 | 21,603 | 21,759 | 37,553 | 16,253 |
| Dabbler subtotal | 333,331 | 323,252 | 275,809 | 346,741 | 279,314 | 306,777 | 244,705 | 260,545 | 232,559 | 279,575 | 262,065 | 297,413 | 264,905 | 303,502 | 244,239 | 276,030 | 191,704 | 315,393 | 153,573 |
| **Divers:** | | | | | | | | | | | | | | | | | | | |
| Redhead | 3,197 | 3,055 | 6,449 | 10,849 | 6,684 | 13,034 | 5,522 | 8,729 | 9,176 | 2,876 | 3,809 | 3,880 | 5,616 | 5,911 | 7,552 | 2,289 | 1,092 | 3,656 | 2,438 |
| Canvasback | 1,357 | 1,831 | 3,646 | 3,250 | 3,118 | 2,111 | 3,709 | 4,914 | 4,034 | 2,792 | 2,034 | 5,200 | 3,262 | 6,072 | 2,549 | 2,996 | 3,516 | 3,684 | 972 |
| Scaup | 10,306 | 10,545 | 71,898 | 40,075 | 40,727 | 66,071 | 11,801 | 57,670 | 28,420 | 65,585 | 31,138 | 28,416 | 14,041 | 32,376 | 15,743 | 13,016 | 5,117 | 30,906 | 12,397 |
| Ring-necked Duck | 4,309 | 4,198 | 6,802 | 6,239 | 7,361 | 11,297 | 8,249 | 12,481 | 4,030 | 23,755 | 9,913 | 7,986 | 6,060 | 18,565 | 14,768 | 16,542 | 5,294 | 15,675 | 13,829 |
| Goldeneye | 408 | 1,046 | 1,972 | 1,016 | 1,514 | 1,617 | 1,391 | 1,706 | 2,291 | 3,834 | 1,340 | 1,041 | 1,687 | 1,684 | 2,367 | 3,477 | 1,539 | 1,269 | 1,383 |
| Bufflehead | 0 | 56 | 2,676 | 234 | 885 | 1,944 | 465 | 1,374 | 56 | 1,439 | 291 | 404 | 111 | 56 | 111 | 2,609 | 1,011 | 2,944 | 517 |
| Ruddy Duck | 2,498 | 4,394 | 5,417 | 3,945 | 14,315 | 8,513 | 5,858 | 3,223 | 2,633 | 1,937 | 993 | 11,052 | 1,613 | 0 | 779 | 22,054 | 3,192 | 2,567 | 2,443 |
| Hooded Merganser | 0 | 408 | 0 | 313 | 348 | 1,143 | 1,154 | 1,275 | 1,439 | 2,411 | 1,719 | 1,202 | 2,641 | 2,392 | 2,299 | 3,432 | 1,209 | 2,251 | 1,785 |
| Large Merganser | 0 | 0 | 0 | 0 | 56 | 576 | 0 | 230 | 174 | 0 | 56 | 0 | 0 | 117 | 228 | 522 | 972 | 234 | 723 |
| Diver subtotal | 22,075 | 25,533 | 98,860 | 65,921 | 75,008 | 106,306 | 38,149 | 91,602 | 52,253 | 104,629 | 51,293 | 59,181 | 35,031 | 67,173 | 46,396 | 66,937 | 22,942 | 63,186 | 36,487 |
| **Total Ducks** | 355,406 | 348,785 | 374,669 | 412,662 | 354,322 | 413,083 | 282,854 | 352,147 | 284,812 | 384,204 | 313,358 | 356,594 | 299,936 | 370,675 | 290,635 | 342,967 | 214,646 | 378,579 | 190,060 |
| **Other:** | | | | | | | | | | | | | | | | | | | |
| Coot | 4,246 | 66,055 | 51,333 | 50,874 | 64,247 | 85,011 | 18,546 | 14,777 | 4,965 | 193,021 | 34,700 | 6,331 | 15,020 | 72,793 | 5,321 | 21,804 | 11,319 | 106,845 | 11,641 |
| Canada Goose | 29,959 | 39,090 | 51,946 | 58,425 | 42,231 | 33,965 | 43,858 | 48,595 | 58,066 | 60,870 | 60,449 | 79,147 | 80,012 | 105,932 | 89,418 | 78,200 | 87,663 | 98,339 | 83,384 |

Table 7. Estimated waterfowl populations during the Minnesota Waterfowl breeding population survey, 1968-2005.

| | Mallard | | | | Blue-winged teal | | | | Other ducks (exc. scaup) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Unad. PI | VCF | PI | SE | Unad. PI | VCF | PI | SE | Unad. PI | VCF | PI |
| 1968[2] | 41,030 | 2.04 | 83,701 | | 61,943 | 2.44 | 151,141 | | 41,419 | 2.08 | 86,152 |
| 1969[2] | 53,167 | 1.67 | 88,789 | | 45,180 | 3.45 | 155,871 | | 34,605 | 2.27 | 78,553 |
| 1970[2] | 67,463 | 1.69 | 113,945 | | 31,682 | 5.06 | 160,343 | | 30,822 | 1.62 | 49,932 |
| 1971[2] | 47,702 | 1.65 | 78,470 | | 42,445 | 3.49 | 148,218 | | 29,520 | 1.71 | 50,450 |
| 1972[2] | 49,137 | 1.27 | 62,158 | | 49,386 | 1.96 | 96,895 | | 34,405 | 1.69 | 58,127 |
| 1973[3] | 56,607 | 1.76 | 99,832 | | 53,095 | 3.92 | 208,292 | | 33,155 | 2.45 | 81,362 |
| 1974[3] | 44,866 | 1.62 | 72,826 | | 39,402 | 2.59 | 102,169 | | 38,266 | 2.79 | 106,609 |
| 1975 | 55,093 | 3.19 | 175,774 | | 45,948 | 3.95 | 181,375 | | 34,585 | 3.31 | 114,459 |
| 1976 | 69,844 | 1.69 | 117,806 | | 89,370 | 4.87 | 435,607 | | 39,022 | 3.35 | 130,669 |
| 1977 | 60,617 | 2.21 | 134,164 | | 37,391 | 3.86 | 144,187 | | 18,633 | 11.95 | 222,748 |
| 1978 | 56,152 | 2.61 | 146,781 | | 28,491 | 8.53 | 242,923 | | 22,034 | 3.3 | 72,798 |
| 1979 | 61,743 | 2.57 | 158,704 | 28,668 | 46,708 | 5.21 | 243,167 | 62,226 | 39,749 | 3.79 | 150,545 |
| 1980 | 83,775 | 2.05 | 171,957 | 22,312 | 50,966 | 6.49 | 330,616 | 40,571 | 47,322 | 3.97 | 188,020 |
| 1981 | 79,562 | 1.95 | 154,844 | 16,402 | 64,546 | 2.59 | 167,258 | 23,835 | 30,947 | 3.8 | 117,667 |
| 1982 | 51,655 | 2.33 | 120,527 | 17,078 | 42,772 | 4.75 | 203,167 | 34,503 | 32,726 | 4.32 | 141,501 |
| 1983 | 73,424 | 2.12 | 155,762 | 15,419 | 42,728 | 2.81 | 119,980 | 20,809 | 32,240 | 2.84 | 91,400 |
| 1984 | 94,514 | 1.99 | 188,149 | 24,065 | 89,896 | 2.82 | 253,821 | 33,286 | 40,326 | 2.18 | 87,709 |
| 1985 | 96,045 | 2.26 | 216,908 | 32,935 | 90,453 | 2.91 | 263,607 | 33,369 | 35,018 | 2.35 | 82,383 |
| 1986 | 108,328 | 2.16 | 233,598 | 30,384 | 68,235 | 2.69 | 183,338 | 28,204 | 38,900 | 2.67 | 103,851 |
| 1987 | 165,881 | 1.16 | 192,289 | 23,500 | 102,480 | 1.99 | 203,718 | 32,289 | 76,746 | 2.51 | 192,947 |
| 1988 | 155,543 | 1.75 | 271,718 | 38,675 | 101,183 | 2.38 | 240,532 | 39,512 | 81,514 | 2.61 | 212,988 |
| 1989 | 124,362 | 2.19 | 272,968 | 26,508 | 90,300 | 3.16 | 285,760 | 39,834 | 88,109 | 2.89 | 254,887 |
| 1990 | 140,879 | 1.65 | 232,059 | 26,316 | 107,177 | 3.09 | 330,659 | 44,455 | 124,531 | 1.97 | 245,152 |
| 1991 | 128,315 | 1.75 | 224,953 | 28,832 | 91,496 | 2.9 | 265,138 | 42,057 | 93,784 | 2.81 | 263,619 |
| 1992 | 144,126 | 2.5 | 360,870 | 43,621 | 93,107 | 3.83 | 356,679 | 53,619 | 109,779 | 2.33 | 255,774 |
| 1993 | 123,771 | 2.47 | 305,838 | 31,103 | 64,670 | 4.02 | 260,070 | 36,307 | 82,612 | 3.28 | 271,263 |
| 1994 | 138,482 | 3.08 | 426,455 | 66,240 | 70,324 | 5.48 | 385,256 | 82,580 | 85,671 | 3.55 | 303,847 |
| 1995 | 142,557 | 2.24 | 319,433 | 48,124 | 47,737 | 4.4 | 210,043 | 40,531 | 66,096 | 4.05 | 267,668 |
| 1996 | 153,473 | 2.05 | 314,816 | 53,461 | 57,196 | 5.05 | 288,913 | 64,064 | 107,950 | 2.64 | 285,328 |
| 1997 | 160,629 | 2.54 | 407,413 | 65,771 | 45,496 | 5.57 | 253,408 | 67,526 | 76,095 | 2.72 | 207,316 |
| 1998 | 188,972 | 1.95 | 368,450 | 61,513 | 47,788 | 3.66 | 174,848 | 33,855 | 91,478 | 1.64 | 149,786 |
| 1999 | 169,213 | 1.87 | 316,394 | 51,651 | 36,106 | 4.53 | 163,499 | 36,124 | 80,459 | 2.49 | 200,570 |
| 2000 | 157,853 | 2.02 | 318,134 | 36,857 | 60,288 | 2.97 | 179,055 | 32,189 | 120,158 | 2.09 | 250,590 |
| 2001 | 146,034 | 2.2 | 320,560 | 39,541 | 37,706 | 3.6 | 135,742 | 19,631 | 91,152 | 2.85 | 260,051 |
| 2002 | 145,191 | 2.53 | 366,625 | 46,264 | 91,982 | 4.67 | 429,934 | 87,312 | 92,778 | 4.04 | 374,978 |
| 2003 | 115,974 | 2.42 | 280,517 | 34,556 | 46,759 | 4.13 | 193,269 | 36,176 | 46,796 | 5.30 | 248,019 |
| 2004 | 158,416 | 2.37 | 375,313 | 57,591 | 94,152 | 3.75 | 353,209 | 56,539 | 95,105 | 2.94 | 279,802 |
| 2005 | 82,472 | 2.89 | 238,500 | 28,595 | 48,394 | 4.01 | 194,125 | 37,358 | 46,797 | 4.26 | 199,355 |
| **Averages:** | | | | | | | | | | | |
| 10-year (1995-2004) | 153,831 | 2.22 | 338,766 | 49,533 | 56,521 | 4.23 | 238,192 | 47,395 | 86,807 | 3.08 | 252,411 |
| Long-term (1968-2005) | 105,075 | 2.12 | 223,368 | 36,888 | 61,973 | 3.88 | 228,838 | 42,917 | 60,824 | 3.14 | 177,339 |
| **% change from:** | | | | | | | | | | | |
| 2004 | -48% | +22% | -36% | -50% | -49% | +7% | -45% | -34% | -51% | +45% | -29% |
| 10-year average | -46% | +30% | -30% | -42% | -14% | -5% | -19% | -21% | -46% | +38% | -21% |
| Long-term average | -22% | +36% | +7% | -23% | -22% | +3% | -15% | -13% | -23% | +36% | +12% |

[1] Unad. PI - unadjusted population index, VCF - Visibility Correction Factor, PI - adjusted population index, SE - standard error.
[2] Calculated from data in Waterfowl breeding ground survey reports, 1968 through 1972, from Minn. Game Res. Quarterly Reps. 1968 and 1969 other duck VCF is total duck VCF.
[3] Calculated from data in Maxson and Pace (1989).

Table 7. Continued.

| | Scaup | | | Total ducks (ex. scaup) | | Total Ducks | | Canada geese | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Unad. PI | VCF | PI | Unad. PI | PI | Unad. PI | PI | Unad. PI | VCF | PI |
| 1968 | 22,834 | 2.08 | 47,495 | 144,392 | 320,994 | 167,226 | 368,488 | | | |
| 1969 | 9,719 | 2.27 | 22,062 | 132,952 | 323,213 | 142,671 | 345,275 | | | |
| 1970 | 12,105 | 1.62 | 19,610 | 129,967 | 324,219 | 142,072 | 343,829 | | | |
| 1971 | 5,713 | 1.71 | 9,764 | 119,667 | 277,137 | 125,380 | 286,901 | | | |
| 1972 | 12,062 | 1.69 | 20,379 | 132,928 | 217,181 | 144,990 | 237,560 | 366 | | |
| 1973 | 10,633 | 2.45 | 26,093 | 142,857 | 389,486 | 153,490 | 415,580 | 1,965 | | |
| 1974 | 18,378 | 2.79 | 51,201 | 122,534 | 281,605 | 140,912 | 332,806 | 8,835 | | |
| 1975 | 9,563 | 3.31 | 31,649 | 135,626 | 471,608 | 145,189 | 503,257 | 5,997 | | |
| 1976 | 22,494 | 3.35 | 75,323 | 198,236 | 684,082 | 220,730 | 759,405 | 5,409 | | |
| 1977 | 2,971 | 11.95 | 35,517 | 116,641 | 501,099 | 119,612 | 536,616 | 7,279 | | |
| 1978 | 14,774 | 3.35 | 48,812 | 106,677 | 462,502 | 121,451 | 511,314 | 7,865 | | |
| 1979 | 92,134 | 3.79 | 348,948 | 148,200 | 552,416 | 240,334 | 901,364 | 4,843 | | |
| 1980 | 12,602 | 3.97 | 50,070 | 182,063 | 690,593 | 194,665 | 740,663 | 6,307 | | |
| 1981 | 19,844 | 3.88 | 75,451 | 175,055 | 439,769 | 194,899 | 515,220 | 10,156 | | |
| 1982 | 21,556 | 4.32 | 93,204 | 127,153 | 465,195 | 148,709 | 558,399 | 6,600 | | |
| 1983 | 9,551 | 2.84 | 27,077 | 148,392 | 367,142 | 157,943 | 394,219 | 11,081 | | |
| 1984 | 15,683 | 2.18 | 34,111 | 224,736 | 529,679 | 240,419 | 563,790 | 14,051 | | |
| 1985 | 7,409 | 2.35 | 17,430 | 221,516 | 562,898 | 228,925 | 580,328 | 16,658 | | |
| 1986 | 6,247 | 2.67 | 16,678 | 215,463 | 520,787 | 221,710 | 537,465 | 19,599 | | |
| 1987 | 10,306 | 2.51 | 25,910 | 345,107 | 588,954 | 355,413 | 614,864 | 29,960 | | |
| 1988 | 10,545 | 2.61 | 27,553 | 338,240 | 725,238 | 348,785 | 752,791 | 39,057 | 1.36 | 53,004 |
| 1989 | 71,898 | 2.89 | 207,991 | 302,771 | 813,615 | 374,669 | 1,021,606 | 51,946 | 1.88 | 97,898 |
| 1990 | 40,075 | 1.97 | 78,892 | 372,587 | 807,870 | 412,662 | 886,761 | 58,425 | 1.37 | 80,147 |
| 1991 | 40,727 | 2.81 | 114,480 | 313,595 | 753,710 | 354,322 | 868,191 | 42,231 | 4.18 | 176,465 |
| 1992 | 66,071 | 2.33 | 153,939 | 347,012 | 973,323 | 413,083 | 1,127,262 | 33,965 | 2.43 | 82,486 |
| 1993 | 11,801 | 3.28 | 38,750 | 271,053 | 837,172 | 282,854 | 875,921 | 43,858 | 2.08 | 91,369 |
| 1994 | 57,670 | 3.55 | 204,536 | 294,477 | 1,115,558 | 352,147 | 1,320,095 | 48,595 | 1.68 | 77,878 |
| 1995 | 28,421 | 4.05 | 115,096 | 256,390 | 797,144 | 284,811 | 912,241 | 58,065 | 2.08 | 120,775 |
| 1996 | 65,585 | 2.64 | 173,351 | 318,619 | 889,057 | 384,204 | 1,062,408 | 60,870 | 3.92 | 238,708 |
| 1997 | 31,138 | 2.72 | 84,834 | 282,220 | 868,137 | 313,358 | 952,971 | 60,449 | 2.59 | 156,817 |
| 1998 | 28,416 | 1.64 | 46,528 | 328,238 | 693,084 | 356,654 | 739,612 | 79,147 | 1.75 | 138,507 |
| 1999 | 14,041 | 2.49 | 35,002 | 285,778 | 680,463 | 299,819 | 715,465 | 80,012 | 3.35 | 268,168 |
| 2000 | 32,376 | 2.10 | 67,520 | 338,299 | 747,779 | 370,675 | 815,299 | 105,932 | 2.84 | 301,298 |
| 2001 | 15,743 | 2.85 | 44,914 | 274,892 | 716,353 | 290,653 | 761,267 | 89,418 | 2.17 | 193,887 |
| 2002 | 13,016 | 4.04 | 52,606 | 327,951 | 1,171,537 | 340,967 | 1,224,143 | 78,200 | 2.42 | 189,353 |
| 2003 | 5,117 | 5.30 | 27,120 | 209,529 | 721,805 | 214,646 | 748,925 | 87,663 | 3.78 | 331,094 |
| 2004 | 30,906 | 2.94 | 90,926 | 347,673 | 1,008,324 | 378,579 | 1,099,250 | 98,339 | 1.58 | 155,859 |
| 2005 | 12,397 | 3.98 | 49,340 | 177,663 | 631,980 | 190,060 | 681,320 | 83,384 | 2.02 | 168,469 |
| **Averages:** | | | | | | | | | | |
| 10-year (1995-2004) | 26,476 | 3.08 | 73,790 | 296,959 | 829,368 | 323,437 | 903,158 | 79,810 | 2.65 | 209,447 |
| Long-term (1968-2005) | 24,014 | 3.14 | 70,794 | 227,820 | 629,545 | 251,834 | 700,339 | 39,898 | 2.42 | 162,343 |
| **% change from:** | | | | | | | | | | |
| 2004 | -60% | +35% | -46% | -49% | -37% | -50% | -38% | -15% | +28% | +8% |
| 10-year average | -53% | +29% | -33% | -40% | -24% | -41% | -25% | +4% | -24% | -20% |
| Long-term average | -48% | +27% | -30% | -22% | 0 | -25% | -3% | +109% | -16% | +4% |

[1] Unad. PI - unadjusted population index, VCF - Visibility Correction Factor, PI - adjusted population index, SE - standard error.

Appendix A. Temperature and precipitation at selected cities in, or adjacent to, Minnesota May Waterfowl Survey Strata, 1 May-29 May 2005 (Source: Minnesota Climatological Working Group, http://climate.umn.edu/cawap/nwssum/nwssum.asp).

| | | Temperature (F) for week ending: | | | | | | | | | | Total weekly precipitation (in) | | | | | Precipitation departure from normal |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1-May | | 8-May | | 15-May | | 22-May | | 29-May | | | | | | | |
| Region | City | Avg[1] | Depart[2] | Avg[1] | Depart[2] | Avg[1] | Depart[2] | Avg[1] | Depart[2] | Avg[1] | Depart[2] | 1-May | 8-May | 15-May | 22-May | 29-May | 1 Apr-29 May |
| NW | Crookston | 36.2 | -12.3 | 47.2 | -4.8 | 48.2 | -6.9 | 60.5 | 2.7 | 54.4 | -5.8 | 0.02 | 0.05 | 1.00 | 1.49 | 0.66 | 0.07 |
| NC | Grand Rapids | 36.1 | -10.9 | 52.3 | 2.1 | 45.2 | -7.8 | 54.4 | -1.2 | 54.4 | -3.4 | 0.40 | 0.24 | 1.02 | 1.08 | 2.81 | 1.77 |
| | Itasca | 36.2 | -8.2 | 45.4 | -2.5 | 47.6 | -3.5 | 55.3 | 1.3 | 53.8 | -2.6 | 0.29 | 0.15 | 0.93 | 0.53 | 2.55 | 1.45 |
| WC | Alexandria | 38.2 | -10.7 | 53.2 | 1.1 | 46.0 | -9.0 | 58.6 | 1.0 | 55.3 | -4.6 | 0.04 | 0.37 | 0.57 | 0.61 | 1.00 | 0.40 |
| | Fergus Falls | 38.8 | -10.5 | 49.2 | -3.4 | 47.7 | -7.8 | 60.2 | 2.0 | 56.5 | -3.9 | 0.00 | 0.17 | 2.30 | 0.50 | 1.50 | 2.20 |
| | Montivideo | 40.5 | -10.0 | 50.5 | -3.3 | 47.2 | -9.6 | 61.7 | 2.2 | 57.4 | -4.6 | 0.10 | 0.35 | 1.94 | 1.37 | 0.81 | 3.15 |
| | Morris | 39.6 | -10.8 | 49.8 | -3.8 | 48.0 | -8.6 | 58.6 | -0.6 | 57.9 | -3.7 | 0.01 | 0.15 | 0.72 | 0.68 | 0.54 | 0.28 |
| C | Becker | 41.4 | -8.2 | 51.2 | -1.4 | 51.3 | -4.1 | 56.8 | -1.0 | 58.4 | -1.6 | 0.08 | 0.11 | 1.02 | 1.00 | 1.22 | -0.18 |
| | Hutchinson | 42.2 | -9.1 | 52.2 | -2.3 | 51.6 | -5.9 | 57.7 | -2.4 | 59.2 | -3.3 | 0.14 | 0.15 | 1.07 | 1.51 | 0.75 | 1.54 |
| | St. Cloud | 39.8 | -9.8 | 53.6 | 1.0 | 48.8 | -6.6 | 58.0 | 0.2 | 57.6 | -2.4 | 0.06 | 0.26 | 0.66 | 1.14 | 1.25 | 0.54 |
| | Staples | 37.7 | -10.4 | 48.1 | -2.9 | 48.8 | -5.0 | 55.4 | -0.9 | 55.1 | -3.3 | 0.08 | 0.02 | 0.45 | 0.57 | 2.34 | 1.78 |
| | Willmar | 41.8 | -8.7 | 50.4 | -3.3 | 49.8 | -6.9 | 57.8 | -1.6 | 59.1 | -2.8 | 0.05 | 0.52 | 0.99 | 0.58 | 1.03 | 0.95 |
| EC | Aitkin | 37.3 | -9.4 | 46.8 | -2.9 | 47.4 | -5.0 | 51.4 | -3.5 | 59.0 | 1.8 | 0.29 | 0.11 | 0.38 | 0.91 | 1.44 | -0.03 |
| | Cambridge | missing | | | | | | | | | | | | | | | |
| | Msp Airport | 41.5 | -10.8 | 55.8 | 0.6 | 50.8 | -7.2 | 59.4 | -1.1 | 59.5 | -3.3 | 0.21 | 0.26 | 1.34 | 0.87 | 0.31 | -0.21 |
| SW | Pipestone | 39.6 | -10.8 | 52.0 | -1.5 | 49.0 | -7.3 | 62.5 | 3.5 | 58.2 | -3.2 | 0.07 | 0.63 | 1.11 | 1.04 | 0.94 | 0.49 |
| | Redwood Falls | 41.4 | -11.4 | 54.4 | -1.6 | 48.4 | -10.5 | 61.7 | 0.1 | 59.0 | -5.1 | 0.10 | 1.08 | 1.45 | 1.47 | 0.18 | 1.33 |
| | Worthington | 40.7 | -8.7 | 52.0 | -0.7 | 50.6 | -5.1 | 60.6 | 2.0 | 59.4 | -1.7 | 0.08 | 0.94 | 1.55 | 2.03 | 0.54 | 3.03 |
| SC | Faribault | 41.3 | -8.6 | 49.9 | -3.1 | 52.4 | -3.5 | 56.0 | -2.7 | 59.5 | -1.8 | 0.28 | 0.63 | 2.29 | 0.95 | 0.52 | 0.55 |
| | Waseca | 41.2 | -9.6 | 52.6 | -1.4 | 51.3 | -5.7 | 57.1 | -2.6 | 59.8 | -2.4 | 0.33 | 0.92 | 3.25 | 1.08 | 0.74 | 2.44 |
| | Winnebago | 43.6 | -7.4 | 52.6 | -1.6 | 51.8 | -5.3 | 58.9 | -1.0 | 60.2 | -2.3 | 0.26 | 1.20 | 4.75 | 0.70 | 0.78 | 4.58 |
| Statewide | | 39.5 | -9.6 | 50.5 | -1.7 | 48.7 | -6.3 | 57.3 | -0.4 | 56.8 | -3.2 | 0.20 | 0.45 | 1.40 | 1.02 | 0.96 | |

[1] Average temperature (°F) for the week ending on the date shown.
[2] Departure from normal temperature.
m = missing data

The following waterfowl information is taken from the U.S. Fish and Wildlife Service report Waterfowl Population , 2005 by Pamela R. Garrettson, Timothy J. Moser, and Khristi Wilkins. The entire report is available on the Division of Migratory Bird Management home pate (http://migratorybirds.fws.gov ).

Table 1. Canada goose population indices (in thousands) of the eastern prairie flock, 1971-2005 (from: U.S. Fish and Wildlife Service. 2005. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. U.S.A.).

| Year | Population[a,b] |
|---|---|
| 1971-72 | 125,000 |
| 1972-73 | 138,000 |
| 1973-74 | 120,000 |
| 1974-75 | 144,000 |
| 1975-76 | 216,000 |
| 1976-77 | 164,000 |
| 1977-78 | 180,000 |
| 1978-79 | 99,000 |
| 1979-80 | n.a. |
| 1980-81 | 125,000 |
| 1981-82 | 132,000 |
| 1982-83 | 155,000 |
| 1983-84 | 136,000 |
| 1984-85 | 158,000 |
| 1985-86 | 195,000 |
| 1986-87 | 203,000 |
| 1987-88 | 209,000 |
| 1988-89 | 210,000 |
| 1989-90 | 232,000 |
| 1990-91 | 212,000 |
| 1991-92 | 202,000 |
| 1992-93 | 157,000 |
| 1993-94 | 211,000 |
| 1994-95 | 205,000 |
| 1995-96 | 190,000 |
| 1996-97 | 199,000 |
| 1997-98 | 126,000 |
| 1998-99 | 207,000 |
| 1999-00 | 275,000 |
| 2000-01 | 215,000 |
| 2001-02 | 216,000 |
| 2002-03 | 229,000 |
| 2003-04 | 291,000 |
| 2004-05 | 255,000 |

[a] Surveys conducted in Spring.
[b] Indirect or preliminary estimate.

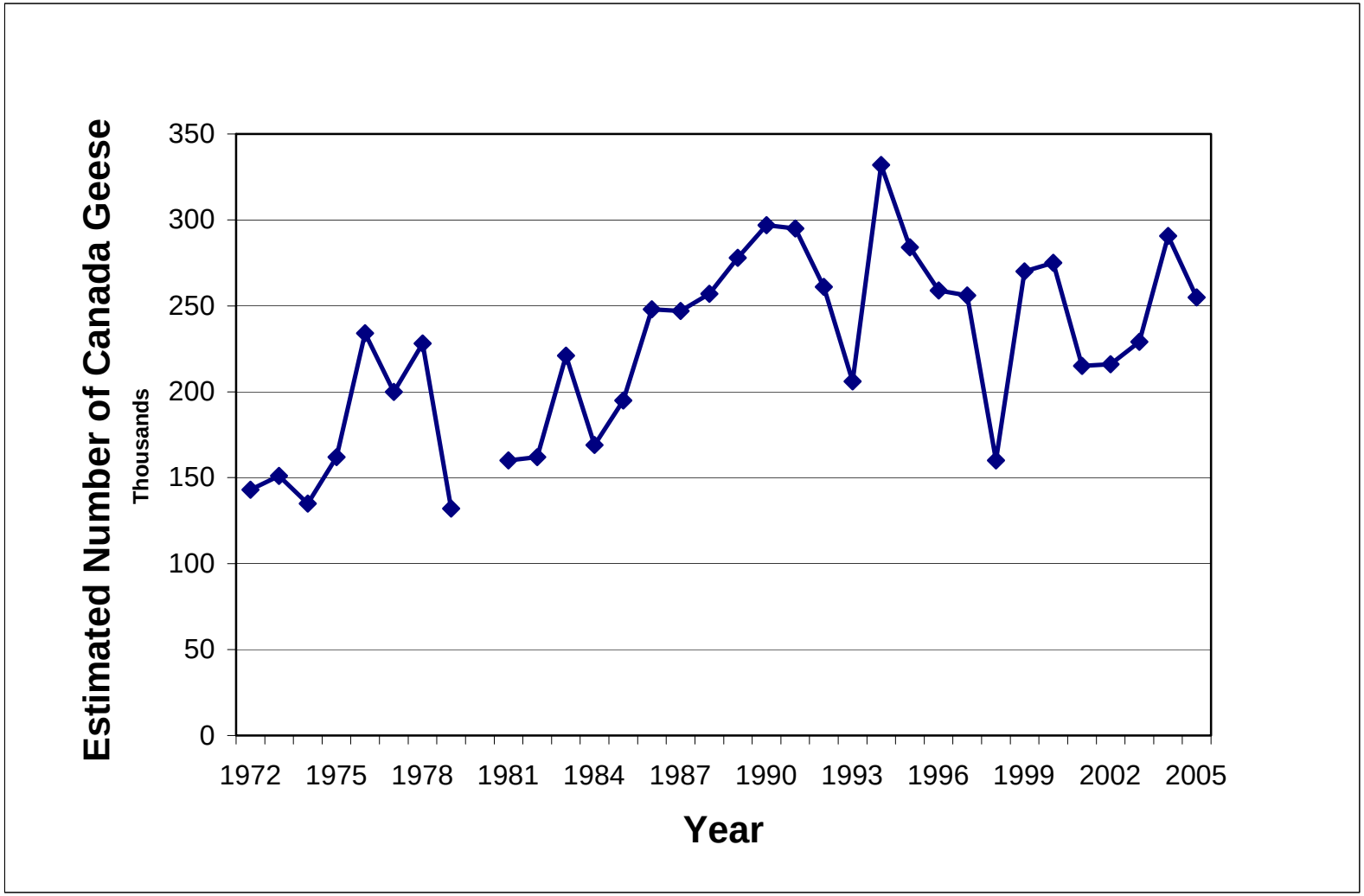


Figure 1. Breeding ground survey estimates of the Eastern Prairie Population of Canada geese, 1972-2005. (from: U.S. Fish and Wildlife Service. 2005. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. U.S.A.). Surveys conducted in spring. Indirect or preliminary estimates. Data not available for 1980.

Table 2. Estimated number of May ponds (adjusted for visibility) in Prairie Canada (portions of Alberta, Saskatchewan and Manitoba) 1961-2005 and north-central U.S. (North Dakota, South Dakota and Montana) 1974-2005. (from: U.S. Fish and Wildlife Service. 2005. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. U.S.A.)

| | Ponds (thousands) | |
|---|---|---|
| Year | Prairie Canada | North Central U.S.[a] |
| 1961 | 1,977 | -- |
| 1962 | 2,369 | -- |
| 1963 | 2,482 | -- |
| 1964 | 3,371 | -- |
| 1965 | 4,379 | -- |
| 1966 | 4,555 | -- |
| 1967 | 4,691 | -- |
| 1968 | 1,986 | -- |
| 1969 | 3,548 | -- |
| 1970 | 4,875 | -- |
| 1971 | 4,053 | -- |
| 1972 | 4,009 | -- |
| 1973 | 2,950 | -- |
| 1974 | 6,390 | 1,841 |
| 1975 | 5,320 | 1,911 |
| 1976 | 4,599 | 1,392 |
| 1977 | 2,278 | 771 |
| 1978 | 3,622 | 1,590 |
| 1979 | 4,859 | 1,522 |
| 1980 | 2,141 | 761 |
| 1981 | 1,443 | 683 |
| 1982 | 3,185 | 1,458 |
| 1983 | 3,906 | 1,259 |
| 1984 | 2,473 | 1,766 |
| 1985 | 4,283 | 1,327 |
| 1986 | 4,025 | 1,735 |
| 1987 | 2,524 | 1,348 |
| 1988 | 2,110 | 791 |
| 1989 | 1,693 | 1,290 |
| 1990 | 2,817 | 691 |
| 1991 | 2,494 | 706 |
| 1992 | 2,784 | 825 |
| 1993 | 2,261 | 1,351 |
| 1994 | 3,769 | 2,216 |
| 1995 | 3,893 | 2,443 |
| 1996 | 5,003 | 2,480 |
| 1997 | 5,061 | 2,397 |
| 1998 | 2,522 | 2,065 |
| 1999 | 3,862 | 2,842 |
| 2000 | 2,422 | 1,524 |
| 2001 | 2,747 | 1,893 |
| 2002 | 1,439 | 1,281 |
| 2003 | 3,522 | 1,668 |
| 2004 | 2,513 | 1,407 |
| 2005 | 3,921 | 1,461 |
| Average | 3,381 | 1,522 |
| 2005 | 3,921 | 1,461 |
| % Change in 2005 from: | | |
| 2004 | + 56 | + 4 |
| Long term Average | + 16 | – 4 |

[a] No comparable survey data available for the north-central U.S. during 1961-73.

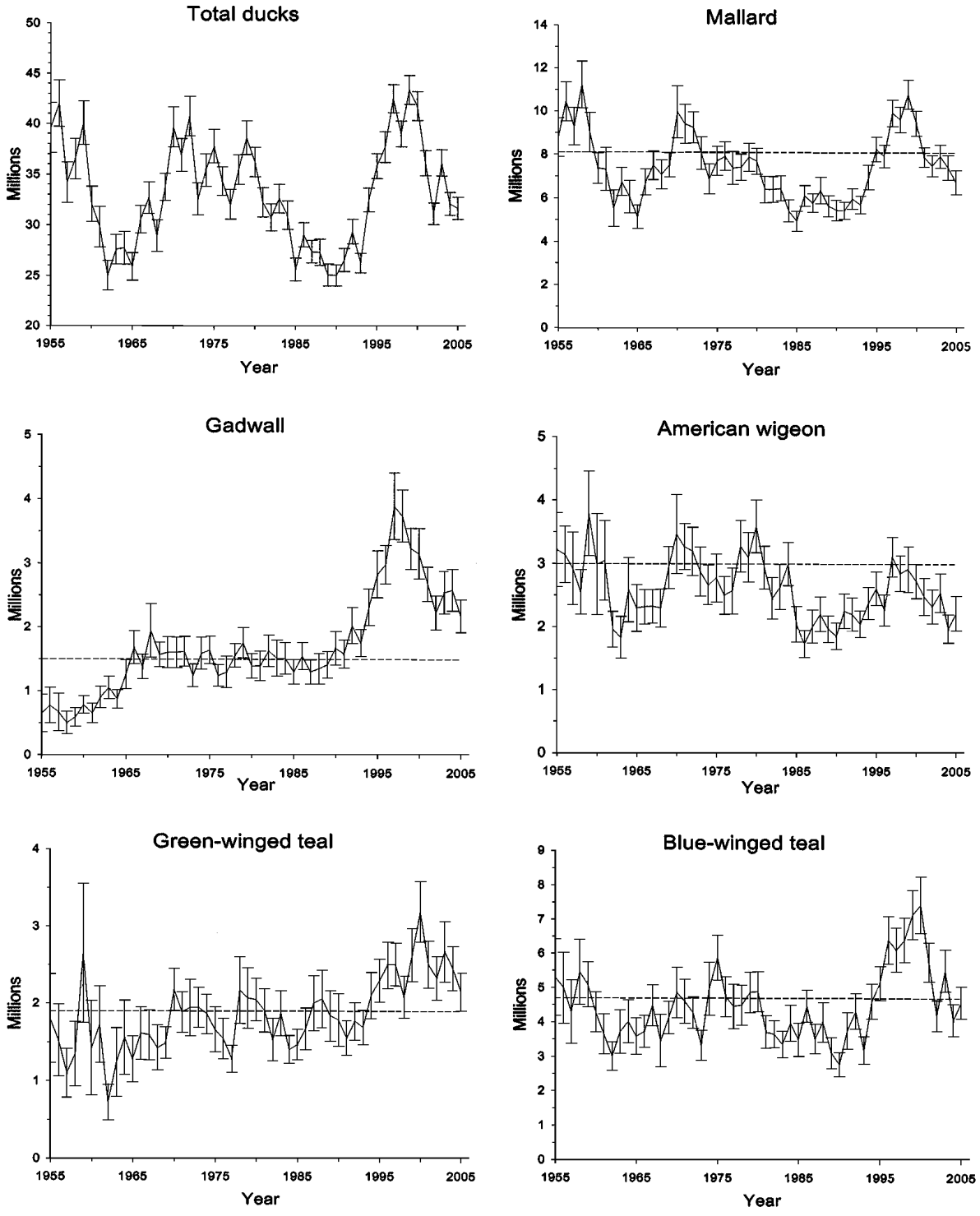


Figure 2. Estimates of North American breeding populations, 95% confidence intervals, and North American Waterfowl Management Plan population goal (dashed line) for selected species and number of water areas in May in Prairie Canada and Northcentral U.S. (from: U.S. Fish and Wildlife Service. 2005. Waterfowl population status, 2005. U.S. Department of the Interior, Washington, D.C. U.S.A.)

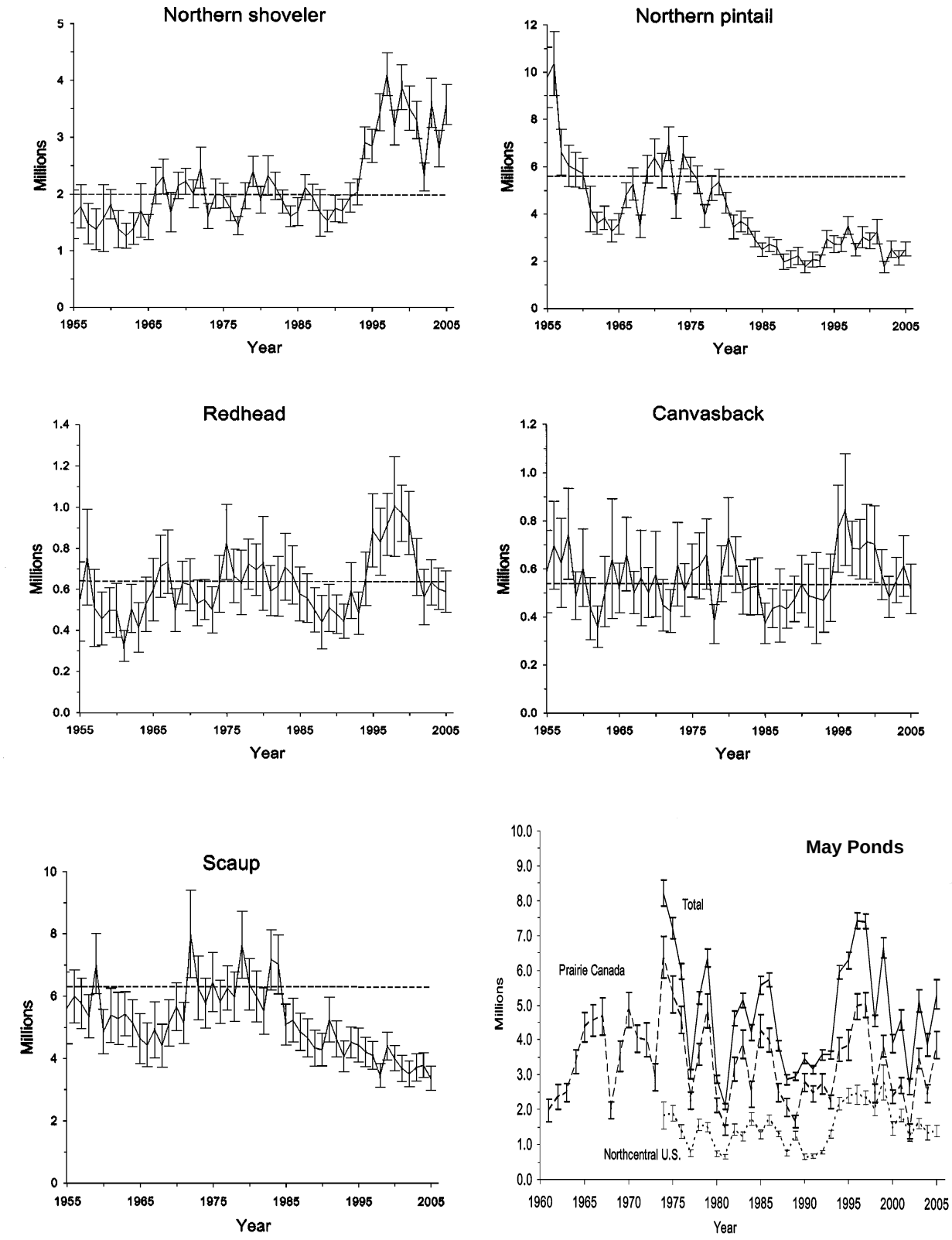


Figure 2. (Continued).

# Minnesota Spring Canada Goose Survey, 2005

Stephen Maxson, Wetland Wildlife Populations & Research Group

## INTRODUCTION

This report presents results from the fifth year of a spring helicopter survey of resident Canada geese in Minnesota. The purpose of the survey is to produce a statewide population estimate with 95% Confidence Intervals.

## METHODS

The state was divided into three ecoregions (Prairie Parkland, Eastern Broadleaf Forest/Tallgrass Aspen Parklands, Laurentian Mixed Forest) hereafter referred to as Prairie, Transition, and Forest. The 7 county Metro area was excluded from the Transition ecoregion. Similarly, Lake and Cook Counties plus the Boundary Waters Canoe Area were excluded from the Forest ecoregion. Within each ecoregion, 900 - ¼ section plots were randomly selected using ArcView.

The 900 plots in each ecoregion were divided into 3 strata based on habitat quality for resident geese. The 3 strata were defined as follows: 1) not nesting habitat – expect no geese, 2) limited nesting habitat – expect 1 or 2 pairs, 3) prime nesting habitat – expect 3 or more pairs. Stratification was based on National Wetland Inventory data and was done using ArcView. Strata were separated based on the total acres of type 3, 4, and 5 wetlands and rivers on the plot as described below:

Prairie

| | |
|---|---|
| No geese = | Type 3-4-5 <0.5 acres and rivers <10 acres or plot is all water. (n = 476 plots). |
| 1-2 pairs = | Type 3-4-5 > 0.5 acres but Type 3 <15 acres or Type 3-4-5 <0.5 acres and rivers >10 acres. (n = 344 plots). |
| 3+ pairs = | Type 3 >15 acres, but plot is not all water. (n = 80 plots). |

Transition

| | |
|---|---|
| No geese = | Type 3-4-5 <1 acre and rivers <8 acres or plot is all water. (n = 377 plots). |
| 1-2 pairs = | Type 3-4-5 = 1-25 acres or Type 3-4-5 >25 acres, but Type 3 <15 acres or Type 3-4-5 <1 acre and rivers >8 acres. (n = 428 plots). |
| 3+ pairs = | Type 3-4-5 >25 acres, but Type 3 >15 acres and plot is not all water. (n = 95 plots). |

Forest

| | |
|---|---|
| No geese = | Type 3-4-5 <2 acres and rivers <2 acres or plot all water. (n = 510 plots). |
| 1-2 pairs = | Type 3-4-5 >2 acres, but not all water or Type 3-4-5 <2 acres and rivers >2 acres. (n = 390 plots). |
| 3+ pairs = | None. |

Plots in the No geese strata are not flown. Each year 30 plots are randomly selected in each of the 5 remaining strata and these 150 plots are surveyed at low level using a helicopter. Ideally, the survey should be conducted during mid-incubation.

Pilot John Heineman and I flew the survey 20-24 April, 28-29 April and 2-3 May, 2005. Canada geese seen within plot boundaries were recorded as singles, pairs, and groups. We also recorded whether

singles and pairs were observed with a nest. The number of singles was doubled when the total number of geese per plot was calculated (unless 2 singles were observed to associate as a pair after being flushed).

## RESULTS AND DISCUSSION

The total population estimate for 2005 was 320,754 (±90,541). Adding 17,500 for the Twin Cities metro area (Cooper 2004) yields a statewide estimate of **338,254** (Table 1). Confidence Intervals were 28.2% of the estimate which is near the target of 25.0%. The survey tallied 33.0% singles (after doubling, as noted above), 50.2% pairs, and 16.8% groups (Table 2). Typically, many of the pairs seen on this survey are not associated with nests and are likely nonbreeders. An index to nesting effort (i.e., "Productive Geese") can be obtained by combining singles (after doubling) and pairs associated with nests. In 2005, 40.7% of the geese seen were classified as Productive Geese (Table 2). While confidence intervals overlap among years, a linear trend line applied to these data suggests the population has been increasing over the 5 years of this survey (Figure 1).

Type 1 wetlands were few and scattered during the survey. However, water levels in Type 3, 4 and 5 wetlands appeared to be about normal. Barring extensive nest flooding, I would expect average to above-average Canada goose production in 2005.

## ACKNOWLEDGEMENTS

Frank Martin (Univ. of MN) was instrumental in designing the survey. Tim Loesch, Christopher Pouliot, and Shelly Buitenwerf set up the original 2,700 - ¼ section plots using ArcView and were very helpful in getting the survey up and running in 2001. Shelly Buitenwerf provided GPS coordinates of plots to the pilot, and printed out maps of the 150 plots flown this year. John Giudice wrote the SAS program that analyzes the survey data.

## BIBLIOGRAPHY

Cooper, J. 2004. Canada goose program report 2004. Unpublished report. 20 pp.

Table 1. Spring Canada goose population estimates in Minnesota, 2001-2005.

| Year | Prairie | Transition | Forest | Subtotal | 95% CI | Metro | **TOTAL** |
|---|---|---|---|---|---|---|---|
| 2001 | 77,360 | 95,470 | 92,390 | 265,220 | 69,500 | 20,000 | **285,220** |
| 2002 | 135,850 | 144,900 | 33,940 | 314,690 | 134,286 | 20,000 | **334,690** |
| 2003 | 106,520 | 121,290 | 56,420 | 284,230 | 78,428 | 20,000 | **304,230** |
| 2004 | 128,501 | 130,609 | 95,636 | 354,747 | 107,303 | 20,000 | **374,747** |
| 2005 | 113,939 | 149,286 | 57,529 | 320,754 | 90,541 | 17,500 | **338,254** |

Table 2. Proportions of Canada Geese seen as singles, pairs, groups, and productive geese on the Minnesota Spring Canada Goose Survey, 2001-2005.

| Year | Singles[1] | Pairs[1] | Groups | Productive Geese[2] |
|---|---|---|---|---|
| 2001 | 27.0 | 63.9 | 9.1 | 36.4 |
| 2002 | 30.7 | 52.0 | 17.2 | 41.5 |
| 2003 | 27.9 | 58.2 | 13.9 | 29.3 |
| 2004 | 26.5 | 57.5 | 16.0 | 35.5 |
| 2005 | 33.0 | 50.2 | 16.8 | 40.7 |

[1]Numbers of singles and pairs were doubled before calculating proportions.
[2]Productive geese equals Singles + Pairs with nests.

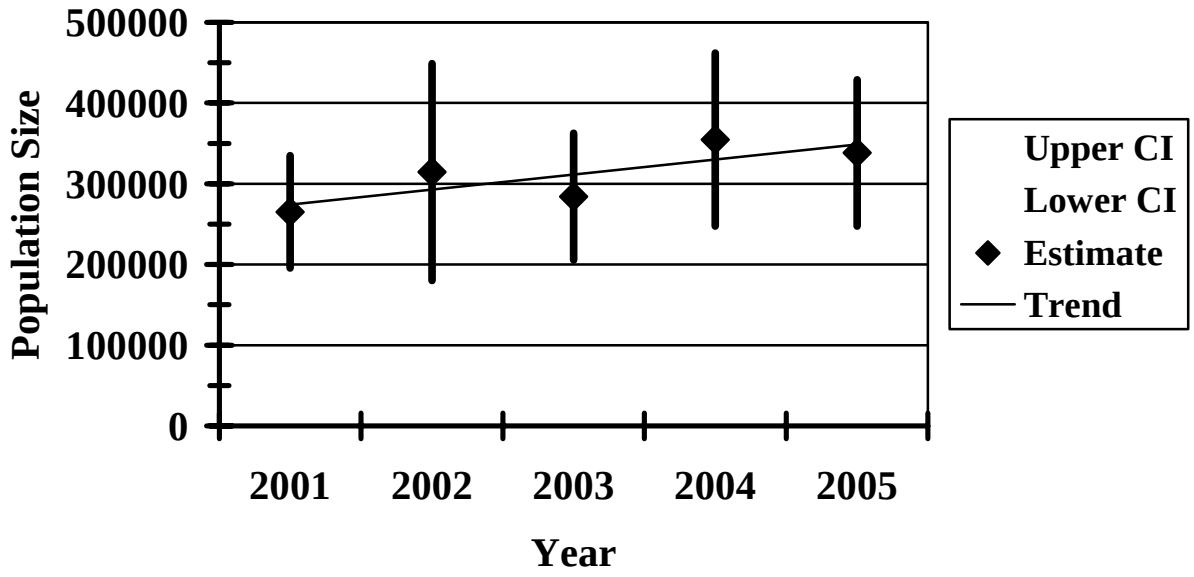


Figure 1. Spring Canada goose population estimates (±95% CI) in Minnesota, 2001-2005. (Does not include Metro area.)

The following mourning dove information is taken from the U.S. Fish and Wildlife Service report by Dolton, D.D. and R.D. Rau. 2005. Mourning dove population status, 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp. The entire report is available on the Division of Migratory Bird Management home page (http://migratorybirds.fws.gov ).

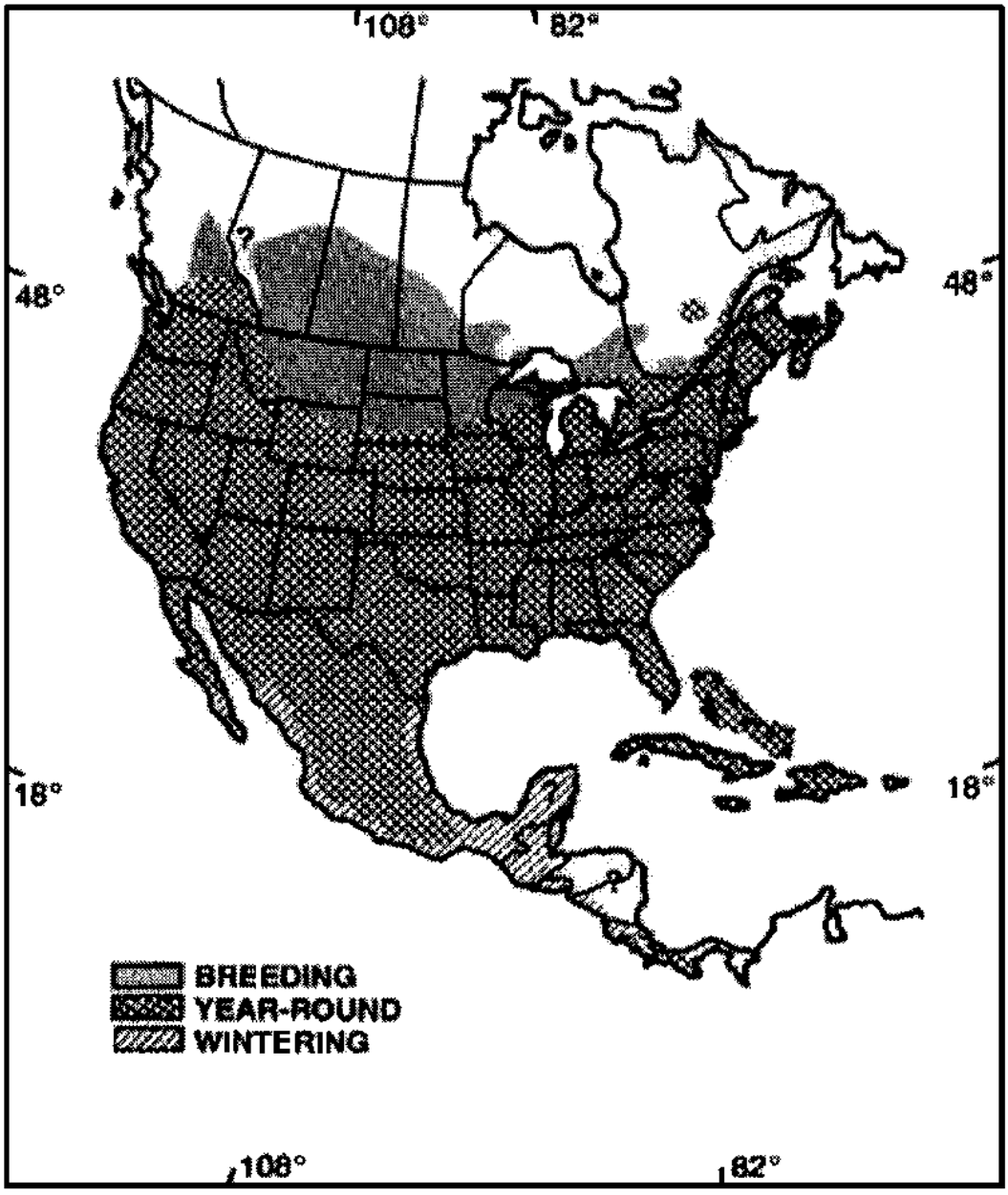


Figure 1. Breeding and wintering ranges of the mourning dove (adapted from Mirarchi and Baskett 1994). From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp.

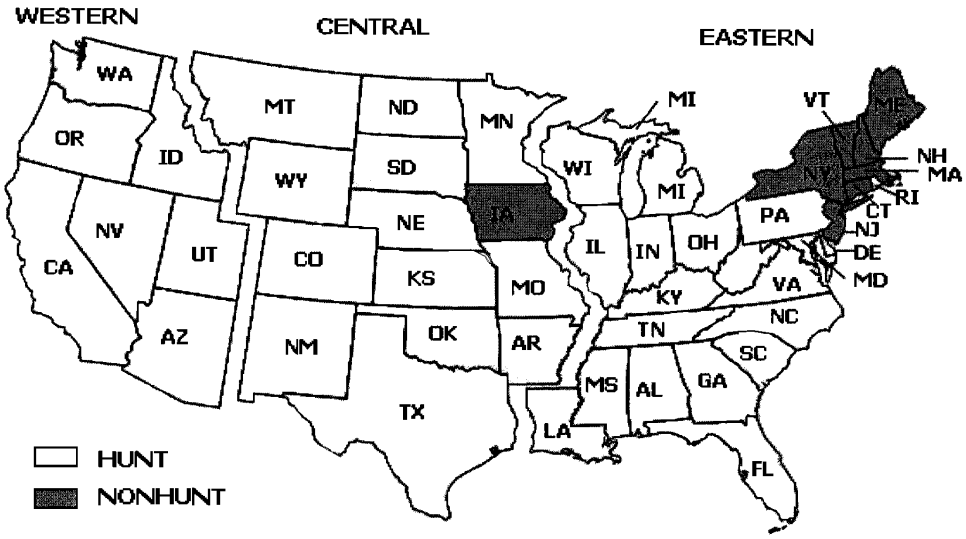


Figure 2. Mourning dove management units with 2004 hunting and nonhunting states. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

Table 1. Preliminary estimates of the number of hunters, days hunted, and total bag from Harvest Information Program surveys for the 2004-05 season. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

| Management unit / State | Hunters | Days Hunted | Birds bagged |
|---|---|---|---|
| | | | |
| CENTRAL | 512,500 | 1,844,300 ± 8% | 9,807,700 ± 8% |
| AR | 37,900 ± 13% | 114,000 ± 21% | 740,600 ± 19% |
| CO | 19,400 ± 8% | 54,800 ± 19% | 299,900 ± 16% |
| KS | 35,800 ± 10% | 119,300 ± 13% | 689,400 ± 13% |
| MN | 13,700 ± 20% | 61,100 ± 50% | 107,000 ± 42% |
| MO | 41,600 ± 9% | 128,800 ± 17% | 775,900 ± 30% |
| MT | 2,600 ± 31% | 11,300 ± 99% | 20,900 ± 44% |
| NE | 19,100 ± 11% | 71,400 ± 14% | 365,900 ± 15% |
| NM | 9,900 ± 15% | 42,000 ± 19% | 302,800 ± 23% |
| ND | 4,500 ± 25% | 13,000 ± 24% | 57,500 ± 32% |
| OK | 27,100 ± 9% | 94,000 ± 11% | 555,300 ± 14% |
| SD | 10,000 ± 16% | 36,700 ± 21% | 184,100 ± 26% |
| TX | 287,700 ± 9% | 1,089,200 ± 13% | 5,664,600 ± 14% |
| WY | 3,200 ± 27% | 8,700 ± 34% | 43,700 ± 46% |

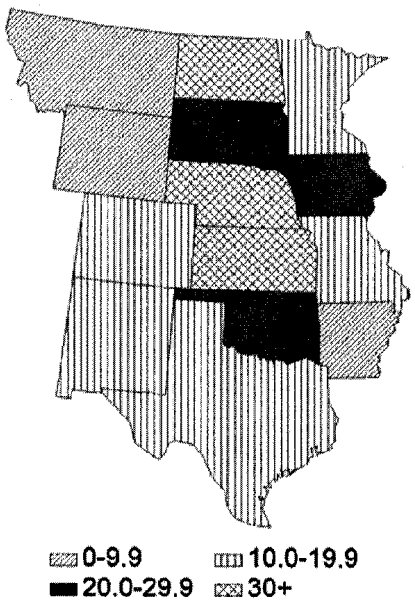


Figure 3. Mean number of mourning doves heard per route by state in the Central Management Unit, 2004-05. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

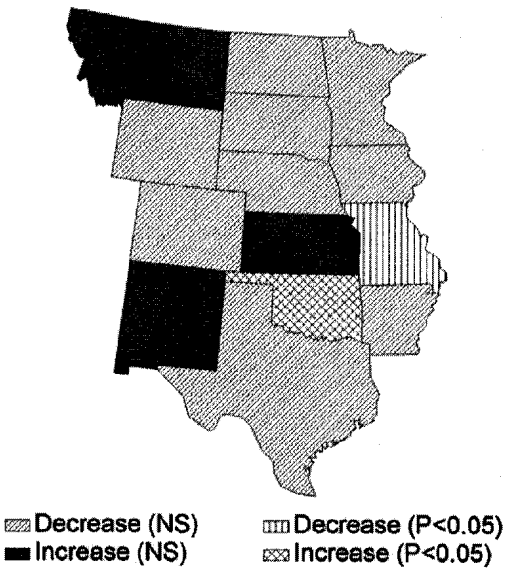


Figure 4. Trends in number of mourning doves heard per route by state in the Central Management Unit, 1996-2005. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

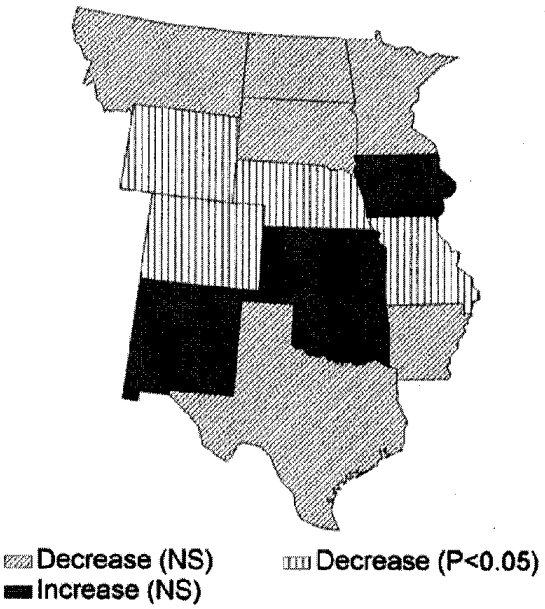


Figure 5. Trends in mourning doves heard per route by state in the Central Management Unit, 1966-2005. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

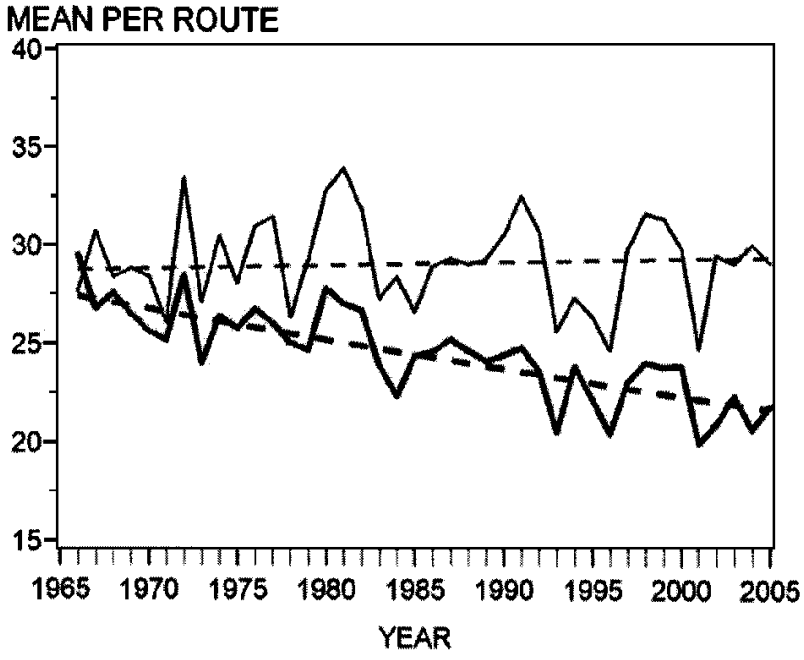


Figure 6. Population indices and trends of breeding mourning doves in the Central Management Unit, 1966-2005. Heavy solid line = doves heard; light solid line = doves seen. Light and heavy dashed lines = predicted trends. (From: Mourning dove population status, 2005. Dolton, D.D. and R.D. Rau. 2005. U.S. Fish and Wildlife Service, Laurel, Maryland, USA. 19 pp).

The following American woodcock information is taken from the U.S. Fish and Wildlife Service report American Woodcock Population Status, 2005 by James R. Kelley, Jr. and Rebecca D. Rau.
The entire report is available on the Division of Migratory Bird Management home page (http://migratorybirds.fws.gov ).

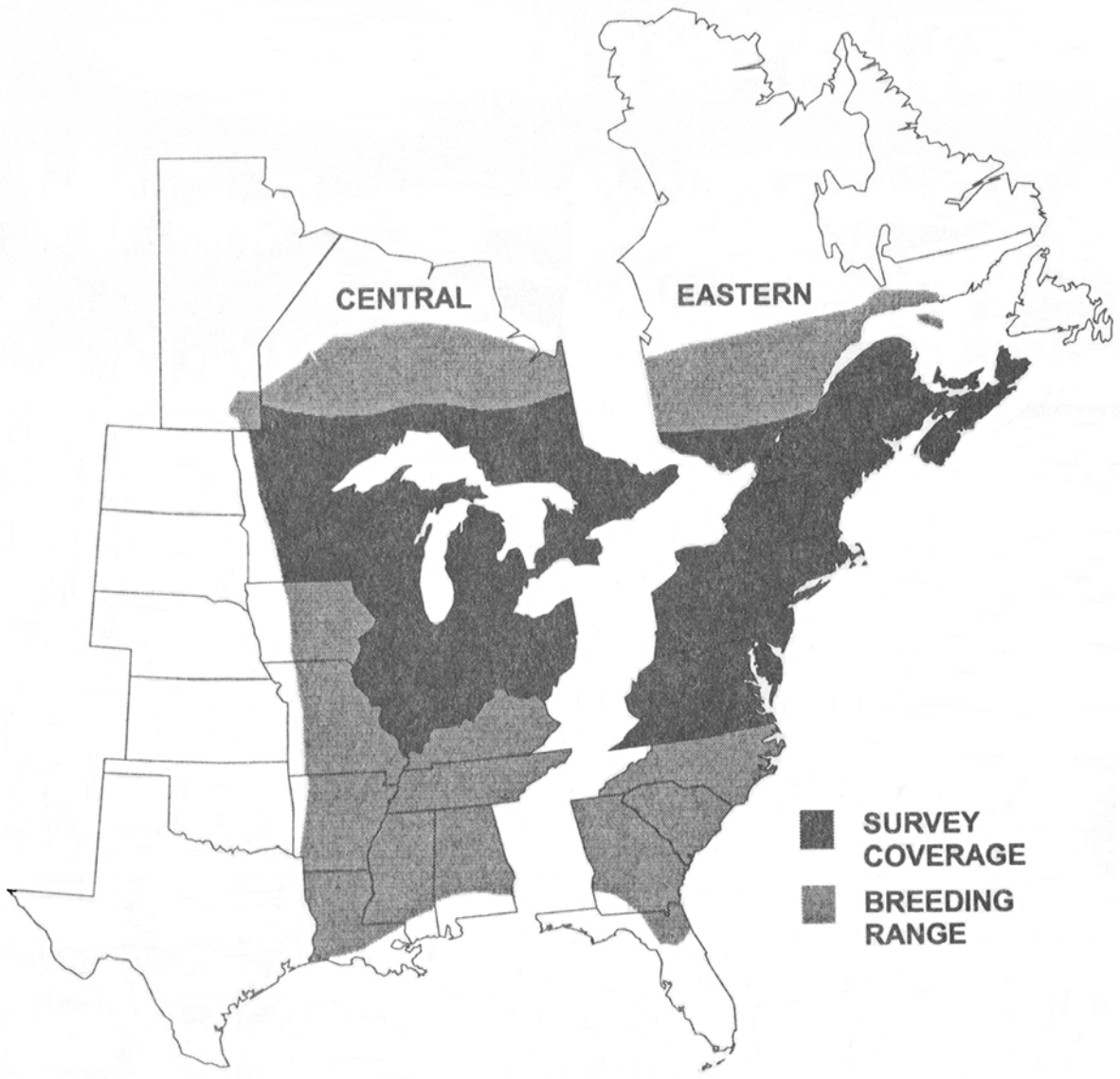


Figure 1. Woodcock management regions, breeding range, singing-ground survey coverage, (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp.)

Table 1. Trends (% change per year [a]) in number of American woodcock heard in singing-ground survey as determined by the estimating equations technique (Link and Sauer, 1994) (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Office of Migratory Bird Management, Laurel, MD. 15pp).

| Management Unit/State | 2 year N[c] | (2004-05) % Change | Routes Run[b] | 10 year N | (1995-05) % Change | 37 year N | (1968-05) % Change |
|---|---|---|---|---|---|---|---|
| CENTRAL | 205 | 5.2 | 336 | 394 | 0.1 | 625 | − 1.8*** |
| IL | 0 | | 5 | 5 | 10.9 | 25 | 25.5 |
| IN | 3 | -51.4 *** | 12 | 7 | − 3.7 | 39 | − 6.6** |
| MB[e] | 4 | 34.5 | 12 | 22 | − 0.9 | 22 | − 2.2 |
| MI | 62 | 0.3 | 93 | 110 | − 0.6 | 146 | − 1.7*** |
| MN | 55 | 12.8 | 77 | 77 | 0.4 | 101 | − 1.0** |
| OH | 11 | -36.7* | 25 | 24 | − 3.1 | 56 | − 6.2*** |
| ON | 20 | 10.3 | 43 | 75 | 2.6 | 136 | − 2.0*** |
| WI | 49 | 18.4 | 69 | 74 | − 0.3 | 100 | − 1.9*** |

[a] Mean of weighted route trends within each State, Province, or Region. 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 2004 for which data were received by 1 June.

[c] Number of comparable routes (2003 versus 2004) with at least 2 non-zero counts.

[d] Indicates slope is significantly different from zero: * $P \leq 0.10$; ** $P \leq 0.05$; *** $P \leq 0.01$; significance levels are approximate for states where $N < 10$.

[e] Manitoba began participating in the Singing-ground survey in 1990.

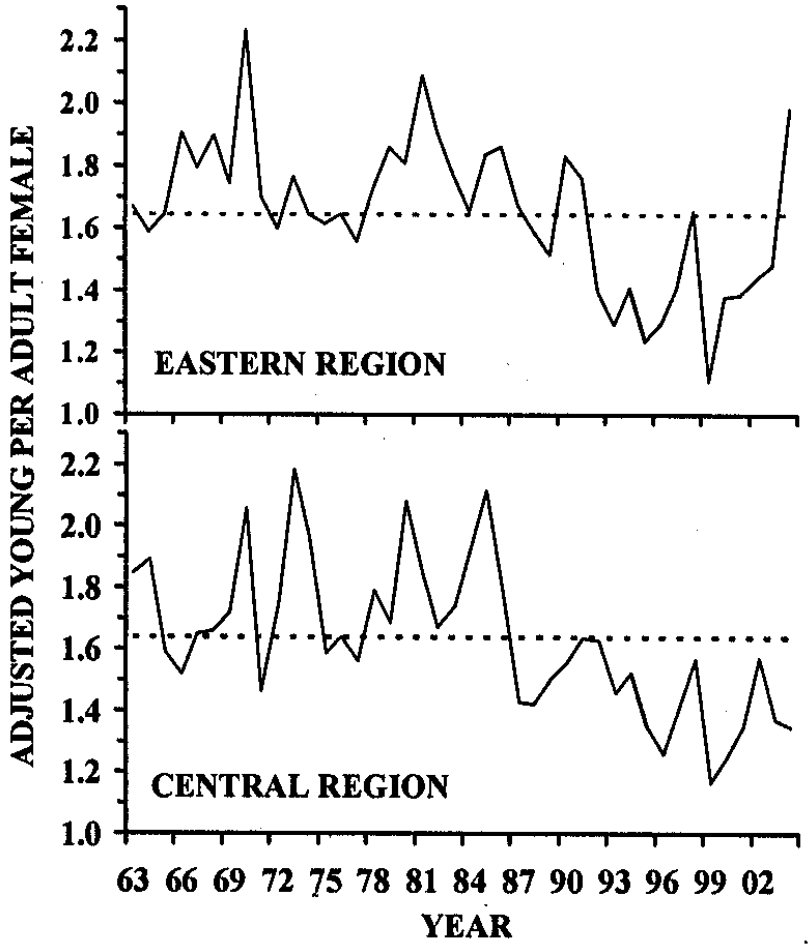


Figure 2. Adjusted index of American woodcock recruitment, 1963-2004. Dashed line is the index based on all 1963-2003 average. (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp).

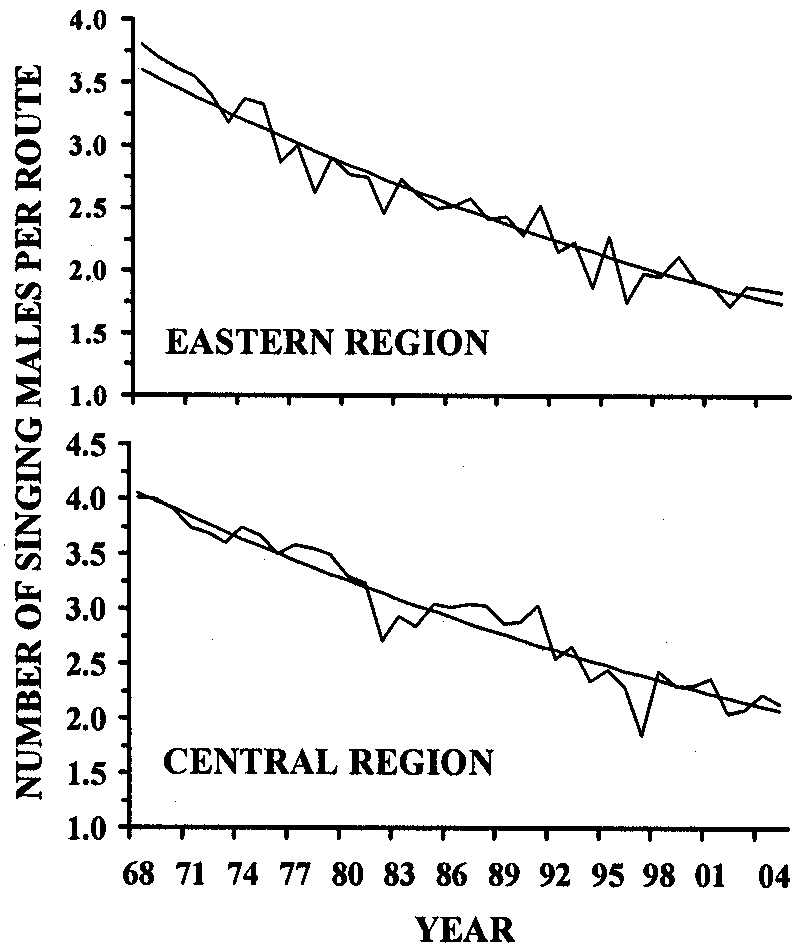


Figure 3. American woodcock singing ground survey long term trends and annual indices, 1968-2005. (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp)

Table 2. Preliminary estimates of woodcock hunter numbers, days afield, and harvest for selected states, from the 2002-03, 2003-04, and 2004-05. Harvest Information Program surveys. (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp).

| Management Unit / State | Active woodcock hunters | | | Days afield | | | Harvest | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2002-03 | 2003-04 | 2004-05 | 2002-03 | 2003-04 | 2004-05 | 2002-03 | 2003-04 | 2004-05 |
| Central Region | n.a. [a] | n.a. | n.a. | 428,200 ± 26% | 369,900 ± 16% | 366,100 ± 15% | 187,500 ± 24% | 213,500 ± 23% | 234,800 ± 20% |
| IL | 3,000 ± 90% | 2,400 ± 79% | 1,200 ± 74% | 6,400 ± 88% | 12,200 ± 112% | 3,500 ± 78% | 9,000 ± 110% | 2,200 ± 90% | 1,900 ± 96% |
| IN | 1,700 ± 114% | 700 ± 97% | 1,100 ±104% | 24,200 ± 172% | 6,000 ± 134% | 5,300 ±124% | 6,900 ± 161% | 1,800 ± 31% | 7,900 ± 145% |
| MI | 25,200 ± 18% | 35,100 ± 14% | 31,200 ± 13% | 135,400 ± 23% | 159,000 ± 18% | 147,000 ± 14% | 78,300 ± 26% | 121,500 ± 30% | 102,500 ± 21% |
| MN | 8,200 ± 66% | 14,300 ± 38% | 14,500 ± 27% | 49,300 ± 92% | 48,700 ± 43% | 67,000 ± 33% | 9,200 ± 31% | 29,900 ± 84% | 38,500 ± 53% |
| OH | 5,200 ± 108% | 3,400 ± 88% | 2,600 ± 82% | 23,200 ± 138% | 10,300 ± 86% | 18,200 ± 126% | 3,100 ± 45% | 2,500 ± 78% | 4,600 ±101% |
| WI | 17,600 ± 30% | 16,100 ± 30% | 15,700 ± 30% | 58,900 ± 26% | 65,600 ± 33% | 61,100 ± 30% | 33,900 ± 34% | 30,300 ± 35% | 47,300 ±50% |

[a] Regional estimates of hunter numbers cannot be obtained due to the occurrence of individual hunters being registered in the Harvest Information Program in more than one state.

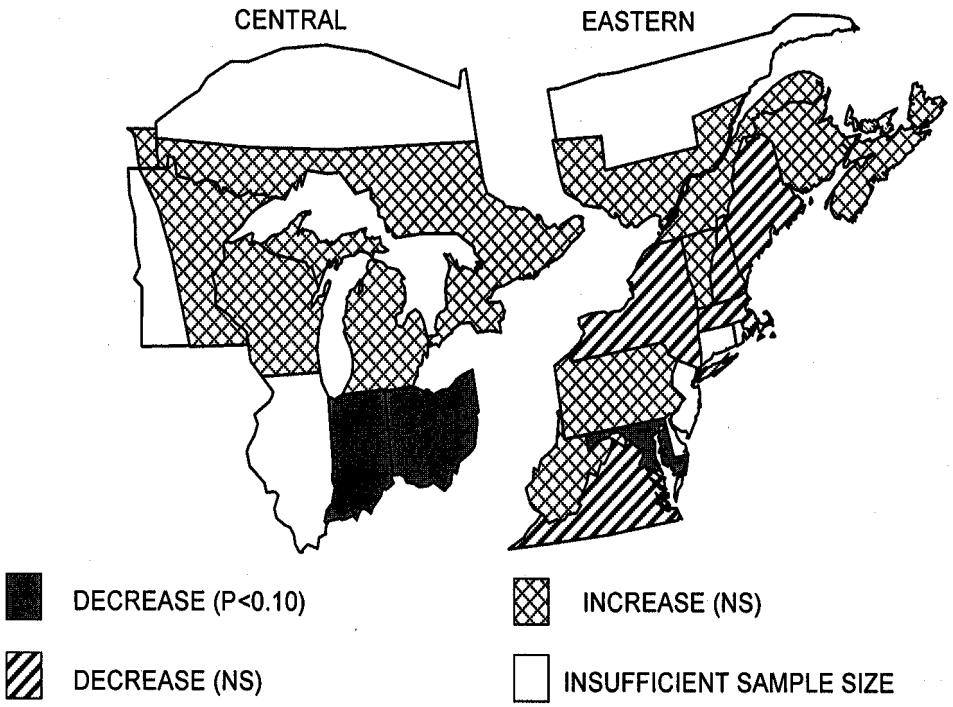


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Figure 4. Short-term trends in number of American woodcock heard on the Singing-ground Survey; 2004-05. (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp)

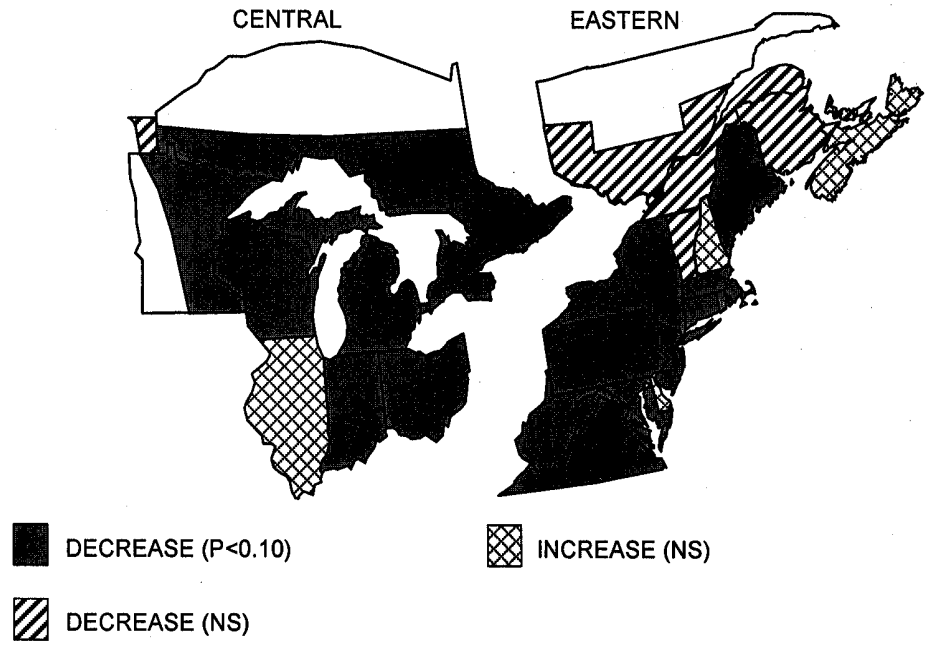


Figure 5. Long-term trends in number of American woodcock heard on the Singing-ground Survey; 1968-05. (from: Kelley, J.R., Jr., and R.D. Rau. 2005. American woodcock population status, 2005. U.S. Fish and Wildlife Service, Laurel, MD. 15pp)