

TITLE: Waterfowl Breeding Population Survey for Minnesota

STRATA SURVEYED: Minnesota Strata 1, 2, and 3

DATES: 3-16 May 2011

DATA SUPPLIED BY: Minnesota Department of Natural Resources (MNDNR)
U.S. Fish and Wildlife Service (USFWS)

Air Crew: Pilot/Observer: Tom Pfingsten, Conservation Officer Pilot
MNDNR, Division of Enforcement
Observer: Steve Cordts, Waterfowl Staff Specialist
MNDNR, Division of Wildlife

Ground Crew Leaders: Sean Kelly, Asst. Chief, Migratory Bird & Refuges
USFWS, Region III, Twin Cities
Wayne Brininger
USFWS, Tamarac National Wildlife Refuge
Dan Hertel
USFWS, HAPET, Fergus Falls
Tom Cooper, Jim Kelley, Bob Russell, and Paul Richert
USFWS, Region III, Twin Cities
Kim Bousquet
USFWS, Big Stone National Wildlife Refuge
Lizzy Berkley and Paul Soler
USFWS, Sherburne National Wildlife Refuge
Ground Crew Assistants: Jihadda Govan
USFWS, Big Stone National Wildlife Refuge
Lowell Deede and Gina Kemper
USFWS, Tamarac National Wildlife Refuge
Ron Beam and Greg Dehmer
USFWS, Sherburne National Wildlife Refuge
Ryan Drum and Seth Fisher
USFWS, HAPET, Fergus Falls

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 in addition to 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 2011 aerial survey portion was flown from 3-16 May. Spring ice-out dates were near normal this year but 2-3 weeks later than 2010. Spring temperatures were below normal in April and May and precipitation was above normal. Overall, spring wetland habitat conditions were excellent across the survey area. Wetland numbers (Types II-V) increased 33% compared to 2010 and were well above both the 10-year (+37%) and long-term (+44%) averages and were the highest count on record. The estimated numbers of temporary (Type 1) wetlands was 36% above the long-term average. The estimated mallard breeding population was 283,000, which was 17% higher than 2010 but statistically unchanged from last year's estimate of 242,000 mallards ($P = 0.49$). Mallard numbers were similar (+3%) to the 10-year average and 26% above the long-term average of 225,000 breeding mallards. The estimated blue-winged teal breeding population was 214,000, which was 61% higher than 2010 but statistically unchanged from last year's estimate

of 132,000 blue-winged teal ($P=0.38$). Blue-winged teal numbers were similar to both their 10-year (+6%) and long-term (-2%) averages. The combined population index of other ducks, excluding scaup, was 191,000, which was 22% higher than last year's estimate of 157,000, 16% below the 10-year average and 7% above the long-term average of 178,000 other ducks. Population estimates of wood duck (57,000), ring-necked duck (54,000), redhead (16,000) and gadwall (12,000) accounted for most (75%) of the total population of other ducks. The estimate of total duck abundance (687,000), which excludes scaup, was 30% higher than last year's estimate (531,000) and was 3% below the 10-year average and 11% above the long-term average of 622,000 ducks. The estimated number of Canada geese (corrected for visibility) was 156,000 and 6% higher than 2010. Based on the social status of mallards observed (number of pairs, lone males, and flocked birds), the survey timing was good and consistent with recent years. Survey timing for other ducks (e.g. blue-winged teal, ring-necked ducks) suggests that some migrants were still present in the state due to the late spring weather conditions.

METHODS: The aerial survey is based on a sampling design that includes three survey strata (Table 1, Fig. 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 Procedures for Aerial Waterfowl 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 (N605NR). 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). Data were recorded on digital voice recorders for both the pilot and observer and transcribed from the digital WAV files.

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 about 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.

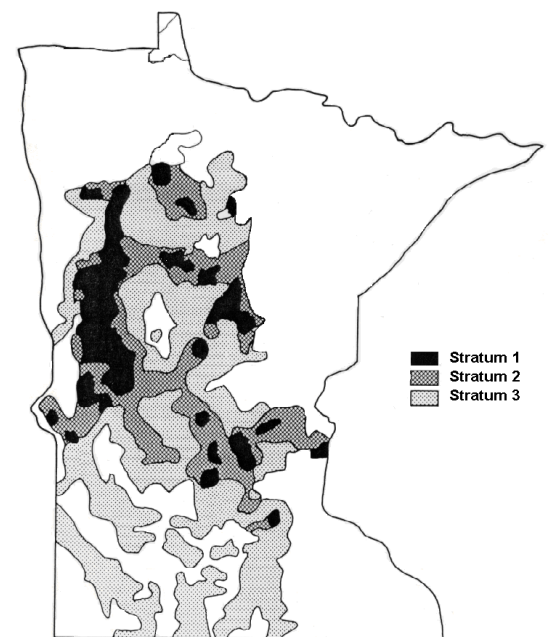


Fig. 1. Location of waterfowl breeding population survey strata in Minnesota.

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 2010 and 2011 were compared using two-tailed Z-tests.

SURVEY CHRONOLOGY: The 2011 aerial survey began on 3 May in southern Minnesota and concluded in northern Minnesota on 16 May. The survey was completed in 9 days of flight time. Transects were flown May 3-4, 6-7, 10-12, and 15-16; flights began no earlier than 7 AM and were completed by 12:00 PM each day.

WEATHER AND HABITAT CONDITIONS: Ice out on most lakes across the state was near average but 2-3 weeks later than last year. Temperatures in April averaged 0.9°F below normal statewide. April precipitation was 0.8 inches above normal statewide and ranged from 0.5 inches below normal in west central Minnesota to 1.9 inches above normal in north central Minnesota. May temperatures averaged 2.2°F below normal statewide. May precipitation was 1.1 inches above normal statewide and ranged from 0.5 inches below normal in north central and northeast Minnesota to 2.4 inches above normal in central Minnesota (<http://climate.umn.edu>). Additional temperature and precipitation data are provided in Appendix A.

In early May 2011, statewide topsoil moisture indices were rated as 56 % adequate and 44% surplus moisture. By late May, statewide indices were rated as 1% short, 65% adequate and 35% surplus moisture. For comparison, in early May 2010 statewide topsoil moisture indices were rated as 24% short or very short, 70% adequate, and 6% surplus moisture.

Planting dates for row crops were extremely late in 2011. By 1 May, only 1% of the corn acres had been planted statewide compared to 84% in 2010 and 46% for the previous 5-year average. By 29 May, only 2% of alfalfa hay had been cut compared to 44% in 2010 and a 5-year average of 21% (Minnesota Agricultural Statistics Service Weekly Crop Weather Reports, (<http://www.nass.usda.gov/mn/>)).

Wetland numbers (Type II-V) increased 33% from 2010 and were 37% above the 10-year average, 44% above the long-term average (Table 2; Fig. 2), and the highest number recorded since the survey was initiated. The number of temporary (Type 1) wetlands was 36% above the long-term average.

Leaf-out dates were 2-3 weeks later than last year, which greatly increased visibility from the air. The emergence of wetland vegetation was also much later than last year, which also improved visibility.

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 expanded for area but not corrected for visibility bias.

The 2011 breeding population estimate of mallards was 283,329 (SE = 49,845), which was unchanged from 2010 (Z = 0.69, P = 0.49) (Table 7, Fig. 3). Mallard numbers were 3% above the 10-year average and 26% above the long-term average of 225,000. In 2010, 3% of the total mallards were in flocks compared to 5% in 2010. Pairs comprised 15% of the mallards observed, compared to 12% in 2010. This suggests that the survey timing for mallards was similar to recent years based on the social status observed.

The estimated blue-winged teal population was 213,584 (SE = 88,720), which was unchanged from 2010 ($Z = 0.88$, $P = 0.38$). Blue-winged teal numbers were 6% above the 10-year average and 2% below the long-term average (Table 7, Fig. 4). Pairs comprised 44% of the blue-winged teal observed. Lone males comprised 9% of the blue-winged teal and flocks comprised 47% of the blue-winged teal observed. In 2010, 21% of the blue-winged teal observed were in flocks. The social structure of blue-winged teal (e.g. more birds observed in flocks) this year was influenced by a few large flocks of blue-winged teal counted during the first 2 days of the survey.

Other duck numbers (excluding scaup) were 191,000, which was 22% higher than last year's estimate of 157,000 and 16% below the 10-year average and 7% above the long-term average (Table 7, Fig. 5). Population estimates of wood duck (57,000), ring-necked duck (54,000), redhead (16,000) and gadwall (12,000) accounted for most (75%) of the total population of other ducks. Scaup numbers were higher than last year but 40% below the 10-year average, indicating most scaup had already migrated through the state before the survey began.

The total duck population index, excluding scaup, was 687,000, which was 30% higher than last year's index of 531,000 ducks but similar (-3%) to the 10-year average and 11% above the long-term average (Table 7, Fig. 6).

Visibility Correction Factors (VCFs) for mallards, blue-winged teal, and other ducks were similar to 2010 (Table 7). The mallard VCF (2.77) was 4% above the 10-year average. The blue-winged teal VCF (3.46) was 17% below the 10-year average. The VCF for other ducks (2.39) was 34% lower than the 10-year average.

Canada goose numbers (uncorrected for visibility) decreased 8% compared to 2010 but remained 36% above the long-term average (Table 7). The VCF for Canada geese was 2.57 and similar to the long-term average of 2.37. The population estimate of Canada geese (adjusted for visibility) was 156,000, which was 4% below the long-term average of 162,000 geese (Table 7, Fig. 7). A total of 10 Canada goose broods were observed, which was the fewest number observed in the past 5 years.

The estimated coot population, uncorrected for visibility, was 4,000 in 2011 compared to 700 in 2010.

The number of swans (likely all trumpeters) counted was a record high this year as breeding swan populations continue to increase and expand across the survey area.

SUMMARY: Overall wetland conditions were excellent. Mallard abundance in 2011 (283,000) was similar to 2010 (242,000). Mallard numbers were 26% above the long-term average (225,000) and similar to the 10-year average. Blue-winged teal abundance (214,000) was 61% higher than 2010 (132,000) but near the 10-year average and the long-term average (219,000). The combined population index of other ducks (191,000) was 22% higher than 2010 and 7% above the long-term average. Total duck abundance (687,000), excluding scaup, was 30% higher than 2010 (531,000) and was 3% below the 10-year average and 11% above the long-term average. Canada goose numbers, adjusted for visibility bias, increased 6% from 2010.

ACKNOWLEDGMENTS: Thanks to the ground crews and the pilot for all of their efforts.

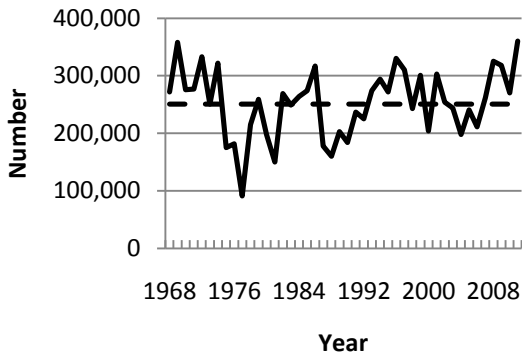


Fig. 2. Number of May ponds (Types II-V) and long-term average (dashed line) in Minnesota, 1968-2011.

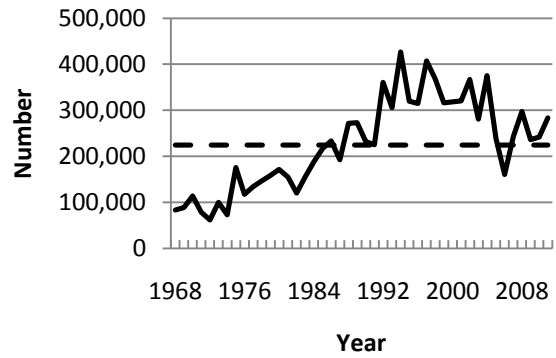


Fig. 3. Mallard population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011.

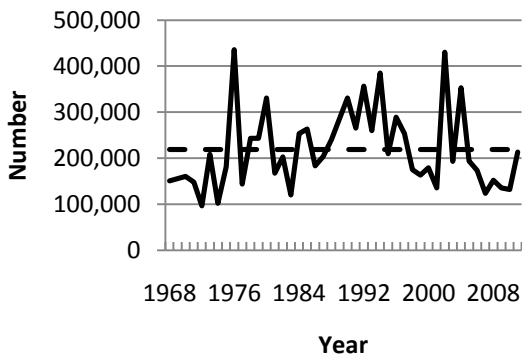


Fig. 4. Blue-winged teal population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011.

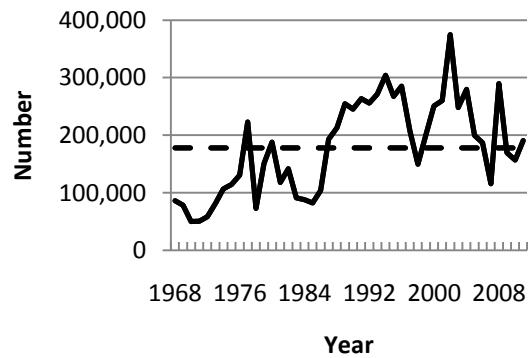


Fig. 5. Other duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011

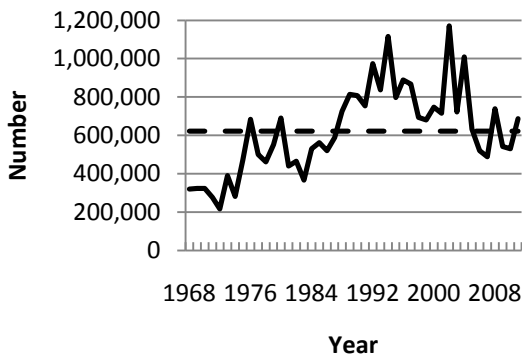


Fig. 6. Total duck (excluding scaup) population estimates (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1968-2011

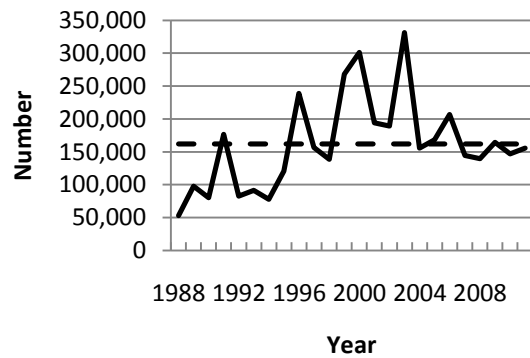


Fig. 7. Canada goose population (adjusted for visibility bias) and long-term average (dashed line) in Minnesota, 1988-2011.

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Table 1. Survey design for Minnesota, May 2011.¹

| | Stratum | | | Total |
|-------------------------------------|---------|---------|----------|---------|
| | 1 | 2 | 3 | |
| <u>Survey design</u> | | | | |
| 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 | |
| <u>Current year coverage</u> | | | | |
| 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 May ponds (Type 1 and Types II-V), 1968-2011.

| | 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 |
| | 2006 | 56,798 | 211,000 |
| | 2007 | 32,415 | 262,000 |
| | 2008 | 69,734 | 325,000 |
| | 2009 | 39,078 | 318,000 |
| | 2010 | 26,880 | 270,000 |
| | 2011 | 89,218 | 360,000 |
| Averages: | 10-year | 39,621 | 263,000 |
| | Long-term | 65,518 | 251,000 |
| % change from: | 2010 | 232% | 33% |
| | 10-year | 125% | 37% |
| | Long-term | 36% | 44% |

¹ Type II-V, correction factor from 1989 (123,000/203,000=0.606) used to adjust 1968-88 pond numbers.

Table 3. Minnesota waterfowl breeding populations by species for Stratum I (high wetland density), expanded for area but not visibility, 1993-2011.

| Species | Year | | | | | | | | | | | | | | | | | | |
|--------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Dabblers: | | | | | | | | | | | | | | | | | | | |
| Mallard | 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 | 16,829 | 16,357 | 25,104 | 19,467 | 18,439 | 19,856 |
| Black Duck | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gadwall | 778 | 444 | 1,055 | 1,083 | 611 | 1,111 | 1,777 | 833 | 1,333 | 944 | 1,250 | 2,111 | 1,166 | 1,444 | 889 | 1,166 | 1,055 | 1,000 | 167 |
| American Wigeon | 0 | 0 | 194 | 0 | 0 | 56 | 56 | 56 | 111 | 0 | 56 | 555 | 167 | 0 | 56 | 111 | 56 | 56 | 111 |
| Green-winged Teal | 111 | 278 | 0 | 278 | 56 | 333 | 0 | 278 | 56 | 278 | 222 | 444 | 56 | 56 | 167 | 278 | 167 | 56 | 56 |
| Blue-winged Teal | 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 | 5,665 | 5,332 | 9,942 | 5,998 | 7,304 | 4,665 |
| Northern Shoveler | 111 | 278 | 111 | 1,277 | 1,500 | 500 | 555 | 1,055 | 305 | 1,277 | 278 | 1,166 | 333 | 167 | 56 | 1,000 | 666 | 1,027 | 111 |
| Northern Pintail | 611 | 167 | 167 | 167 | 111 | 111 | 167 | 167 | 389 | 56 | 111 | 56 | 0 | 56 | 0 | 56 | 56 | 0 | 111 |
| Wood Duck | 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 | 3,555 | 2,666 | 6,665 | 4,277 | 3,999 | 3,416 |
| Dabbler Subtotal | 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 | 27,772 | 25,523 | 44,322 | 31,742 | 31,881 | 28,493 |
| Divers: | | | | | | | | | | | | | | | | | | | |
| Redhead | 1,416 | 1,972 | 639 | 722 | 778 | 944 | 500 | 583 | 1,444 | 750 | 333 | 805 | 666 | 666 | 916 | 1,389 | 472 | 944 | 805 |
| Canvasback | 2,777 | 3,166 | 3,860 | 1,166 | 1,333 | 1,777 | 2,971 | 1,222 | 2,027 | 1,833 | 1,333 | 666 | 972 | 833 | 1,000 | 2,277 | 1,333 | 1,222 | 833 |
| Scaup | 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 | 111 | 555 | 6,276 | 8,553 | 2,777 | 2,222 |
| Ring-necked Duck | 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 | 2,055 | 1,555 | 21,494 | 6,859 | 3,138 | 4,804 |
| Goldeneye | 111 | 222 | 111 | 167 | 0 | 111 | 56 | 56 | 333 | 111 | 0 | 222 | 222 | 56 | 222 | 278 | 278 | 222 | 56 |
| Bufflehead | 0 | 444 | 56 | 278 | 0 | 56 | 111 | 56 | 111 | 222 | 111 | 389 | 167 | 222 | 56 | 1,611 | 833 | 389 | 278 |
| Ruddy Duck | 1,250 | 639 | 167 | 139 | 528 | 11,052 | 972 | 0 | 83 | 1,305 | 417 | 305 | 1,222 | 305 | 0 | 1,027 | 861 | 28 | 56 |
| Hooded Merganser | 222 | 111 | 278 | 611 | 555 | 389 | 722 | 500 | 722 | 555 | 333 | 278 | 333 | 555 | 111 | 666 | 944 | 555 | 500 |
| Large Merganser | 0 | 56 | 0 | 0 | 56 | 0 | 0 | 0 | 111 | 0 | 972 | 0 | 111 | 0 | 278 | 333 | 333 | 333 | 111 |
| Diver Subtotal | 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 | 4,803 | 4,693 | 35,351 | 20,466 | 9,608 | 9,665 |
| Total Ducks | 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 | 32,575 | 30,216 | 79,673 | 52,208 | 41,489 | 38,158 |
| Other: | | | | | | | | | | | | | | | | | | | |
| Coot | 1,166 | 528 | 611 | 3,055 | 5,054 | 555 | 83 | 3,999 | 1,722 | 2,888 | 2,666 | 21,411 | 2,444 | 639 | 139 | 16,829 | 2,166 | 139 | 2,194 |
| Canada Goose | 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 | 21,633 | 29,797 | 18,717 | 16,523 | 16,440 | 13,691 |

Table 4. Minnesota waterfowl breeding populations by species for Stratum II (medium wetland density), expanded for area but not visibility, 1993-2011.

| Species | Year | | | | | | | | | | | | | | | | | | |
|--------------------|--------|--------|--------|---------|---------|--------|--------|---------|--------|--------|--------|---------|--------|--------|--------|--------|--------|--------|--------|
| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Dabblers: | | | | | | | | | | | | | | | | | | | |
| Mallard | 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 | 25,130 | 24,779 | 27,935 | 23,494 | 21,507 | 30,974 |
| Black Duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gadwall | 1,286 | 1,403 | 1,052 | 935 | 468 | 584 | 1,519 | 3,039 | 1,636 | 701 | 584 | 3,565 | 584 | 1,052 | 234 | 3,039 | 1,169 | 1,286 | 935 |
| American Wigeon | 0 | 117 | 0 | 468 | 351 | 818 | 0 | 468 | 0 | 0 | 0 | 2,513 | 117 | 0 | 0 | 351 | 0 | 351 | 0 |
| Green-winged Teal | 351 | 117 | 0 | 935 | 234 | 351 | 117 | 117 | 117 | 468 | 234 | 234 | 0 | 117 | 0 | 0 | 234 | 117 | 0 |
| Blue-winged Teal | 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 | 9,000 | 8,416 | 12,740 | 11,104 | 8,474 | 12,390 |
| Northern Shoveler | 1,286 | 935 | 818 | 1,636 | 2,571 | 701 | 2,104 | 4,675 | 1,052 | 2,221 | 1,403 | 1,753 | 234 | 584 | 351 | 468 | 701 | 2,513 | 1,052 |
| Northern Pintail | 351 | 468 | 234 | 117 | 234 | 468 | 117 | 117 | 117 | 0 | 117 | 0 | 0 | 0 | 234 | 0 | 0 | 0 | 234 |
| Wood Duck | 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 | 1,753 | 2,221 | 6,546 | 5,260 | 6,312 | 6,955 |
| Dabbler subtotal | 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 | 37,636 | 36,235 | 51,079 | 41,962 | 40,560 | 52,540 |
| Divers: | | | | | | | | | | | | | | | | | | | |
| Redhead | 2,279 | 3,799 | 1,403 | 1,110 | 1,987 | 935 | 1,636 | 2,805 | 2,455 | 234 | 584 | 1,110 | 292 | 175 | 935 | 935 | 584 | 760 | 1,578 |
| Canvasback | 584 | 1,052 | 0 | 234 | 701 | 117 | 117 | 935 | 0 | 468 | 1,052 | 234 | 0 | 0 | 1,169 | 468 | 234 | 117 | 584 |
| Scaup | 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 | 468 | 643 | 3,097 | 2,104 | 0 | 1,929 |
| Ring-necked Duck | 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 | 3,331 | 1,578 | 13,149 | 9,117 | 2,396 | 11,455 |
| Goldeneye | 584 | 701 | 701 | 1,753 | 818 | 234 | 935 | 584 | 468 | 234 | 234 | 351 | 117 | 117 | 0 | 351 | 584 | 468 | 468 |
| Bufflehead | 117 | 234 | 0 | 117 | 117 | 0 | 0 | 0 | 0 | 1,169 | 117 | 468 | 351 | 117 | 117 | 1,403 | 818 | 643 | 1,403 |
| Ruddy Duck | 3,390 | 409 | 117 | 58 | 117 | 0 | 468 | 0 | 0 | 1,870 | 2,688 | 0 | 351 | 58 | 0 | 0 | 175 | 409 | 58 |
| Hooded Merganser | 584 | 468 | 117 | 234 | 468 | 117 | 701 | 935 | 1,403 | 701 | 701 | 234 | 234 | 351 | 234 | 584 | 701 | 117 | 2,221 |
| Large Merganser | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 117 | 0 | 0 | 234 | 351 | 0 | 0 | 351 | 0 | 0 | 234 |
| Diver subtotal | 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 | 4,617 | 4,676 | 20,338 | 14,317 | 4,910 | 19,930 |
| Total Ducks | 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 | 42,253 | 40,911 | 71,417 | 56,279 | 45,470 | 72,470 |
| Other: | | | | | | | | | | | | | | | | | | | |
| Coot | 5,201 | 1,461 | 526 | 7,013 | 5,026 | 643 | 234 | 1,110 | 468 | 4,909 | 1,519 | 8,007 | 584 | 292 | 409 | 23,961 | 0 | 117 | 292 |
| Canada Goose | 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 | 26,825 | 25,890 | 19,753 | 22,675 | 18,935 | 14,201 |

Table 5. Minnesota waterfowl breeding populations by species for Stratum III (low wetland density), expanded for area but not visibility, 1993-2011.

| Species | Year | | | | | | | | | | | | | | | | | | | |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|--------|---------|--------|--------|--------|---------|--------|--------|---------|--|
| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | |
| Dabblers: | | | | | | | | | | | | | | | | | | | | |
| Mallard | 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 | 30,884 | 35,843 | 50,371 | 35,408 | 40,976 | 51,415 | |
| Black Duck | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 174 | 0 | 0 | 174 | 174 | 0 | 0 | 0 | |
| Gadwall | 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 | 5,568 | 4,176 | 870 | 1,392 | 1,392 | 4,089 | |
| American Wigeon | 348 | 1,218 | 0 | 1,044 | 348 | 696 | 0 | 522 | 174 | 1,218 | 174 | 1,566 | 1,044 | 174 | 348 | 348 | 174 | 348 | 1,044 | |
| Green-winged Teal | 348 | 174 | 0 | 957 | 348 | 174 | 0 | 1,218 | 1,392 | 522 | 174 | 0 | 174 | 522 | 0 | 0 | 0 | 0 | 174 | |
| Blue-winged Teal | 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 | 23,663 | 15,659 | 18,095 | 20,183 | 16,964 | 44,716 | |
| Northern Shoveler | 1,914 | 2,784 | 5,307 | 12,701 | 11,049 | 4,176 | 4,002 | 20,444 | 10,701 | 6,264 | 870 | 3,828 | 348 | 522 | 870 | 4,002 | 2,088 | 6,873 | 2,088 | |
| Northern Pintail | 1,218 | 696 | 174 | 870 | 522 | 870 | 870 | 696 | 522 | 0 | 174 | 348 | 174 | 174 | 348 | 174 | 0 | 174 | 0 | |
| Wood Duck | 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 | 7,308 | 5,394 | 14,442 | 10,266 | 12,354 | 13,659 | |
| Dabbler subtotal | 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 | 68,815 | 62,812 | 88,476 | 69,511 | 79,081 | 117,185 | |
| Divers: | | | | | | | | | | | | | | | | | | | | |
| Redhead | 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 | 0 | 522 | 783 | 870 | 174 | 4,350 | |
| Canvasback | 348 | 696 | 174 | 1,392 | 0 | 3,306 | 174 | 3,915 | 522 | 696 | 1,131 | 2,784 | 0 | 0 | 348 | 1,566 | 1,218 | 348 | 1,044 | |
| Scaup | 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 | 1,392 | 696 | 5,481 | 1,914 | 522 | 5,133 | |
| Ring-necked Duck | 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 | 6,699 | 1,392 | 8,526 | 6,525 | 3,045 | 6,264 | |
| Goldeneye | 696 | 783 | 1,479 | 1,914 | 522 | 696 | 696 | 1,044 | 1,566 | 3,132 | 1,305 | 696 | 1,044 | 1,044 | 870 | 348 | 522 | 174 | 870 | |
| Bufflehead | 348 | 696 | 0 | 1,044 | 174 | 348 | 0 | 0 | 0 | 1,218 | 783 | 2,088 | 0 | 174 | 696 | 1,218 | 870 | 174 | 2,871 | |
| Ruddy Duck | 1,218 | 2,175 | 2,349 | 1,740 | 348 | 0 | 174 | 0 | 696 | 18,878 | 87 | 2,262 | 870 | 696 | 261 | 87 | 348 | 0 | 3,828 | |
| Hooded Merganser | 348 | 696 | 1,044 | 1,566 | 696 | 696 | 1,218 | 957 | 174 | 2,175 | 174 | 1,740 | 1,218 | 870 | 174 | 696 | 348 | 1,218 | 1,044 | |
| Large Merganser | 0 | 174 | 174 | 0 | 0 | 0 | 0 | 0 | 0 | 522 | 0 | 0 | 261 | 957 | 348 | 348 | 348 | 348 | 174 | |
| Diver subtotal | 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 | 11,832 | 5,307 | 19,053 | 12,963 | 6,003 | 25,578 | |
| Total Ducks | 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 | 80,647 | 68,119 | 107,529 | 82,474 | 85,084 | 142,763 | |
| Other: | | | | | | | | | | | | | | | | | | | | |
| Coot | 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 | 14,702 | 5,742 | 15,137 | 7,047 | 435 | 1,479 | |
| Canada Goose | 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 | 27,230 | 42,629 | 31,841 | 28,274 | 30,710 | 32,711 | |

Table 6. Minnesota waterfowl breeding populations by species for Stratum I-III combined, expanded for area coverage but not for visibility, 1993-2011.

| Species | Year | | | | | | | | | | | | | | | | | | |
|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
| Dabblers: | | | | | | | | | | | | | | | | | | | |
| Mallard | 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 | 72,843 | 76,979 | 103,411 | 78,368 | 80,922 | 102,245 |
| Black Duck | 0 | 56 | 0 | 0 | 0 | 0 | 0 | 0 | 117 | 0 | 0 | 174 | 56 | 0 | 174 | 174 | 0 | 0 | 0 |
| Gadwall | 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 | 8,064 | 5,298 | 5,075 | 3,616 | 3,677 | 5,191 |
| American Wigeon | 348 | 1,335 | 194 | 1,512 | 699 | 1,570 | 56 | 1,045 | 285 | 1,218 | 230 | 4,634 | 1,327 | 174 | 404 | 810 | 230 | 754 | 1,155 |
| Green-winged Teal | 810 | 569 | 0 | 2,170 | 638 | 858 | 117 | 1,613 | 1,564 | 1,267 | 630 | 678 | 230 | 694 | 167 | 278 | 400 | 172 | 230 |
| Blue-winged Teal | 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 | 38,328 | 29,407 | 40,777 | 37,286 | 32,742 | 61,772 |
| Northern Shoveler | 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 | 1,273 | 1,276 | 5,469 | 3,456 | 10,413 | 3,251 |
| Northern Pintail | 2,180 | 1,331 | 575 | 1,154 | 867 | 1,449 | 1,153 | 979 | 1,028 | 56 | 402 | 404 | 174 | 230 | 582 | 230 | 56 | 174 | 345 |
| Wood Duck | 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 | 12,616 | 10,281 | 27,652 | 19,802 | 22,664 | 24,029 |
| Dabbler subtotal | 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 | 134,222 | 124,568 | 183,876 | 143,214 | 151,518 | 198,218 |
| Divers: | | | | | | | | | | | | | | | | | | | |
| Redhead | 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 | 842 | 2,373 | 3,107 | 1,926 | 1,878 | 6,733 |
| Canvasback | 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 | 833 | 2,517 | 4,311 | 2,785 | 1,687 | 2,461 |
| Scaup | 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 | 1,971 | 1,894 | 14,854 | 12,571 | 3,299 | 9,283 |
| Ring-necked Duck | 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 | 12,085 | 4,525 | 43,169 | 22,501 | 8,579 | 22,523 |
| Goldeneye | 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 | 1,216 | 1,092 | 976 | 1,384 | 864 | 1,393 |
| Bufflehead | 465 | 1,374 | 56 | 1,439 | 291 | 404 | 111 | 56 | 111 | 2,609 | 1,011 | 2,944 | 517 | 513 | 868 | 4,231 | 2,521 | 1,206 | 4,551 |
| Ruddy Duck | 5,858 | 3,223 | 2,633 | 1,937 | 993 | 11,052 | 1,613 | 0 | 779 | 22,054 | 3,192 | 2,567 | 2,443 | 1,060 | 261 | 1,114 | 1,384 | 437 | 3,942 |
| Hooded Merganser | 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 | 1,776 | 519 | 1,947 | 1,993 | 1,890 | 3,765 |
| Large Merganser | 0 | 230 | 174 | 0 | 56 | 0 | 0 | 117 | 228 | 522 | 972 | 234 | 723 | 957 | 626 | 1,032 | 681 | 681 | 519 |
| Diver subtotal | 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 | 21,253 | 14,675 | 74,741 | 47,746 | 20,521 | 55,170 |
| Total Ducks | 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 | 155,475 | 139,243 | 258,617 | 190,960 | 172,039 | 253,388 |
| Other: | | | | | | | | | | | | | | | | | | | |
| Coot | 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 | 15,633 | 6,290 | 55,927 | 9,213 | 691 | 3,965 |
| Canada Goose | 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 | 75,688 | 98,316 | 70,311 | 67,473 | 66,085 | 60,603 |

Table 7. Estimated waterfowl populations in Minnesota from May breeding waterfowl survey, 1968-2011.

| Year | Mallard | | | | Blue-winged teal | | | | Other ducks (exc. scaup) | | | |
|----------------------------------|----------|------|---------|--------|------------------|------|---------|--------|--------------------------|-------|---------|------|
| | Unad. PI | VCF | PI | SE | Unad. PI | VCF | PI | SE | Unad. PI | VCF | PI | |
| 1968 | 41,030 | 2.04 | 83,701 | | 61,943 | 2.44 | 151,141 | | 41,419 | 2.08 | 86,152 | |
| 1969 | 53,167 | 1.67 | 88,789 | | 45,180 | 3.45 | 155,871 | | 34,605 | 2.27 | 78,553 | |
| 1970 | 67,463 | 1.69 | 113,945 | | 31,682 | 5.06 | 160,343 | | 30,822 | 1.62 | 49,932 | |
| 1971 | 47,702 | 1.65 | 78,470 | | 42,445 | 3.49 | 148,218 | | 29,520 | 1.71 | 50,450 | |
| 1972 | 49,137 | 1.27 | 62,158 | | 49,386 | 1.96 | 96,895 | | 34,405 | 1.69 | 58,127 | |
| 1973 | 56,607 | 1.76 | 99,832 | | 53,095 | 3.92 | 208,292 | | 33,155 | 2.45 | 81,362 | |
| 1974 | 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 | 3.30 | 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 | 3.80 | 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 | 2.90 | 265,138 | 42,057 | 93,784 | 2.81 | 263,619 | |
| 1992 | 144,126 | 2.50 | 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 | 4.40 | 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 | 2.20 | 320,560 | 39,541 | 37,706 | 3.60 | 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 | |
| 2006 | 72,843 | 2.21 | 160,715 | 24,230 | 38,328 | 4.53 | 173,674 | 60,353 | 42,333 | 4.41 | 186,719 | |
| 2007 | 76,979 | 3.15 | 242,481 | 30,020 | 29,407 | 4.20 | 123,588 | 20,055 | 30,963 | 3.73 | 115,390 | |
| 2008 | 103,411 | 2.88 | 297,565 | 27,787 | 40,777 | 3.74 | 152,359 | 24,157 | 99,575 | 2.91 | 289,629 | |
| 2009 | 78,368 | 3.02 | 236,436 | 36,539 | 37,286 | 3.63 | 135,262 | 32,155 | 62,725 | 2.70 | 169,568 | |
| 2010 | 80,922 | 2.99 | 241,884 | 33,940 | 32,742 | 4.04 | 132,261 | 27,430 | 55,076 | 2.84 | 156,599 | |
| 2011 | 102,245 | 2.77 | 283,329 | 49,845 | 61,772 | 3.46 | 213,584 | 88,720 | 79,743 | 2.39 | 190,586 | |
| Averages: 10-year (01-10) | 106,061 | 2.67 | 276,060 | 35,906 | 49,753 | 4.03 | 202,342 | 40,117 | 66,330 | 3.60 | 228,011 | |
| Long-term (1968-10) | 102,451 | 2.20 | 224,816 | 35,891 | 58,919 | 3.90 | 218,906 | 41,341 | 60,511 | 3.16 | 178,065 | |
| % change from: | 2010 | 26% | -7% | 17% | 47% | 89% | -14% | 61% | 223% | 45% | -16% | 22% |
| 10-year average | | -4% | 4% | 3% | 39% | 24% | -14% | 6% | 121% | 20% | -34% | -16% |
| Long-term average | | 0% | 26% | 26% | 39% | 5% | -11% | -2% | 115% | 32% | -24% | 7% |

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

Table 7. Cont.

| Year | Scaup | | | Total ducks (ex. scaup) | | Total Ducks | | Canada geese | | | |
|-----------------------|---------------------|--------|---------|-------------------------|-----------|-------------|-----------|--------------|--------|---------|---------|
| | 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 | 4.26 | 52,811 | 177,663 | 631,980 | 190,060 | 684,791 | 83,384 | 2.02 | 168,469 | |
| 2006 | 1,971 | 4.41 | 8,692 | 153,504 | 521,109 | 155,475 | 529,801 | 75,688 | 2.73 | 206,757 | |
| 2007 | 1,894 | 3.73 | 7,058 | 137,349 | 488,517 | 139,243 | 495,575 | 98,316 | 1.47 | 144,289 | |
| 2008 | 14,854 | 2.91 | 43,205 | 243,763 | 739,553 | 258,617 | 782,758 | 70,311 | 1.99 | 139,708 | |
| 2009 | 12,571 | 2.70 | 33,979 | 178,379 | 541,266 | 190,950 | 575,245 | 67,473 | 2.44 | 164,405 | |
| 2010 | 3,299 | 2.84 | 9,380 | 168,740 | 530,744 | 172,039 | 540,124 | 66,085 | 2.22 | 146,960 | |
| 2011 | 9,283 | 2.39 | 22,186 | 244,105 | 687,499 | 253,043 | 709,685 | 60,603 | 2.57 | 155,750 | |
| Averages: | 10-year (00-10) | 11,177 | 3.60 | 37,069 | 221,944 | 707,119 | 233,123 | 744,188 | 81,488 | 2.28 | 184,078 |
| | Long-term (1968-10) | 22,076 | 3.17 | 65,022 | 221,835 | 621,951 | 243,861 | 686,973 | 44,472 | 2.36 | 161,926 |
| % change from: | 2010 | 181% | -16% | 137% | 45% | 30% | 47% | 31% | -8% | 16% | 6% |
| | 10-year average | -17% | -34% | -40% | 10% | -3% | 9% | -5% | -26% | 13% | -15% |
| | Long-term average | -58% | -25% | -66% | 10% | 11% | 4% | 3% | 36% | 9% | -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, 12 April - 17 May 2011 (Source: Minnesota Climatological Working Group, <http://climate.umn.edu/cawap/nwssum/nwssum.asp>).

| Region | City | Temperature (F) for week ending: | | | | | | | | | | Total weekly precipitation (inches) | | | | | Precipitation departure from normal | |
|-----------|---------------|----------------------------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------|---------------------|-------------------------------------|----------|-------|-------|--------|-------------------------------------|----------------|
| | | 17-April | | 24-April | | 1-May | | 8-May | | 15-May | | 17-April | 24-April | 1-May | 8-May | 15-May | | 1 April-15 May |
| | | Avg. ¹ | Depart ² | Avg. ¹ | Depart ² | Avg. ¹ | Depart ² | Avg. ¹ | Depart ² | Avg. ¹ | Depart ² | | | | | | | |
| NW | Crookston | 36.8 | -4.2 | 38.4 | -6.4 | 49.8 | 1.3 | 48.2 | -3.8 | 51.8 | -3.3 | 0.55 | 0.41 | 0.23 | 0.22 | 0.21 | 0.16 | |
| NC | Grand Rapids | 38.2 | -2.2 | 37.8 | -6.0 | 44.8 | -2.2 | 48.0 | -2.2 | 52.9 | -0.1 | 0.49 | 0.53 | 1.43 | 0.72 | 0.16 | 1.09 | |
| | Itasca | 36.9 | -0.2 | 35.0 | -5.7 | 45.8 | 1.4 | 43.4 | -4.5 | 50.6 | -0.5 | 2.12 | 0.55 | 0.53 | 0.08 | 0.83 | 2.66 | |
| WC | Alexandria | 40.0 | -1.9 | 39.4 | -6.0 | 46.5 | -2.4 | 50.4 | -1.7 | 55.0 | -0.1 | 0.07 | 0.52 | 0.40 | 0.73 | 0.63 | -0.07 | |
| | Fergus Falls | | | | | | | | | | | | | | | | | |
| | Montevideo | 42.6 | -1.1 | 39.6 | -7.5 | 47.6 | -2.9 | 49.3 | -4.5 | 56.0 | -0.8 | 0.16 | 0.59 | 0.56 | 0.85 | 0.85 | 0.12 | |
| | Morris | 40.5 | -2.9 | 38.1 | -8.9 | 46.6 | -3.8 | 47.5 | -6.1 | 53.2 | -3.4 | 0.10 | 0.71 | 0.39 | 0.51 | 1.72 | 0.92 | |
| C | Becker | 45.0 | 1.1 | 39.4 | -7.8 | 45.4 | -4.9 | 47.4 | -5.8 | 56.8 | 1.0 | 0.04 | 0.55 | 1.54 | 1.01 | 1.07 | 2.98 | |
| | Hutchinson | 44.6 | 0.5 | 39.4 | -8.1 | 46.7 | -4.1 | 48.4 | -5.6 | 57.0 | 0.0 | 0.23 | 0.62 | 1.68 | 0.64 | 1.30 | 3.28 | |
| | St. Cloud | 43.2 | 0.2 | 40.2 | -6.2 | 44.7 | -4.9 | 50.0 | -2.6 | 56.7 | 1.3 | 0.02 | 0.45 | 1.04 | 0.92 | 0.58 | 2.03 | |
| | Staples | Missing | | | | | | | | | | | | | | | | |
| | Willmar | 42.0 | -0.5 | 38.4 | -7.5 | 45.4 | -3.9 | 46.2 | -6.5 | 55.6 | -0.2 | 0.16 | 0.74 | 1.02 | 0.77 | 1.08 | 1.68 | |
| EC | Aitkin | 40.0 | -0.4 | 36.6 | -7.0 | 43.9 | -2.8 | 44.0 | -5.7 | 49.2 | -3.2 | 0.44 | 0.67 | 1.49 | 0.97 | 0.54 | 3.11 | |
| | Cambridge | | | | | | | | | | | | | | | | | |
| | Msp Airport | 45.8 | -0.2 | 42.4 | -6.8 | 46.4 | -5.9 | 52.4 | -2.8 | 59.2 | 1.2 | 0.13 | 0.49 | 1.99 | 0.33 | 0.59 | 1.85 | |
| SW | Pipestone | 41.0 | -3.0 | 36.7 | -10.5 | 44.4 | -6.0 | 50.0 | -3.5 | 55.4 | -0.9 | 0.73 | 0.57 | 0.57 | 0.50 | 1.70 | 2.70 | |
| | Redwood Falls | 43.5 | -2.7 | 41.9 | -7.7 | 46.4 | -6.4 | 52.5 | -3.5 | 57.8 | -1.1 | 0.30 | 0.66 | 0.93 | 0.78 | 1.54 | 3.30 | |
| | Worthington | 43.9 | 1.1 | 36.0 | -10.1 | 46.0 | -3.4 | 49.9 | -2.8 | 56.0 | 0.3 | 0.77 | 0.80 | 0.69 | 0.04 | 1.44 | 1.38 | |
| SC | Faribault | 45.7 | 2.2 | 39.0 | -7.8 | 45.1 | -4.8 | 46.3 | -6.7 | 59.1 | 3.2 | 0.28 | 0.55 | 1.84 | 0.14 | 1.48 | 1.48 | |
| | Waseca | 45.2 | 1.0 | 39.0 | -8.6 | 45.3 | -5.5 | 48.0 | -6.0 | 59.2 | 2.2 | 0.67 | 0.50 | 1.35 | 0.02 | 1.16 | 1.08 | |
| | Winnebago | 45.8 | 0.4 | 39.2 | -9.4 | 47.0 | -4.6 | 51.6 | -3.0 | 59.2 | 1.9 | 1.00 | 0.89 | 1.14 | 0.01 | 0.98 | 1.40 | |
| Statewide | | 41.6 | -0.7 | 38.6 | -7.1 | 45.6 | -3.3 | 47.8 | -4.2 | 54.9 | 0.0 | 0.46 | 0.56 | 1.13 | 0.35 | 0.89 | | |

¹ Average temperature (°F) for the week ending on the date shown.

² Departure from normal temperature.