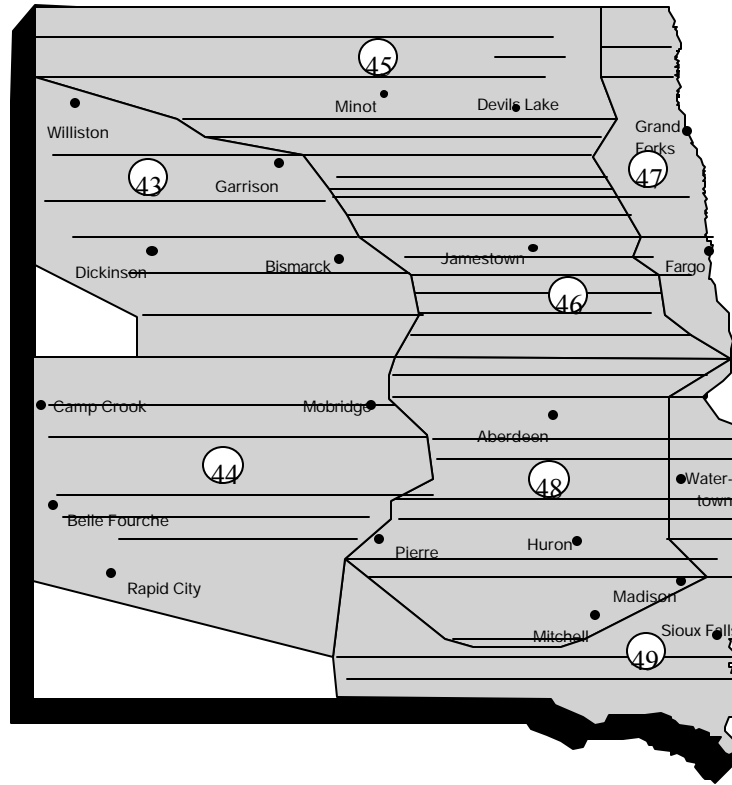


2004

**WATERFOWL BREEDING POPULATION SURVEY  
FOR  
SOUTH DAKOTA AND NORTH DAKOTA**



TITLE: Waterfowl Breeding Population and Habitat Survey for South and North Dakota

STRATA SURVEYED: 44, 48, 49 (South Dakota)  
43, 45, 46, 47 (North Dakota)

DATES: 2 - 6 May 2004 (43 and 44)  
6 - 23 May 2004 (45, 46, 47, 48, and 49)

DATA SUPPLIED BY: United States Fish and Wildlife Service

Strata 45, 46, 47, 48, 49

Aerial Crew

Observer/Pilot - John W. Solberg, Flyway Biologist, WPS/DMBM, Bismarck, ND

Observer - Michael Y. Rich, Refuge Operations Specialist, Neal Smith NWR, Prairie City, IA

Ground Crew

Leader - Pam Garrettson, Wildlife Biologist, PHAS/DMBM, Laurel, MD

Assistants -

Adrianna Araya, Wildlife Biologist, MBSP, Denver, CO  
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Terri Thorn, Wildlife Biologist, Ecological Services, Bismarck, ND

Strata 43 and 44

Aerial Crew

Observer/Pilot - James F. Voelzer, Chief - WPS/DMBM, Portland, OR

Observer - Ray Bentley, Flyway Biologist, WPS/DMBM, Corvallis, OR

Ground Crew

Leader - Ken Richkus, Wildlife Biologist, HSS/DMBM, Laurel, MD

Assistants -

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ABSTRACT: The 2004 Waterfowl Breeding Ground and Habitat Survey for Eastern South and North Dakota was conducted 6 - 23 May using standard aerial coverage. East river personnel changes occurred this year in both the air and ground crew. Habitat conditions in the crew area were variable and ranged from poor to good. Upland nesting cover was generally adequate but over water nesting sites, particularly in South Dakota, are severely depressed due to diminished

water conditions. Temporary and seasonal wetlands in South Dakota were dry and remaining semi-permanent and permanent basins were in recessional stages. General wetland conditions were comparatively better in North Dakota. Since 2003, wetland counts were 36% lower in South Dakota and -14% in North Dakota. The estimated waterfowl breeding population in South Dakota (1.672 million) was 23% lower than the long-term average and the lowest since 1992. In North Dakota, the waterfowl breeding population (4.450 million) was 53% higher than the long-term mean and increased modestly (15%) since last year.

Selected information for 2004 is presented below:

#### South Dakota

	2004 Indices (thousands)	Percent Change From		
		2003	1994-2003 mean	1959-2003 mean
Mallard	535.7	-7%	-42%	12%
Gadwall	290.4	-9%	-44%	25%
Blue-winged Teal	570.4	-34%	-59%	-32%
Northern Pintail	63.8	64%	-72%	-70%
Redhead	13.7	-52%	-77%	-71%
Canvasback	7.8	153%	10%	23%
Total Ducks	1671.7	-20%	-55%	-23%
May Ponds	305.2	-36%	-61%	-43%

#### North Dakota

	2004 Indices (thousands)	Percent Change From		
		2003	1994-2003 mean	1959-2003 mean
Mallard	1152.9	10%	-8%	89%
Gadwall	846.2	42%	5%	127%
Blue-winged Teal	1096.3	-17%	-35%	24%
Northern Pintail	237.1	104%	-28%	-30%
Redhead	161.3	67%	-27%	18%
Canvasback	37.5	87%	-18%	27%
Total Ducks	4450.1	15%	-16%	53%
May Ponds	804.5	-14%	-20%	10%

**METHODS:** The procedures followed in conducting the survey are described in the Standard Operating Procedures for Aerial Breeding Ground and Habitat Surveys in North America, Section III, revised 1987. There were no changes in survey coverage and all transects were flown (Tables 3 and 6).

Personnel changes in 2004 occurred in both air and ground crews. Adrianna Araya, a wildlife biologist from Migratory Birds and State Programs in Denver, joined the east river ground crew this year. Mike Rich, Refuge Operations Specialist from Neal Smith NWR in IA, was also a first

year participant and performed as observer on the aerial crew. Remaining air and ground personnel were unchanged since 2003. The crew participated in pre-survey training/review sessions relating to air and ground procedures. Participants were critiqued regarding species identification, judgement of transect width, and adherence to standard operating procedures.

Visibility Correction Factors (VCFs) in the crew area are calculated using observations collected from 17 air/ground comparison segments. All comparison segments in the crew area are co-located with operational survey segments. The VCF for wetlands, established by comparison of air and ground observations, was 1.00. Wetland counts and all other data are considered comparable to all years when VCF's were determined.

Transect flying was accomplished in a wheeled Cessna 185. The survey required about 70 hours of flight time including aerial observer review, reconnaissance, survey, interviews and the collection of video footage. Aerial crews continued to utilize on-board computers, interfaced with the aircraft GPS, to capture georeferenced waterfowl and wetland observations. Aerial sampling commenced 6 May in the eastern Dakotas and was completed on the 23rd. Once the survey was initiated, 4 days were forfeited to adverse weather. The common culprit again this year was wind, which exceeded 50 mph on numerous occasions. Information from Stratum 43 and 44 was collected 2 - 6 May by the Montana survey crew led by James Voelzer. Our appreciation is extended to that crew for their efforts and contributions of data and habitat information from the Western Dakotas.

#### WEATHER AND HABITAT CONDITIONS:

The entire western half of the Dakotas entered the fall of 2003 in moderate to extreme drought conditions. Abnormally hot (as much as 7°F above normal) and dry weather during early fall plagued both North and South Dakota, further reducing soil moisture in an already parched landscape. The eastern half of the Dakota's wasn't fairing much better as most areas were short of soil moisture or in moderate drought. A couple of large storms brought much needed rain to southwestern North Dakota in late September but soil moisture remained short in most of the state. The month of October continued the trend of above average temperatures and below average rainfall.

November saw below average temperatures and precipitation with most areas receiving less than .12 inches in North Dakota and less than .5 inches in South Dakota. This spotty precipitation provided little relief to the drought conditions. Cold temperatures and lack of snow cover were becoming a concern in protecting winter crops. Above average temperatures brought above average precipitation in North Dakota and provided much needed crop protection in December. South Dakota was also above average in temperature, which melted much of the existing snow, but fell short of normal precipitation by almost a 1/4 inch.

The New Year saw different weather patterns in North Dakota and South Dakota. Temperatures were below average in North Dakota with several record lows in the east with Grand Forks recording an all-time record of -43°F. The cold weather brought an above average snowfall with 20 inches being common across North Dakota. South Dakota saw much different temperature and precipitation with slightly above average temperatures and below average snowfall. The

average depth for the state was 4.2 inches. February offered some relief to the bitter cold in North Dakota with temperatures ranging from near normal to only slightly below. February was a very dry month in North Dakota with most areas recording less than .25 inch of precipitation. South Dakota saw normal temperatures and above average precipitation but the sub-soil moisture condition for most areas of both states remained in the short or very short category.

Early spring began with above average precipitation and cold temperatures but finished with above average temperatures and some storms dumping over 2.5 inches of rain on parts of the region. With snow melting and spring rains starting, the surface moisture shortage began to improve but the sub-soil moisture remained short. Spring run-off fell short of expectations in many areas. As April arrived, only the eastern half of South Dakota was without some sort of moisture deficiency but no rains fell during the first half of the month and conditions soon worsened. Spotty rains late in the month provided localized temporary relief but did little to erase the sub-soil deficit. Significant rainfall events near Devils Lake have provided a surplus of topsoil moisture there but the remainder of North Dakota was either adequate or short for topsoil moisture. The temperatures remained close to normal for North Dakota in April but the ever present prairie winds accelerated drying. The southern part of North Dakota ended April with a soil deficit of short to very short (covering 30% of the area statewide). South Dakota was 57% short on topsoil moisture and 70% short on subsoil moisture. The fact that drought conditions have existed since last year's Breeding Population Survey and average or lower precipitation has occurred; severe to extreme drought conditions were present over much of the Dakotas.

May 2004 provided some odd weather which was more March-like than May. Record hi's (95° Mitchell, SD on 5/5), record lows (26° Aberdeen, SD on 5/11), big winds (over 50 mph on numerous occasions) and late snows (5" - 10" across the northern tier of counties in North Dakota on 10 - 11 May) all occurred in May of 2004. The month started with temperatures much higher than normal coupled with strong winds. This pattern continued during most of the South Dakota portion of the survey. On about the 11<sup>th</sup> of the month, temperatures cooled and a constant pattern of rain/showers continued through for the remainder of the month. This pattern provided much needed moisture and has charged/improved some of the dry basins. Soil moisture and wetland basin condition has improved but the effects on this year's waterfowl production are questionable.

At the time of survey initiation in southern South Dakota, the response of vegetation to the warm April and early May was evident. Warm season grasses along roads and in pastures, as well as tree leaves, were well developed and resembled stages not encountered some years until mid or late month. The drying trend of the past 2 - 4 years in South Dakota continued in 2004. The statewide wetland index of 305.2 thousand decreased 36% since last year and was well below ten-year (-61%) and long-term (-43%) comparisons (Table 2). Descriptions by stratum are listed below.

SOUTH DAKOTA (St. 44: 2 - 4 May, St. 48, 49: 6 -13 May)

Stratum 44 - Stratum 44 was the only stratum in the state posting an increase in wetland numbers

since 2003 (26%). The 2004 index (140,800) was 29% below the ten-year mean and near (-6%) the long-term average. The increase since 2003 probably results from the drying (and resultant "puddling") of streams, which causes an inflated index. Despite the increase in the wetland index, the west river crew reported a general deterioration in habitat conditions compared to last year. Larger stock ponds held water but were in recession stages. Water courses and small streams were reported dry and larger rivers/streams, including the Missouri River, were at or near record low levels. Nesting cover was reported adequate throughout the stratum. Overall conditions ranged from poor (central and extreme north west) to good (west central and southwest) with the majority of the area considered fair. Production potential in 44 this year is projected below average.

Stratum 48 - Extremely dry conditions over the majority of the stratum provided a wetland index that was well short of last year (-58%), the ten-year (-75%) and long-term (-60%) averages. Overall conditions south of Aberdeen were reminiscent of those in the late 1980's. Streams and waterways were dry along with temporary and seasonal basins, most dugouts, and many semi-permanent basins. Larger streams, rivers, those dugouts with water, and remaining wet basins were commonly receded or below normal flows. Surprisingly, we observed limited negative impacts to basin margin cover. Upland cover, encouraged from the warm April, was adequate but due to the poor water conditions, over water nesting sites in the drift prairie were scarce. We considered the prairie coteau and extreme western reaches of the Leola Hills as fair nesting habitat with the remainder of stratum 48 being poor. Expect less than average waterfowl production from 48 this year.

Stratum 49 - As in stratum 48, wetland counts in 49 decreased compared to the 3 standard time comparisons (-47%, -65%, and -52%). Because wetlands in the extreme southeastern and southwestern portions of the stratum were relatively less receded and because we encountered the occasional seasonal wetland, we considered these small areas as fair habitat. The remainder of the stratum was in poor condition. Nesting cover was generally in adequate supply in stratum 49 and in similar condition to that observed in stratum 48. We expect waterfowl production below average from stratum 49 in 2004.

North Dakota wetland counts fared better than South Dakota's in May 2004. Resulting mainly from winter precipitation and to a lesser extent, the benefit of mid-May precipitation, wetland counts statewide decreased only 14% since 2003. The 2004 index (804,500) was below the ten-year average (-20%) and similar to (10%) the long-term mean (Table 5).

NORTH DAKOTA (St. 43: 4 - 6 May, St. 45, 46, 47: 14 - 23 May)

Stratum 43 - Wetland counts in stratum 43 increased 49% compared to 2003, probably for similar reasons outlined for stratum 44. The 2004 index was similar to the ten-year average (10%) and above the long-term (40%) average. The west river crew reported habitat in a small area west of the badlands as poor. The southern and east central edges, along with most of the northwest quadrant, were considered fair. The remainder, and majority of stratum 43, was classed as marginally good. It was the opinion of the crew that to retain the marginally good rating, considerable precipitation must be received. Also noted by the west river crew, was the absence of the dense CRP-type cover that has been evident between Dickinson and Bismarck the

past few years. Overall, production in 43 is expected to be below average.

Stratum 45 - Overall habitat conditions in 45 were the best of any east river stratum. Wetland counts in Stratum 45 exhibited little change (-9%) since last year and offered the least difference (-11%) compared to the ten-year average. The 2004 figure remained 16% above the long-term average. Considered good habitat was the area from Devils Lake north and east. Here, soil moisture levels have remained high since the mid-1990's and precipitation from the past winter maintained the good wetland conditions. Additionally, the heaviest snows in recent years fell in the northern tier of counties in the central and western regions. Even so, spring runoff fell short of expectations in terms of wetland formation but soil moisture levels were greatly improved none-the-less. As a result, May snows (6" - 12" on the 11<sup>th</sup> and 12<sup>th</sup>) along with numerous heavy rains (some 2" - 4" north of Minot) received through the remainder of the month, created the only habitat east of the Missouri River considered good. Spring planting was delayed or halted in some areas due to wet fields and some acres already planted will not produce a crop. With the exception of small areas in the south central and west central which were considered poor, the remainder of 45 was rated in fair condition for breeding waterfowl. The outlook for waterfowl production in stratum 45 is average to above.

Stratum 46 - The 2004 wetland count in stratum 46 fell 41% since 2003. The index was -46% compared to the ten-year mean and 18% below the long-term average. In stratum 46, two small lobes of poor habitat in south central and south western regions were extensions from South Dakota. The balance of the stratum was considered fair. The greatest evidence of negative impact to basins (tilling and planting through) were witnessed in 46. Also observed in the stratum was the most extreme effect of May rains. Here, vast amounts of "new water" (mostly seasonal) was present but often was void of waterfowl. Waterfowl production from stratum 46 is expected average or below.

Stratum 47 - Although wetland counts decreased 47% since last year the 2004 index was unchanged from the long-term average (3%). The 2004 count fell short (-33%) of the ten-year average. Habitat in the extreme north eastern corner of 47 was poor and the remainder of the stratum classed as fair. Wetland basin densities in the majority of the stratum are low and likewise, nesting cover is extremely impacted. The production outlook for 47 is average at best.

DISCUSSION/BREEDING POPULATION ESTIMATES: Traveling to Mitchell and subsequent reconnaissance flights provided first glances of the poor condition of waterfowl breeding habitat in South Dakota. Wetland conditions over most of the state east of the Missouri River were reminiscent of the late 1980's. Temporary and seasonal wetlands were absent and in many areas, semi-permanent basins and dugouts were dry. Permanent wetlands, and those dugouts containing water, were in slight to more severe stages of recession. Upland nesting cover though, was in adequate supply in most areas. Encouraged by warmer than normal April - early May temperatures, grasses, forbs, and tree leaves were well developed. Conversely, over water nesting sites were lacking in most areas due to the depressed condition of the wetlands.

Breeding waterfowl arrived at least 2 weeks earlier than in 2003 but the degraded condition of wetlands offered little attraction to settle and breed in eastern South Dakota. As demonstrated by the total duck index (and more specifically the blue-winged teal component), a 20% reduction in

breeding birds occurred since 2003. We believe the overall decrease represents a redistribution/overflight of pairs to areas of higher quality breeding habitat. The total duck index (1.672 million) is 55% lower than the ten-year average and 23% lower than the long-term average (Table 1). Comparing individual species to 2003 figures, all were at or below last years levels with two exceptions. Canvasback posted a 153% increase since 2003 but the sample is small and South Dakota is a relatively unimportant breeding area for the species. The increase in the pintail index, a species that is highly attracted to temporary and seasonal water and willing to seek out those conditions, is counter intuitive. We believe that our survey timing was such that pintail migration was complete yet the estimate increased 64% from 2003 levels. Additional support for acceptable survey timing is indicated by lone drake to pair ratios for early nesting "target" species. Suggesting that breeding activities were properly advanced, South Dakota mallards and pintails, expressed in terms of lone males/100 pairs, were 133 and 118 respectively. Comparing the 2004 estimates to the long-term averages, only mallards (12%), gadwall (25%), and canvasback (23%) were above their comparative figures. Over most of the survey area, birds were reasonably distributed considering the generally poor condition of the habitat. In areas of slightly improved habitat, such as the northern portion of the prairie coteau, limited crowding of birds was observed.

At the beginning of the breeding season, habitat conditions in North Dakota were generally better than in South Dakota. The 11 May weather change provided immediate positive effects to soil moisture and wetland conditions. Our survey activities in North Dakota began on the 14<sup>th</sup> at which time we observed artifacts of recent precipitation. Local areas on the drift plain offered areas of "new" water which were usually void of ducks. By the 15<sup>th</sup> - 20<sup>th</sup>, locally heavy precipitation (e.g. Sherwood, ND north of Minot) had restricted/paralyzed spring planting. As in South Dakota, upland cover in North Dakota was well developed and due to the relatively better (than SD) condition of wetlands, over water nesting sites were more common. Sheet water and temporary wetlands were lacking from the landscape but seasonal basins held water in some locations. Semi-permanent and permanent basins were recessional but not to the extent observed in South Dakota.

The total duck index for 2004 in North Dakota is 4.450 million birds (Table 4). This figure represents a slight increase (15%) from 2003, is slightly lower (-15%) than the ten-year average, and is above (53%) the long-term level. We suspect that some birds over flying the depressed habitat conditions in South Dakota continued north and settled in North Dakota. Breeding pair distributions were variable, ranging from vacant "new" water to some crowding in the coteau. Some large groups of migratory scaup were encountered in the coteau as exemplified by the index more than twice the long-term average. With a trend similar to South Dakota, the North Dakota pintail estimate increased substantially compared to 2003 (104%). Although lower than ten-year (-28%) and long-term (30%) averages, these birds chose the fair or slightly better habitat in North Dakota for breeding attempts this year. As expected, lone male to pair ratios for North Dakota mallards and pintails suggest breeding activities were further advanced than in South Dakota. Although some migrants (scaup) were observed during the survey, lone drake/pair ratios of target mallards (193/100) and pintails (115/100) indicate these species were well along in their activities.



## CONCLUSIONS:

1. The drying trend experienced in much of the crew area over the past 3 - 5 years continued in 2004. Wetland conditions in the southern 3/4ths of South Dakota were extremely depressed. Conditions improved in the northern 1/4 of the state and improvements generally continued in North Dakota to the Canada border. Wetland counts in South Dakota were 36% lower than 2003 levels and remained 61% and 43% lower than the respective ten-year and long-term averages. In North Dakota, the 2004 wetland index decreased only 14% since 2003, was 20% lower than the ten-year mean, and similar to (-10%) the long-term average. Upland nesting cover is well advanced and generally looks good in both states. Although more than 3 million acres of CRP remain in the Dakotas, concern over potential changes in program rules exist among waterfowl resource managers. Over water nest sites are rare in southern areas with availability increasing to the north. A change to cooler, wetter weather occurred on about 11 May and is assisting habitat conditions through out the region.
2. Breeding waterfowl arrived about 2 weeks earlier than in 2003. Dry conditions in the southern 3/4ths of South Dakota offered little attraction for breeding birds to settle. In this region, we suspect some overflight had occurred. Pair densities were higher in northern South Dakota and throughout North Dakota than in southern regions of the survey unit. Limited crowding was observed in the coteau regions. May precipitation was probably more beneficial to second attempt and mid/late-nesting birds.

Reflecting the poor habitat conditions in South Dakota, total breeding ducks (1.672 million) were lower than 2003 (-20%), the ten-year average (-55%), and the long-term average (-23%). Only mallard (12%), gadwall (25%), and canvasback (23%) were higher than their long-term averages.

Where overall habitat conditions were better, the 2004 waterfowl breeding population index for North Dakota (4.450 million) increased modestly (15%) compared to 2003. Although lower than the ten-year average (-16%), the 2004 figure is 53% higher than the long-term mean. Of dabblers, only pintail (-30%) fell short of the long-term comparison. In the diver group, all species with a significant sample size were higher than long-term averages.

3. May precipitation is offering maintenance, and in some cases improvement, to waterfowl breeding habitat in the crew area. We expect below average waterfowl production in South Dakota and average to above average production in North Dakota in 2004. It is unfortunate that no quantitative assessment of waterfowl production will be conducted this year.

John W. Solberg and Mike Rich  
July 2004

Table 1. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean (from 1959) for South Dakota.

Species/Ponds	Stratum			2004 Total	2003 Total	10-Year Mean	Long-Term Mean	% Change From		
	44	48	49					2003	10-Year Mean	Long-Term Mean
Ducks										
Dabblers										
Mallard	111.8	311.5	112.4	535.7	577.5	927.6	477.5	-7.2%	-42.3%	12.2%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	-100.0%
Gadwall	46.4	186.9	57.1	290.4	320.2	520.8	232.2	-9.3%	-44.3%	25.1%
Am. wigeon	11.9	11.2	0.0	23.1	27.0	55.7	39.3	-14.4%	-58.5%	-41.2%
Am. green-winged teal	23.1	3.6	0.0	26.7	26.4	49.5	29.7	1.0%	-46.1%	-10.1%
Blue-winged teal	77.6	317.2	175.6	570.4	859.9	1395.7	842.7	-33.7%	-59.1%	-32.3%
N. shoveler	26.5	60.2	14.2	100.9	131.2	293.8	190.1	-23.1%	-65.7%	-46.9%
N. pintail	25.5	29.8	8.5	63.8	39.0	225.2	216.7	63.6%	-71.7%	-70.5%
Subtotal	322.7	920.5	367.7	1610.9	1981.3	3468.3	2028.1	-18.7%	-53.6%	-20.6%
Divers										
Redhead	0.0	9.4	4.3	13.7	28.5	59.9	47.6	-52.0%	-77.2%	-71.3%
Canvasback	1.6	4.8	1.4	7.8	3.1	7.1	6.3	152.8%	9.8%	23.1%
Scaups	0.5	20.2	9.3	30.0	37.0	78.1	43.8	-18.9%	-61.6%	-31.5%
Ring-necked duck	1.5	3.2	0.3	5.0	8.9	16.5	8.3	-43.9%	-69.7%	-39.8%
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.2	0.3	--	-100.0%	-100.0%
Bufflehead	0.6	0.4	0.0	1.0	1.6	2.8	1.5	-35.2%	-63.6%	-33.7%
Ruddy Duck	0.0	1.1	0.8	1.9	28.0	44.9	32.4	-93.2%	-95.8%	-94.1%
Subtotal	4.2	39.1	16.1	59.4	107.1	209.5	140.3	-44.5%	-71.7%	-57.7%
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	-100.0%
Mergansers	0.5	0.9	0.0	1.4	0.5	3.3	1.6	169.6%	-58.5%	-13.9%
Subtotal	0.5	0.9	0.0	1.4	0.5	3.3	1.6	169.6%	-58.5%	-15.8%
Total Ducks	327.4	960.4	383.8	1671.7	2088.9	3681.2	2170.0	-20.0%	-54.6%	-23.0%
Canada Goose	10.2	71.9	25.9	108.0	130.4	102.9	33.1	-17.2%	5.0%	226.5%
Am. coot	1.3	18.0	12.9	32.2	22.0	349.1	198.1	46.5%	-90.8%	-83.7%
Ponds	140.8	100.1	64.3	305.2	473.9	783.6	537.4	-35.6%	-61.1%	-43.2%

Table 2. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean (from 1974) for South Dakota. Estimates prior to 1974 were not adjusted for visibility bias.

Year	Stratum			Total
	44	48	49	
1961	33.1	48.1	34.2	115.4
1962	69.5	152.3	95.7	317.4
1963	80.2	142.2	106.9	329.3
1964	62.0	79.3	56.8	198.0
1965	84.5	100.3	53.0	237.8
1966	94.5	143.6	79.7	317.8
1967	90.2	132.4	66.5	289.0
1968	71.8	146.0	61.1	278.9
1969	156.5	263.5	111.6	531.6
1970	161.3	183.3	58.9	403.4
1971	146.4	132.7	85.4	364.4
1972	205.5	263.8	108.1	577.4
1973	153.4	126.1	82.4	362.0
1974	68.0	186.0	125.4	379.4
1975	151.0	236.4	108.3	495.7
1976	92.9	121.8	93.1	307.8
1977	84.7	114.5	73.0	272.3
1978	212.3	307.4	131.5	651.2
1979	82.0	214.6	148.6	445.3
1980	66.8	108.4	88.3	263.5
1981	64.3	58.8	40.0	163.0
1982	148.1	176.7	73.7	398.4
1983	104.3	189.4	142.6	436.4
1984	142.8	262.4	189.4	594.6
1985	116.7	183.8	124.4	425.0
1986	216.7	260.5	132.2	609.4
1987	194.9	216.4	105.9	517.3
1988	92.5	99.9	114.4	306.8
1989	195.4	222.0	86.7	504.1
1990	124.0	79.4	56.7	260.0
1991	106.5	113.1	69.5	289.1
1992	107.5	96.8	61.6	265.8
1993	141.1	334.7	225.0	700.7
1994	281.1	356.5	180.9	818.4
1995	279.4	458.2	195.9	933.4
1996	324.4	418.2	172.2	914.8
1997	278.8	478.8	167.5	925.1
1998	195.3	337.8	162.0	695.1
1999	157.4	618.1	249.4	1025.0
2000	161.3	324.7	141.6	627.6
2001	105.3	562.9	320.9	989.1
2002	85.9	204.1	143.8	433.9
2003	111.9	240.7	121.4	473.9
2004	140.8	100.1	64.3	305.2
10-year Mean	198.1	400.0	185.5	783.6
Long-term Mean	149.8	252.8	134.9	537.4
Percent Change:				
From 2003	25.90%	-58.40%	-47.00%	-35.60%
From 10-year Mean	-28.90%	-75.00%	-65.40%	-61.10%
From Long-term Mean	-6.00%	-60.40%	-52.30%	-43.20%

Table 3. Survey design for South Dakota, May 2004.

	Stratum			Total
	44	48	49	
<u>Survey design</u>				
Square miles in stratum	27,299	24,587	15,830	67,716
Square miles in sample	216	315	171	702
Linear miles in sample	864	1,260	684	2,808
Number of transects in sample	5	9	11	25
Number of segments in sample	48	70	38	156
Expansion factor	126.3842	78.05396	92.57309	---
<u>Current year coverage</u>				
Square miles in sample	216	315	171	702
Linear miles in sample	864	1,260	684	2,808
Number of transects in sample	5	9	11	25
Number of segments in sample	48	70	38	156
Expansion factor	126.3842	78.05396	92.57309	---

Appendix 1. Long –term trend in adjusted waterfowl breeding population estimates (thousands) in South Dakota.

Species/Ponds	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
<b>Ducks</b>										
<b>Dabblers</b>										
Mallard	108.2	176.6	212.1	367.3	535.8	261.1	314.5	216.3	248.2	450.7
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	0.0	9.9	18.9	73.9	164.0	53.6	115.4	112.9	75.1	197.8
Am. wigeon	7.1	9.6	6.1	8.1	3.1	4.4	0.0	9.6	29.7	22.6
Am. green-winged teal	0.0	0.0	2.7	10.0	2.7	0.0	0.0	7.7	9.6	23.5
Blue-winged teal	413.1	524.5	673.8	602.5	1201.5	686.3	703.6	623.9	313.7	466.1
N. shoveler	38.4	156.3	96.4	335.5	225.4	95.7	90.2	108.3	82.2	150.6
N. pintail	25.5	305.7	175.4	557.8	221.6	108.8	128.9	228.9	186.6	129.1
Subtotal	592.3	1182.5	1185.3	1955.1	2354.1	1209.9	1352.6	1307.7	945.1	1440.2
<b>Divers</b>										
Redhead	0.0	30.1	14.3	56.4	50.5	50.4	56.4	56.7	20.1	33.4
Canvasback	2.8	1.4	2.8	2.2	2.6	5.0	2.0	6.1	3.5	2.6
Scaups	13.6	18.3	8.1	32.9	11.0	1.4	29.2	29.7	11.2	22.3
Ring-necked duck	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.4	1.1	0.0
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.9	0.0
Ruddy Duck	0.0	10.7	3.6	11.8	5.6	1.4	1.9	5.6	0.0	8.9
Subtotal	16.4	60.5	28.8	103.4	70.7	58.1	89.5	100.0	36.8	67.2
<b>Miscellaneous</b>										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	0.0
Total Ducks	608.7	1243.0	1214.2	2058.5	2424.9	1268.1	1442.0	1409.0	982.0	1507.4
Canada Goose	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3	0.9	0.0
Am. coot	31.1	40.4	29.3	61.0	21.0	53.4	19.3	33.8	28.0	75.7
<b>Ponds</b>										
<b>Species/Ponds</b>										
<b>Ducks</b>										
<b>Dabblers</b>										
Mallard	443.3	415.2	392.0	493.0	432.6	276.5	354.3	256.2	186.8	537.3
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	243.8	214.5	162.2	192.1	149.9	85.5	126.4	44.6	31.4	233.6
Am. wigeon	30.7	21.4	19.0	99.1	43.7	16.3	42.7	56.6	29.2	92.7
Am. green-winged teal	29.0	115.1	25.4	42.6	29.6	19.1	37.4	31.1	9.8	38.5
Blue-winged teal	742.2	706.8	654.3	1209.0	777.1	348.8	437.2	351.7	318.9	1287.3
N. shoveler	195.7	260.3	103.2	330.9	110.6	51.1	92.9	56.5	58.6	419.1
N. pintail	396.6	333.3	247.8	395.4	275.1	99.1	218.2	111.7	130.8	678.4
Subtotal	2081.2	2066.8	1603.9	2762.1	1818.6	896.5	1309.0	908.4	765.5	3287.0
<b>Divers</b>										
Redhead	87.8	53.6	60.7	48.6	34.6	20.2	27.3	4.1	10.8	144.4
Canvasback	17.9	6.1	2.8	14.2	13.1	6.4	5.6	3.1	3.0	12.3
Scaups	12.1	74.4	7.3	41.1	19.2	13.0	12.7	45.3	16.4	73.7
Ring-necked duck	0.0	1.1	0.5	0.0	0.0	0.0	0.0	0.3	0.4	1.4
Goldeneyes	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	1.0
Bufflehead	0.0	0.0	0.0	1.5	0.0	0.5	0.0	0.0	0.0	0.5
Ruddy Duck	7.0	39.3	27.7	30.1	18.6	23.2	209.7	6.2	5.8	28.7
Subtotal	124.8	174.5	99.0	136.6	85.5	63.2	255.4	59.0	36.4	261.9
<b>Miscellaneous</b>										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Total Ducks	2206.0	2241.2	1702.9	2898.7	1904.9	959.7	1564.4	967.4	801.9	3548.9
Canada Goose	8.2	0.9	2.1	3.4	6.4	3.7	1.9	3.0	1.8	7.2
Am. coot	91.1	91.8	35.0	110.9	126.1	27.8	75.7	66.6	91.4	232.5
<b>Ponds</b>										
						379.4	495.7	307.8	272.3	651.2

Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in South Dakota.

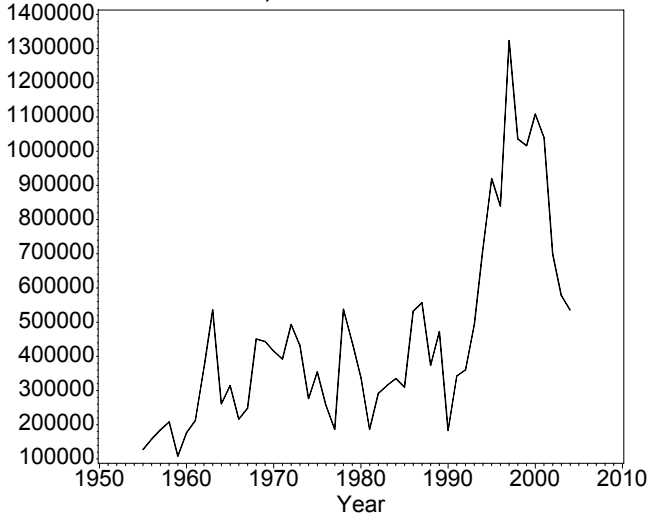
Species/Ponds	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Ducks										
Dabblers										
Mallard	441.7	338.9	186.8	291.7	314.9	334.9	310.1	532.0	556.8	374.1
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	136.7	69.8	113.6	189.1	219.0	263.7	145.5	254.3	205.7	222.5
Am. wigeon	33.6	41.5	60.0	40.7	73.8	87.0	45.2	39.7	45.6	48.8
Am. green-winged teal	19.3	70.2	21.1	34.9	36.6	22.0	31.6	52.1	23.4	25.5
Blue-winged teal	906.0	483.3	254.1	519.9	801.8	938.8	604.5	1433.5	777.1	617.1
N. shoveler	341.8	59.3	66.7	152.4	200.0	236.9	113.2	379.8	226.9	84.4
N. pintail	280.0	119.7	53.0	204.2	223.8	263.5	165.3	389.5	212.8	118.4
Subtotal	2159.0	1182.6	755.3	1432.9	1869.9	2146.9	1415.3	3080.8	2048.2	1490.9
Divers										
Redhead	50.9	28.2	22.0	45.2	82.9	111.9	35.9	64.2	34.1	19.3
Canvasback	5.6	8.0	5.9	2.2	2.3	15.8	4.6	11.5	5.7	7.6
Scaups	36.7	5.4	19.1	43.7	54.3	58.6	30.6	104.7	35.4	63.2
Ring-necked duck	0.6	1.2	2.8	7.1	59.0	17.3	1.4	18.3	14.4	5.7
Goldeneyes	0.0	0.0	0.0	1.2	2.4	0.8	0.8	0.8	0.0	0.0
Bufflehead	1.5	1.1	0.9	3.1	6.1	2.8	0.0	4.8	0.0	2.9
Ruddy Duck	16.0	21.6	67.0	84.4	88.9	48.7	23.1	69.4	28.5	3.2
Subtotal	111.3	65.5	117.8	187.0	295.9	255.8	96.5	273.6	118.1	101.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	2.5	0.8	0.0	7.0	5.7	6.1	0.0	0.0	0.0	2.1
Subtotal	2.5	0.8	0.0	7.0	5.7	6.1	0.0	0.0	0.0	2.1
Total Ducks	2272.9	1248.9	873.1	1626.9	2171.4	2408.9	1511.8	3354.5	2166.3	1594.7
Canada Goose	4.8	3.4	9.8	23.9	13.0	19.0	15.2	12.5	17.6	57.2
Am. coot	356.1	77.1	176.8	202.7	263.5	603.7	196.5	487.5	427.3	436.4
Ponds	445.3	263.5	163.0	398.4	436.4	594.6	425.0	609.4	517.3	306.8

Species/Ponds	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Ducks										
Dabblers										
Mallard	472.0	183.5	342.6	360.6	491.5	715.9	919.7	839.8	1323.2	1035.6
Am. black duck	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	177.7	125.7	282.9	281.5	246.6	383.0	541.5	451.8	819.5	624.2
Am. wigeon	21.6	27.4	44.4	32.9	17.3	83.6	46.8	47.6	71.3	74.6
Am. green-winged teal	24.4	8.5	17.0	12.6	6.6	55.2	58.4	63.0	69.4	34.3
Blue-winged teal	860.2	346.3	1075.4	626.4	679.9	1383.6	1468.4	1390.9	1535.0	1573.4
N. shoveler	185.4	79.2	117.2	102.0	213.4	283.5	350.0	287.6	414.3	230.3
N. pintail	148.3	63.4	69.8	65.7	166.7	230.1	364.2	187.3	349.9	205.4
Subtotal	1889.5	834.3	1949.3	1481.8	1821.9	3134.8	3749.0	3268.0	4582.7	3777.8
Divers										
Redhead	55.1	16.7	11.7	41.0	62.4	98.2	68.4	54.3	55.6	78.9
Canvasback	5.3	8.1	5.3	1.4	8.0	14.6	7.6	9.1	9.2	4.5
Scaups	80.4	43.5	66.8	47.9	7.3	155.2	120.9	94.6	75.6	87.4
Ring-necked duck	17.7	17.6	5.5	27.6	5.8	11.1	41.6	17.4	19.1	8.4
Goldeneyes	0.0	0.0	3.6	0.0	0.0	0.8	0.8	0.9	0.0	0.0
Bufflehead	5.0	0.5	1.2	7.5	0.0	12.0	5.9	1.2	1.3	0.6
Ruddy Duck	44.0	34.1	10.2	3.9	21.5	36.7	43.2	14.7	18.7	24.9
Subtotal	207.6	120.5	104.2	129.3	105.0	328.7	288.4	192.1	179.5	204.8
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	3.5	2.4	4.0	0.0	2.1	3.7	4.9	0.5	7.7	2.5
Subtotal	3.5	2.4	4.0	1.6	2.1	3.7	4.9	0.5	7.7	2.5
Total Ducks	2100.5	957.3	2057.5	1612.7	1929.1	3467.2	4042.3	3460.6	4769.9	3985.1
Canada Goose	65.4	46.2	44.2	48.6	37.7	46.5	55.9	73.5	86.8	99.8
Am. coot	284.7	191.5	77.4	132.8	167.2	311.0	616.9	409.9	525.7	469.0
Ponds	504.1	260.0	289.1	265.8	700.7	818.4	933.4	914.8	925.1	695.1

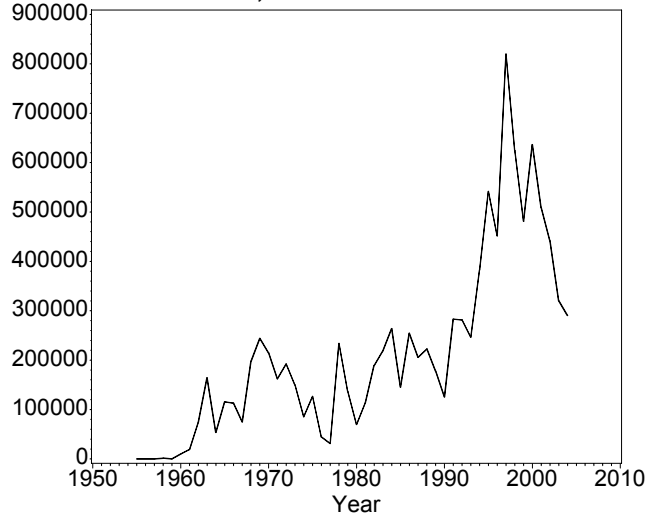
Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in South Dakota.

Species/Ponds	1999	2000	2001	2002	2003	2004
Ducks						
Dabblers						
Mallard	1016.4	1108.4	1040.5	699.3	577.5	535.7
Am. black duck	0.0	0.0	0.0	0	0.0	0.0
Gadwall	481.6	636.2	508.9	441.6	320.2	290.4
Am. wigeon	49.1	69.9	53.5	33	27.0	23.1
Am. green-winged teal	39.1	51.6	69.8	28.2	26.4	26.7
Blue-winged teal	1516.6	1576.9	1608.7	1043.1	859.9	570.4
N. shoveler	364.3	226.8	461.9	188.3	131.2	100.9
N. pintail	201.9	200.5	385.4	88.1	39.0	63.8
Subtotal	3669.0	3870.3	4128.7	2521.6	1981.3	1610.9
Divers						
Redhead	56.0	33.0	51.0	75.6	27.7	13.7
Canvasback	2.9	6.7	5.1	7.8	3.1	7.8
Scaups	40.3	59.1	44.5	66.6	37.0	30.0
Ring-necked duck	25.7	10.8	8.7	13.3	9.9	5.0
Goldeneyes	0.0	0.0	0.0	0	0.0	0.0
Bufflehead	2.3	0.4	0.6	1.9	1.4	1.0
Ruddy Duck	82.1	65.9	58.8	75.6	28.0	1.9
Subtotal	209.4	175.9	168.7	240.9	107.0	59.4
Miscellaneous						
Long-tailed duck	0.0	0.0	0.0	0	0.0	0.0
Eiders	0.0	0.0	0.0	0	0.0	0.0
Scoters	0.0	0.0	0.0	0	0.0	0.0
Mergansers	4.0	2.9	3.7	2.4	0.8	1.4
Subtotal	4.0	2.9	3.7	2.4	0.8	1.4
Total Ducks	3882.5	4049.1	4301.1	2764.9	2089.1	1671.7
Canada Goose	111.8	165.3	169.9	88.7	130.4	108.0
Am. coot	458.6	300.9	141.7	235.1	22.5	32.2
Ponds	1025.0	627.6	989.1	433.9	473.9	305.2

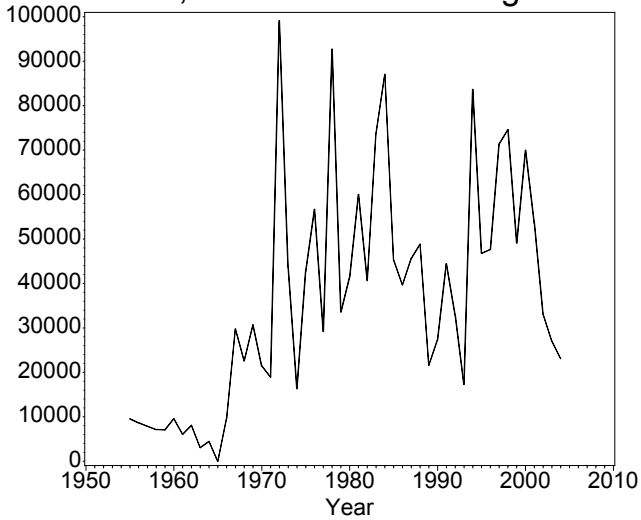
Strata 44, 48-49 Mallard



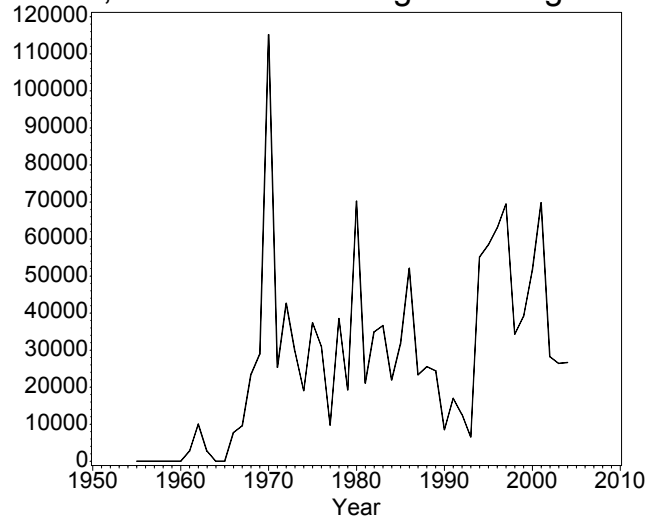
Strata 44, 48-49 Gadwall



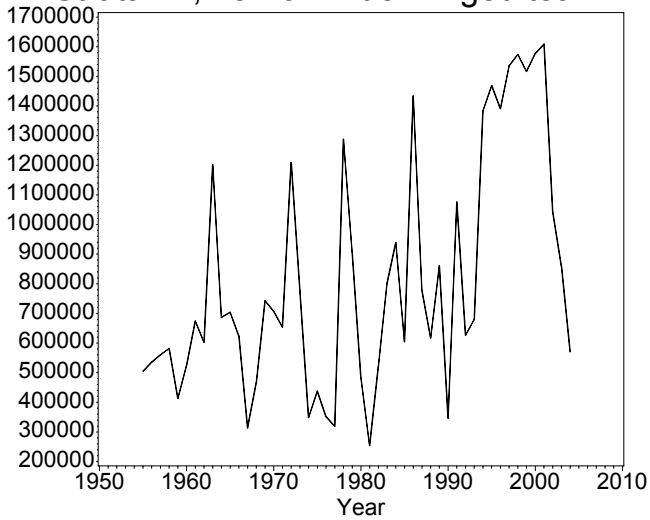
Strata 44, 48-49 American wigeon



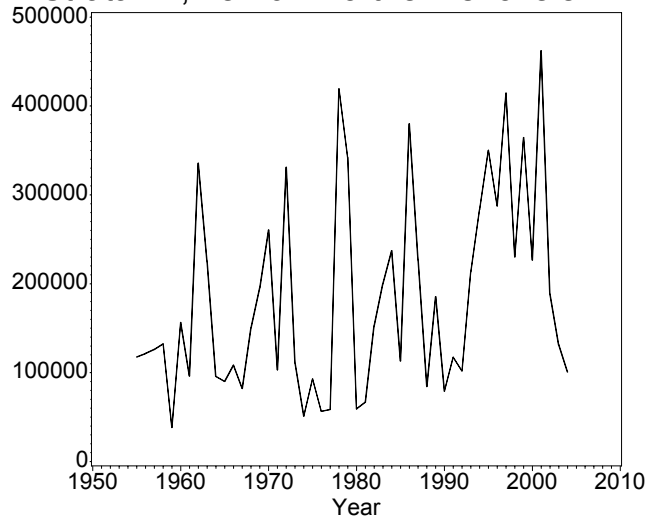
Strata 44, 48-49 American green-winged teal



Strata 44, 48-49 Blue-winged teal

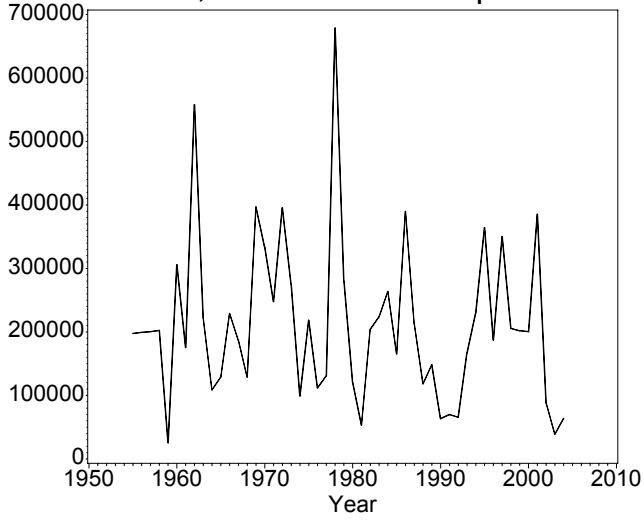


Strata 44, 48-49 Northern shoveler

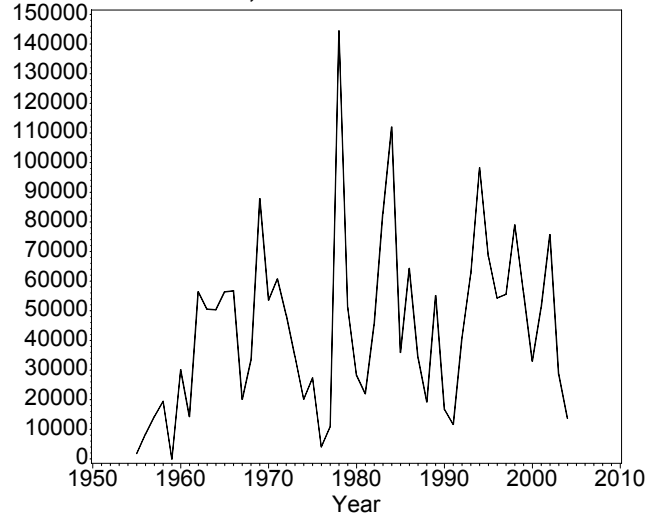




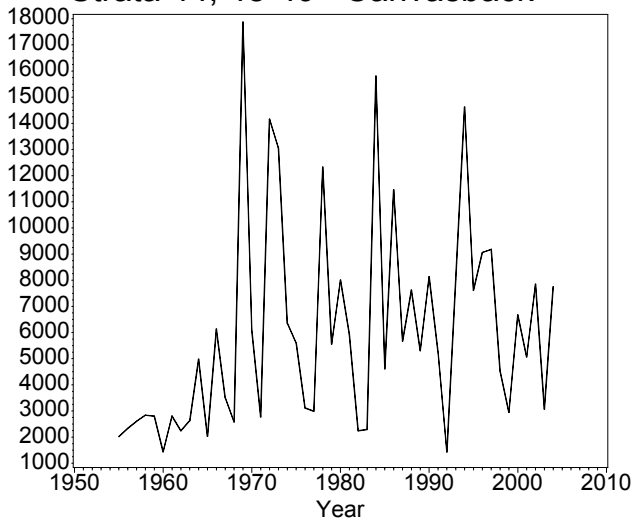
Strata 44, 48-49 Northern pintail



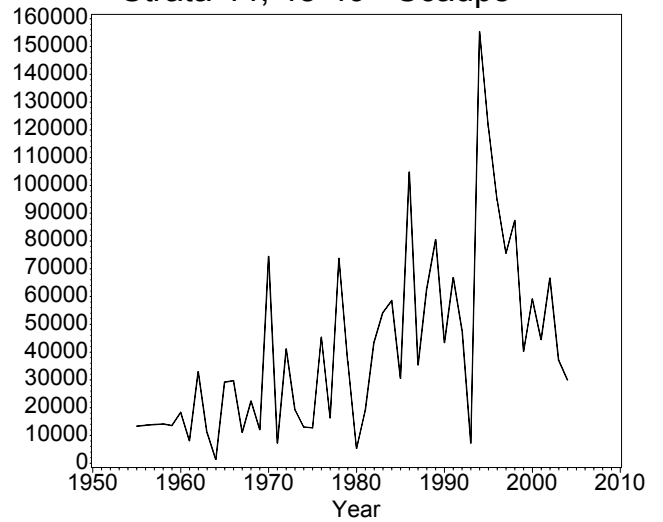
Strata 44, 48-49 Redhead



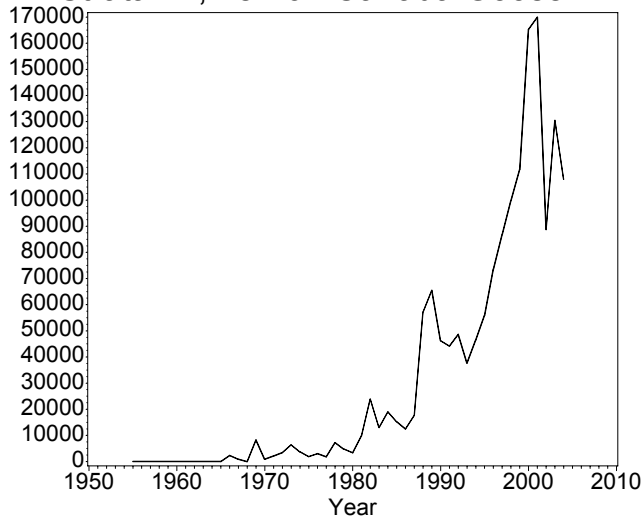
Strata 44, 48-49 Canvasback



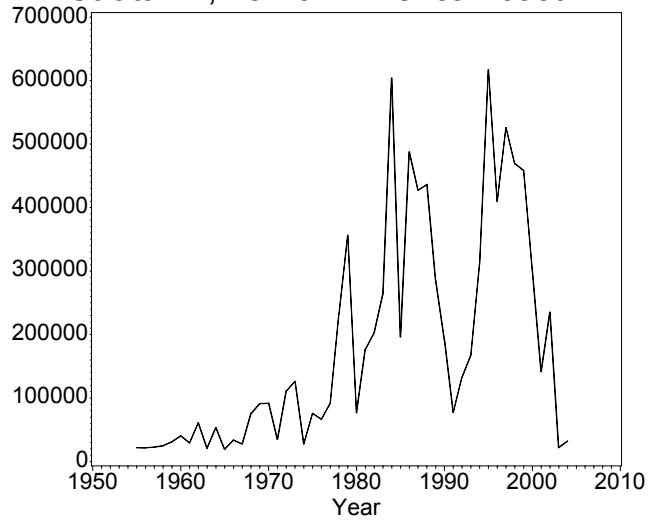
Strata 44, 48-49 Scaups



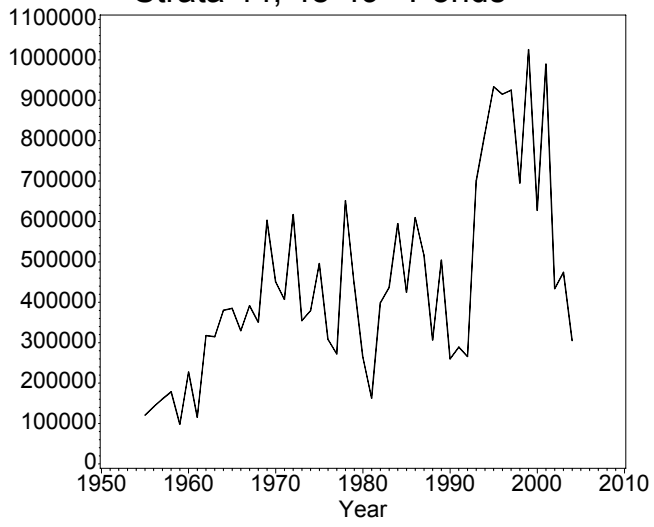
Strata 44, 48-49 Canada Goose



Strata 44, 48-49 American coot



Strata 44, 48-49 Ponds



Strata 44, 48-49 Total Ducks

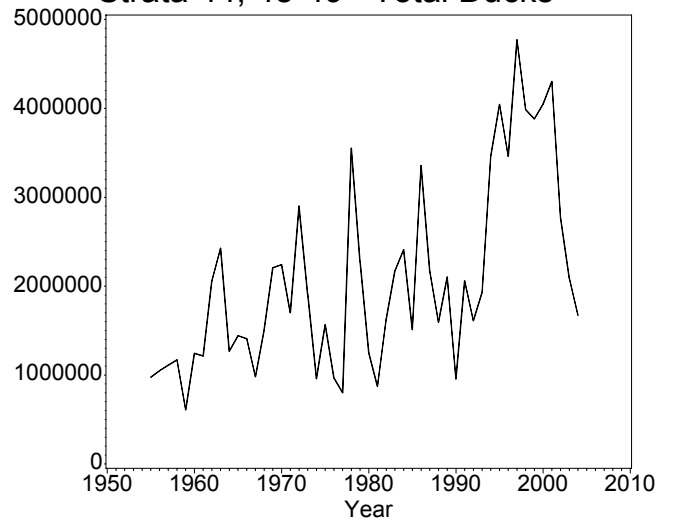


Table 4. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean (from 1958) for North Dakota.

Species/Ponds	Stratum				2004 Total	2003 Total	10-Year Mean	Long-Term Mean	% Change From		
	43	45	46	47					2003	10-Year Mean	Long-Term Mean
Ducks											
Dabblers											
Mallard	120.4	655.0	347.2	30.4	1152.9	1051.1	1246.7	609.8	9.7%	-7.5%	89.1%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Gadwall	57.6	491.7	282.2	14.6	846.2	597.4	804.8	373.3	41.6%	5.1%	126.6%
Am. wigeon	11.1	31.6	10.4	3.1	56.2	66.3	83.0	45.8	-15.3%	-32.3%	22.8%
Am. green-winged teal	24.6	50.9	24.1	0.0	99.6	39.1	57.4	35.7	155.0%	73.4%	179.3%
Blue-winged teal	96.3	638.9	328.1	33.0	1096.3	1327.1	1686.6	881.0	-17.4%	-35.0%	24.4%
N. shoveler	47.9	224.4	76.9	1.7	350.8	321.5	515.3	276.3	9.1%	-31.9%	27.0%
N. pintail	28.5	129.0	75.6	4.0	237.1	116.1	329.4	338.3	104.2%	-28.0%	-29.9%
Subtotal	386.4	2221.4	1144.4	86.9	3839.1	3518.6	4723.2	2560.1	9.1%	-18.7%	50.0%
Divers											
Redhead	13.8	113.0	27.9	6.7	161.3	96.4	220.7	136.3	67.4%	-26.9%	18.4%
Canvasback	0.0	34.0	3.5	0.0	37.5	20.0	45.7	29.6	87.4%	-18.0%	26.7%
Scaups	10.8	82.6	138.8	0.0	232.1	140.7	128.0	71.6	65.0%	81.4%	224.3%
Ring-necked duck	0.7	0.0	1.9	0.0	2.5	10.6	16.4	8.4	-76.0%	-84.5%	-69.7%
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	--	-100.0%	-100.0%
Bufflehead	0.6	0.0	0.0	0.0	0.6	2.5	2.7	1.4	-77.9%	-79.2%	-59.3%
Ruddy Duck	10.7	130.6	33.8	1.6	176.7	81.5	146.9	93.3	116.7%	20.2%	89.4%
Subtotal	36.5	360.2	205.8	8.3	610.7	351.8	560.6	340.7	73.6%	8.9%	79.3%
Miscellaneous											
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	-100.0%
Mergansers	0.0	0.3	0.0	0.0	0.3	0.0	1.3	0.8	--	-74.1%	-60.5%
Subtotal	0.0	0.3	0.0	0.0	0.3	0.0	1.3	0.8	--	-74.1%	-61.0%
Total Ducks	422.9	2581.9	1350.2	95.2	4450.1	3870.4	5285.1	2901.7	15.0%	-15.8%	53.4%
Canada Goose	17.9	97.4	67.7	0.8	183.8	175.3	104.3	28.5	4.9%	76.3%	545.6%
Am. coot	40.5	454.5	27.8	3.1	525.8	77.9	864.7	394.5	575.3%	-39.2%	33.3%
Ponds	159.3	455.4	163.8	26.0	804.5	933.1	1000.2	732.9	-13.8%	-19.6%	9.8%

Table 5. Long-term trend in adjusted May pond estimates (thousands) by stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean (from 1974) for North Dakota. Estimates prior to 1974 were not adjusted for visibility bias.

Year	Stratum				Total
	43	45	46	47	
1961	11.8	38.2	26.3	9.6	85.8
1962	25.5	132.6	97.1	17.4	272.6
1963	41.6	206.2	150.9	17.4	416.1
1964	29.4	107.2	41.4	10.4	188.5
1965	51.3	199.4	103.8	13.9	368.4
1966	55.7	265.5	182.9	36.5	540.6
1967	50.1	311.7	168.8	29.9	560.6
1968	54.0	141.1	109.9	11.7	316.8
1969	89.5	326.2	169.9	31.6	617.2
1970	101.5	473.0	152.4	29.2	756.1
1971	109.4	365.5	87.4	17.0	579.3
1972	130.9	338.2	148.0	35.3	652.4
1973	88.4	167.4	54.0	11.8	321.6
1974	64.7	950.9	179.3	57.3	1252.2
1975	104.9	703.4	286.0	41.4	1135.8
1976	84.0	505.1	221.8	37.4	848.2
1977	88.2	179.2	60.1	12.8	340.3
1978	123.7	304.2	195.2	14.2	637.3
1979	87.0	447.4	268.5	32.9	835.8
1980	65.4	179.5	89.4	11.1	345.5
1981	70.3	208.4	55.2	9.7	343.5
1982	140.5	443.2	183.4	19.0	786.0
1983	80.0	398.1	147.5	23.3	648.9
1984	113.9	554.6	269.2	27.7	965.4
1985	115.0	355.5	126.6	17.6	614.6
1986	120.0	381.2	201.7	25.8	728.8
1987	134.5	281.2	170.4	15.1	601.1
1988	94.7	135.4	74.8	8.7	313.6
1989	116.4	198.6	117.5	15.5	448.0
1990	72.8	64.9	39.5	8.0	185.2
1991	72.4	59.1	36.1	7.7	175.3
1992	119.6	146.7	47.9	9.4	323.6
1993	106.4	167.3	163.0	18.4	455.1
1994	203.2	412.0	275.5	27.9	918.7
1995	197.0	581.6	348.0	34.1	1160.6
1996	193.9	545.0	386.1	55.8	1180.7
1997	163.0	558.8	393.3	42.4	1157.6
1998	159.4	462.4	359.0	64.0	1044.8
1999	137.5	895.5	361.3	45.6	1439.9
2000	105.1	363.2	242.4	23.6	734.3
2001	86.2	414.9	222.1	26.9	750.2
2002	96.4	373.7	192.5	19.9	682.5
2003	107.0	499.4	277.1	49.5	933.1
2004	159.3	455.4	163.8	26.0	804.5
10-year Mean	144.9	510.7	305.7	39.0	1000.2
Long-term Mean	114.1	392.3	199.7	26.8	732.9
Percent Change:					
From 2003	48.80%	-8.80%	-40.90%	-47.40%	-13.80%
From 10-year Mean	10.00%	-10.80%	-46.40%	-33.30%	-19.60%
From Long-term Mean	39.60%	16.10%	-18.00%	-2.80%	9.80%

Table 6. Survey design for North Dakota, May 2004.

	Stratum				Total
	43	45	46	47	
<u>Survey design</u>					
Square miles in stratum	19,835	26,625	14,238	7,821	68,519
Square miles in sample	175.5	310.5	270.0	45.0	801.0
Linear miles in sample	702	1,242	1,080	180	3,204
Number of transects in sample	5	7	8	6	26
Number of segments in sample	39	69	60	10	178
Expansion factor	113.0199	85.7487	52.7333	173.8000	---
 <u>Current year coverage</u>					
Square miles in sample	175.5	310.5	270.0	45.0	801.0
Linear miles in sample	702	1,188	1,080	180	3,204
Number of transects in sample	5	7	8	6	26
Number of segments in sample	39	69	60	10	178
Expansion factor	113.0199	85.7487	52.7333	173.8000	---

Appendix 2. Long-term trend in adjusted waterfowl breeding population estimates (thousands) in North Dakota.

Species/Ponds	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
<b>Ducks</b>										
<b>Dabblers</b>										
Mallard	402.4	162.2	288.5	225.9	238.1	512.8	271.1	430.2	507.1	545.0
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	44.8	13.4	85.2	56.4	156.2	213.8	86.0	226.8	269.5	216.2
Am. wigeon	24.7	24.9	22.8	5.0	3.8	16.4	4.6	5.9	18.6	27.9
Am. green-winged teal	4.5	0.0	0.0	6.8	0.0	2.2	0.0	3.3	60.9	26.9
Blue-winged teal	528.7	316.4	519.5	295.6	755.2	686.6	584.5	913.5	1041.7	1106.1
N. shoveler	62.9	45.3	184.8	106.8	271.5	221.0	102.8	289.4	290.4	403.8
N. pintail	330.4	62.8	632.7	244.9	429.6	320.7	230.3	478.6	495.3	544.9
Subtotal	1398.3	625.0	1733.4	941.4	1854.5	1973.5	1279.2	2347.6	2683.5	2870.8
<b>Divers</b>										
Redhead	34.1	15.3	88.9	39.3	91.2	97.4	58.5	117.1	203.1	163.1
Canvasback	30.7	6.9	13.2	3.1	2.2	14.7	17.2	19.0	53.6	26.5
Scaups	11.7	22.1	40.7	18.3	77.7	15.1	3.0	14.0	15.5	22.1
Ring-necked duck	0.0	0.0	2.9	0.0	0.0	0.9	0.0	0.0	2.5	0.0
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.0
Ruddy Duck	1.6	23.8	44.3	23.3	27.5	18.2	5.4	9.0	33.4	41.8
Subtotal	78.1	68.1	190.0	84.0	198.6	146.3	84.1	159.3	309.4	253.6
<b>Miscellaneous</b>										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.2	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.2	0.2	0.0
Total Ducks	1476.4	693.1	1923.4	1025.5	2053.1	2120.0	1363.3	2507.2	2993.2	3124.4
Canada Goose	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0
Am. coot	59.0	94.4	82.0	51.1	104.0	47.4	14.2	93.8	150.5	203.3
<b>Ponds</b>										
Species/Ponds	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
<b>Ducks</b>										
<b>Dabblers</b>										
Mallard	434.6	462.6	736.6	769.3	674.0	547.2	458.4	566.5	368.0	292.1
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	352.9	323.1	373.9	372.2	353.6	223.2	213.6	330.1	76.5	103.0
Am. wigeon	8.3	40.5	30.0	28.1	29.1	36.0	44.1	72.8	62.3	31.7
Am. green-winged teal	12.4	67.0	138.6	23.4	51.0	38.0	75.0	59.4	17.4	7.4
Blue-winged teal	749.7	902.9	712.7	1238.1	780.3	588.7	1171.3	1051.4	357.0	282.2
N. shoveler	194.8	304.0	454.9	219.4	289.9	129.7	219.5	225.2	89.7	71.2
N. pintail	169.4	693.7	831.6	690.0	749.1	257.1	487.1	455.6	208.6	91.1
Subtotal	1922.2	2793.9	3278.5	3340.4	2926.9	1819.9	2669.0	2761.1	1179.5	878.6
<b>Divers</b>										
Redhead	93.3	177.1	153.5	123.7	126.9	94.6	110.7	214.8	63.6	31.9
Canvasback	17.3	58.9	24.7	14.7	30.2	28.5	63.0	39.3	15.3	10.3
Scaups	16.6	36.3	28.3	28.2	30.4	41.9	37.3	70.3	54.1	19.7
Ring-necked duck	0.0	0.6	2.8	1.1	0.7	0.0	0.6	1.2	1.1	1.4
Goldeneyes	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0
Bufflehead	0.0	0.0	1.8	0.0	2.6	0.5	0.0	0.0	0.7	0.0
Ruddy Duck	15.5	45.2	86.0	47.0	55.1	40.7	167.0	125.1	22.8	21.1
Subtotal	142.8	318.0	297.1	214.7	247.1	206.1	378.5	450.7	157.7	84.4
<b>Miscellaneous</b>										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	2.9	0.0	0.0	1.4	0.7	0.7	0.0	0.0	0.0
Subtotal	0.0	2.9	0.0	0.0	1.4	0.7	0.7	0.0	0.0	0.0
Total Ducks	2065.0	3114.7	3575.6	3555.1	3175.4	2026.7	3048.2	3211.8	1337.2	963.0
Canada Goose	0.0	0.0	0.0	0.0	0.0	3.8	0.9	3.3	2.2	3.8
Am. coot	127.5	131.3	192.3	147.7	178.8	124.7	368.9	512.9	104.2	74.8
<b>Ponds</b>										
							1252.2	1135.8	848.2	340.3

Appendix 2 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in North Dakota.

Species/Ponds	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Ducks										
Dabblers										
Mallard	506.6	641.4	485.4	308.6	466.5	398.9	550.3	361.4	487.8	582.6
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	243.9	369.2	224.3	255.6	381.2	435.0	528.8	274.0	287.7	275.9
Am. wigeon	69.4	47.4	84.0	119.2	41.5	45.1	38.7	58.9	30.9	44.1
Am. green-winged teal	20.5	25.4	92.4	39.2	52.6	16.4	16.2	58.9	20.1	33.5
Blue-winged teal	737.4	826.5	888.4	252.8	906.3	545.7	861.0	547.0	871.8	579.4
N. shoveler	277.5	447.3	181.9	264.1	377.4	194.3	273.3	153.2	244.7	255.5
N. pintail	588.5	517.3	291.8	135.2	369.4	329.4	375.5	198.9	260.0	191.6
Subtotal	2443.7	2874.5	2248.2	1374.7	2594.9	1964.8	2643.7	1652.3	2202.9	1962.8
Divers										
Redhead	191.8	198.3	122.7	75.2	258.2	226.3	170.3	116.9	103.5	99.0
Canvasback	17.0	42.7	28.5	31.9	32.4	12.4	50.9	20.1	36.3	28.7
Scaups	99.8	199.2	47.7	107.5	103.9	92.6	120.8	102.1	129.4	91.4
Ring-necked duck	2.2	8.4	3.6	0.0	11.6	103.0	12.2	3.5	11.6	3.2
Goldeneyes	0.0	0.0	0.0	0.0	0.0	2.5	1.4	0.0	0.0	1.0
Bufflehead	1.0	2.4	1.4	1.0	0.7	3.7	7.1	0.5	0.8	0.0
Ruddy Duck	123.3	98.0	111.4	237.6	357.1	184.8	251.8	111.9	170.1	113.9
Subtotal	435.0	549.0	315.4	453.2	763.9	625.2	614.4	355.0	451.7	337.2
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.0	0.0	0.0	0.3	6.3	2.7	0.5	0.0	0.5
Subtotal	0.0	0.0	0.0	0.0	0.3	6.3	2.7	0.5	0.0	0.5
Total Ducks	2878.7	3423.5	2563.6	1827.9	3359.1	2596.3	3260.8	2007.8	2654.6	2300.5
Canada Goose	0.9	2.7	3.7	7.4	22.4	10.5	13.7	11.3	17.0	12.3
Am. coot	389.6	1358.1	396.0	374.7	561.3	411.0	898.9	309.7	313.2	530.3
Ponds	637.3	835.8	345.5	343.5	786.0	648.9	965.4	614.6	728.8	601.1

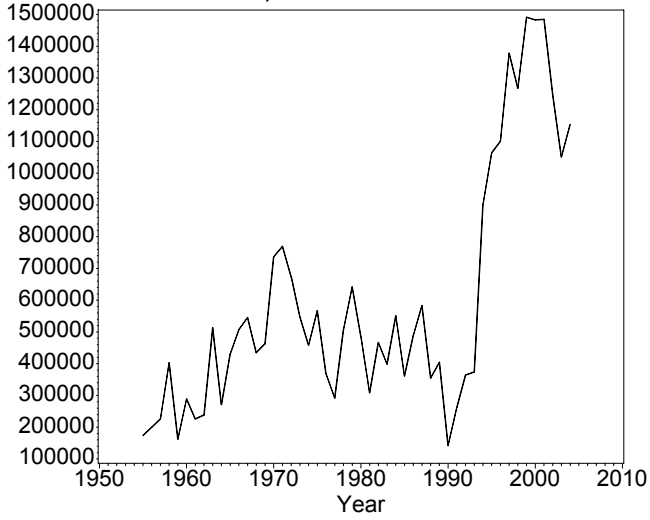
Species/Ponds	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Ducks										
Dabblers										
Mallard	354.9	404.0	142.2	261.8	364.1	374.1	900.7	1063.9	1100.5	1377.7
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	294.9	296.3	296.0	197.9	388.7	285.8	433.3	757.4	806.3	893.8
Am. wigeon	40.8	15.6	22.9	20.9	44.1	13.9	71.4	92.0	78.9	83.2
Am. green-winged teal	28.3	9.5	26.7	9.1	14.1	9.0	60.5	45.9	90.6	79.0
Blue-winged teal	553.9	338.5	230.4	233.4	401.4	303.1	1088.8	1463.1	1764.1	1544.6
N. shoveler	118.4	158.7	67.1	75.2	114.7	175.1	507.8	573.6	653.8	492.2
N. pintail	149.7	109.0	61.8	49.3	112.1	126.9	375.5	424.9	351.5	418.1
Subtotal	1541.1	1331.5	847.1	847.7	1439.2	1288.0	3438.0	4420.8	4845.8	4888.7
Divers										
Redhead	55.2	133.4	17.0	14.7	78.8	102.2	155.0	218.2	257.9	216.5
Canvasback	19.2	39.2	10.1	8.6	17.3	19.8	56.1	42.0	58.6	69.2
Scaups	83.0	38.8	43.6	89.9	23.0	36.6	109.6	108.5	91.5	115.5
Ring-necked duck	10.5	10.9	9.6	5.0	10.3	0.4	15.7	44.4	12.1	11.2
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0
Bufflehead	0.5	2.1	0.5	3.2	3.3	2.5	4.7	3.6	1.8	2.0
Ruddy Duck	12.6	55.3	62.5	14.0	29.5	33.9	105.6	78.6	72.8	180.2
Subtotal	181.1	279.7	143.3	135.5	162.0	195.4	447.3	495.3	494.7	594.6
Miscellaneous										
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.7	4.3	3.2	0.0	0.3	0.5	1.4	0.3	0.9
Subtotal	0.0	0.7	4.3	3.7	0.0	0.3	0.5	1.4	0.3	0.9
Total Ducks	1722.2	1611.9	994.7	986.9	1601.3	1483.7	3885.8	4917.5	5340.8	5484.3
Canada Goose	18.0	34.9	26.6	18.0	32.1	21.2	40.9	55.5	51.8	69.5
Am. coot	429.1	246.8	161.7	58.1	84.1	113.9	608.0	1675.9	1241.9	1715.3
Ponds	313.6	448.0	185.2	175.3	323.6	455.1	918.7	1160.6	1180.7	1157.6

Appendix 2 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in North Dakota.

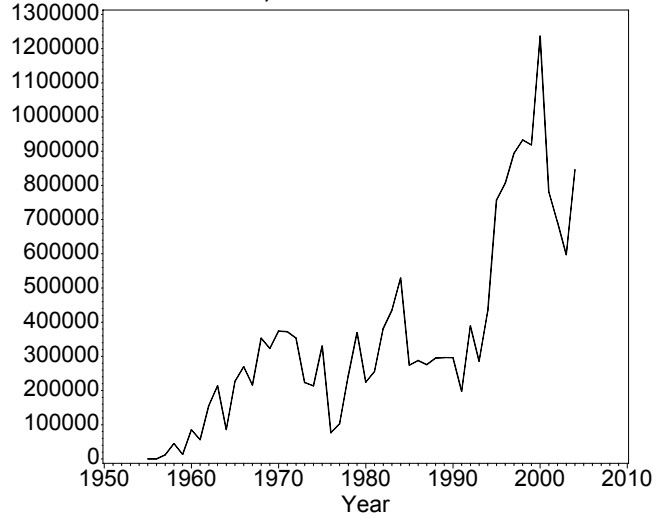
Species/Ponds	1998	1999	2000	2001	2002	2003	2004
<b>Ducks</b>							
<b>Dabblers</b>							
Mallard	1267.7	1490.9	1482.8	1484.3	1247.7	1051.1	1152.9
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	932.9	918.4	1236.3	780.3	691.5	597.4	846.2
Am. wigeon	101.0	69.1	98.0	82.5	87.5	66.3	56.2
Am. green-winged teal	48.4	55.5	44.4	44.7	66.3	39.1	99.6
Blue-winged teal	1734.6	2068.0	2848.5	1688.7	1338.3	1327.1	1096.3
N. shoveler	360.6	535.0	647.0	682.5	378.8	321.5	350.8
N. pintail	281.2	459.1	262.8	377.0	227.7	116.1	237.1
Subtotal	4726.4	5596.1	6619.8	5140.0	4037.9	3518.6	3839.1
<b>Divers</b>							
Redhead	327.6	259.8	306.1	226.4	143.5	93.9	161.3
Canvasback	49.4	42.3	20.8	66.5	32.5	20.0	37.5
Scaups	148.0	120.8	178.2	130.3	136.8	140.7	232.1
Ring-necked duck	7.0	20.6	6.2	13.3	22.8	11.4	2.5
Goldeneyes	0.0	0.0	1.3	0.0	0.0	0.0	0.0
Bufflehead	1.1	0.3	3.2	5.2	2.4	2.4	0.6
Ruddy Duck	143.3	217.3	212.3	185.0	192.6	79.0	176.7
Subtotal	676.4	661.0	728.1	626.7	530.5	347.6	610.7
<b>Miscellaneous</b>							
Long-tailed duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.5	0.7	7.5	0.7	0.0	0.0	0.3
Subtotal	0.5	0.7	7.5	0.7	0.0	0.0	0.3
Total Ducks	5403.3	6257.9	7355.4	5767.4	4568.4	3866.1	4450.1
Canada Goose	76.5	104.5	161.6	184.1	122.9	175.3	183.8
Am. coot	767.9	889.9	912.6	319.6	437.9	82.6	525.8
Ponds	1044.8	1439.9	734.3	750.2	682.5	933.1	804.5



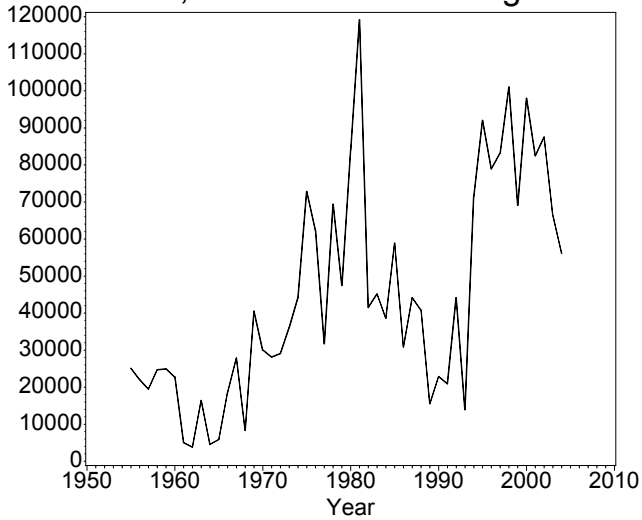
Strata 43, 45-47 Mallard



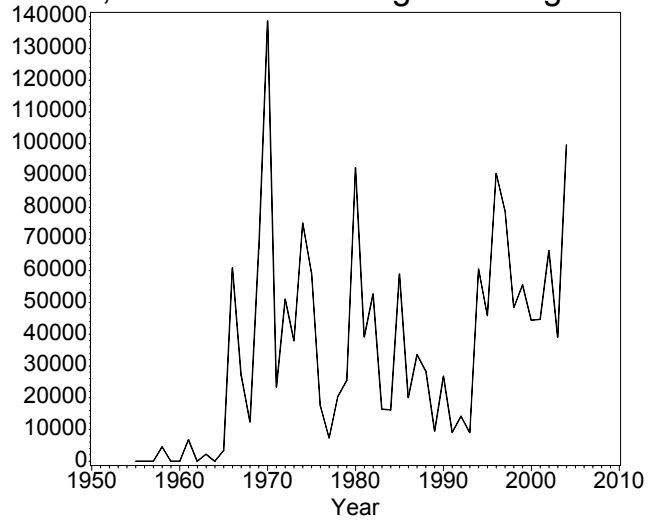
Strata 43, 45-47 Gadwall



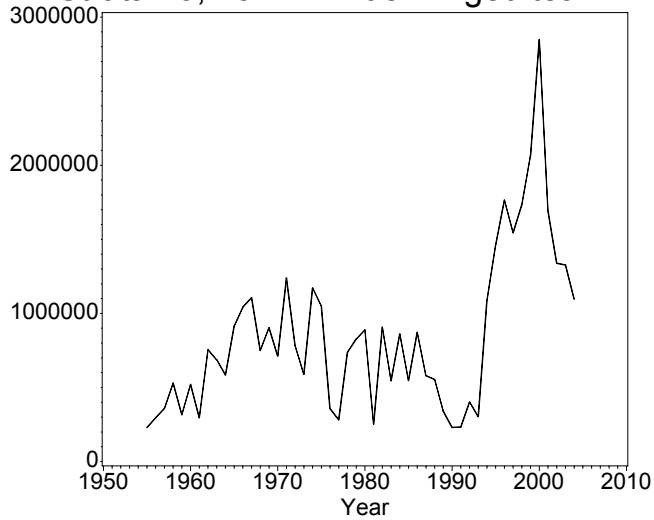
Strata 43, 45-47 American wigeon



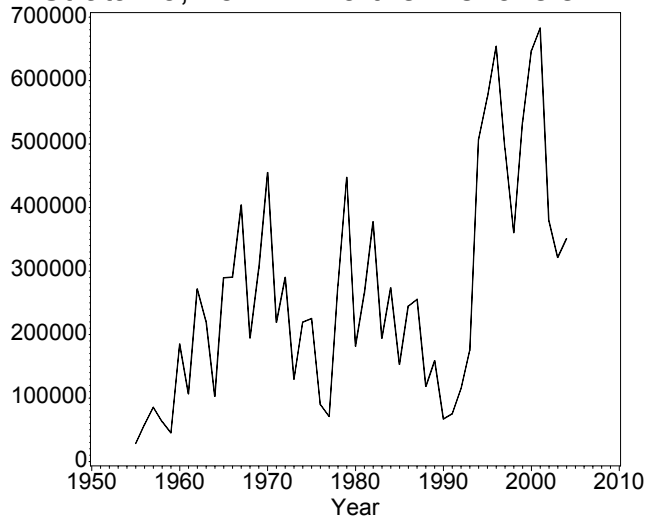
Strata 43, 45-47 American green-winged teal



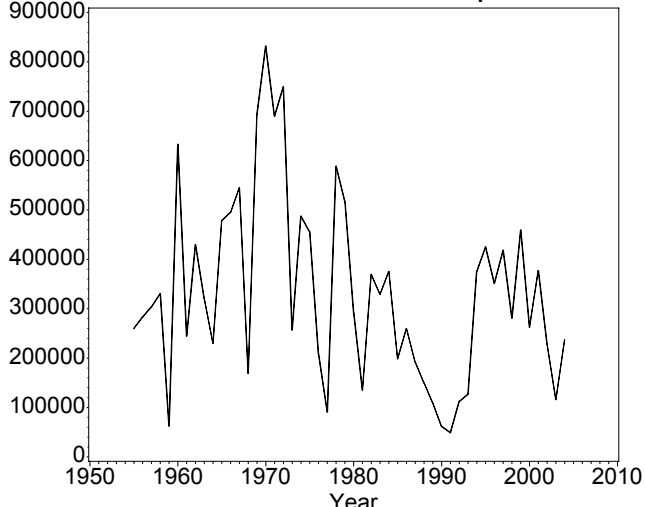
Strata 43, 45-47 Blue-winged teal



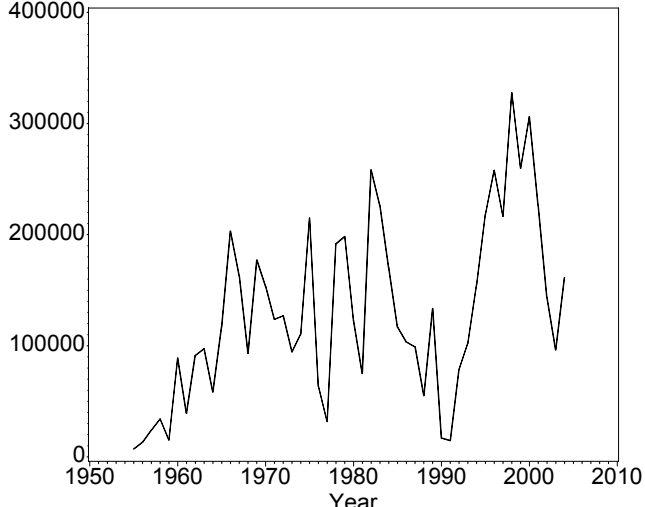
Strata 43, 45-47 Northern shoveler



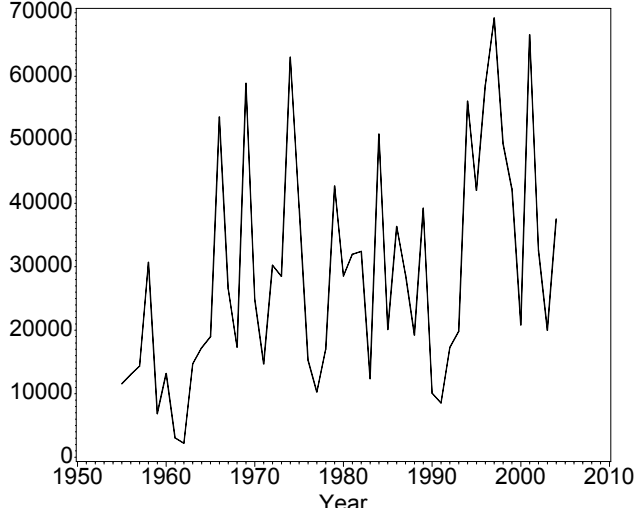
Strata 43, 45-47 Northern pintail



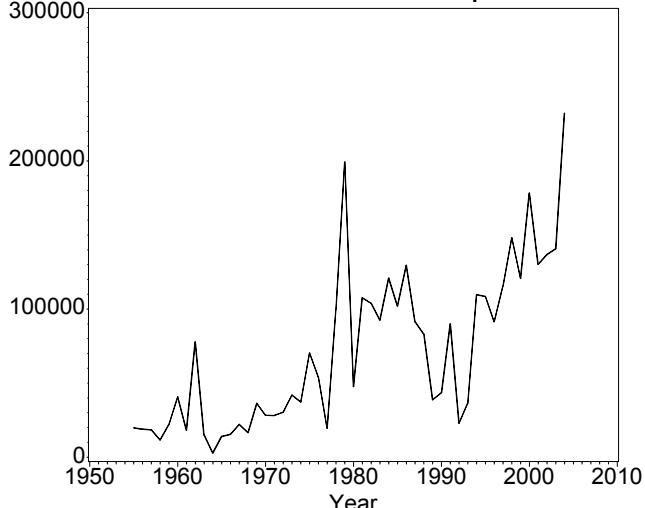
Strata 43, 45-47 Redhead



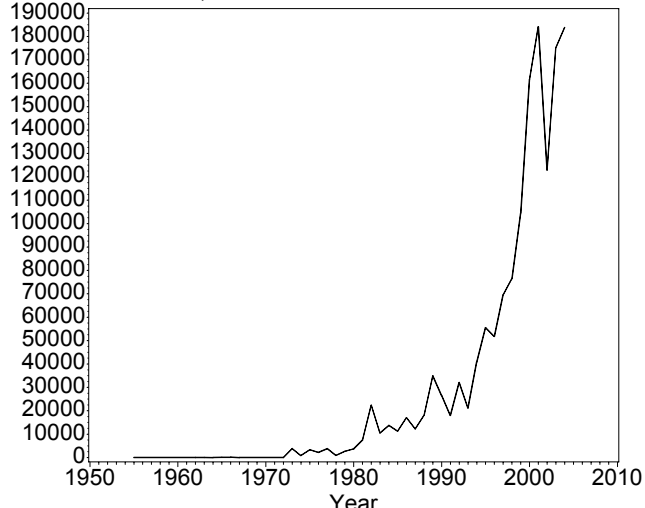
Strata 43, 45-47 Canvasback



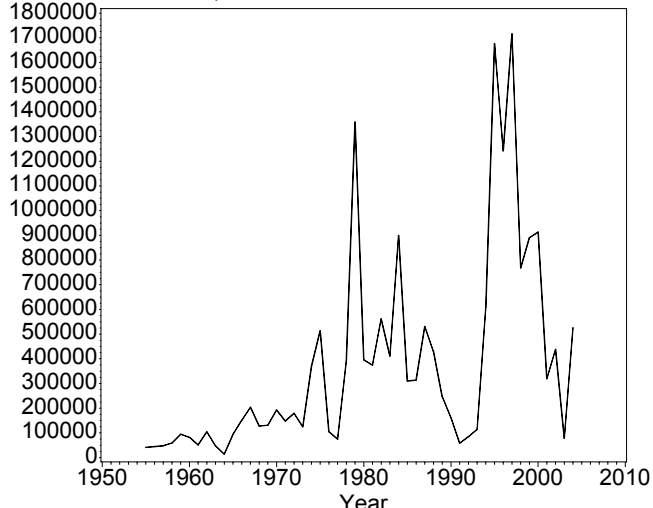
Strata 43, 45-47 Scaups



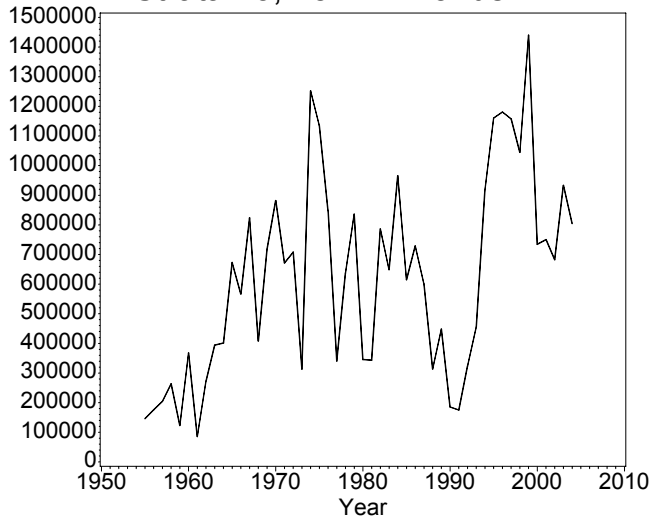
Strata 43, 45-47 Canada Goose



Strata 43, 45-47 American coot



Strata 43, 45-47 Ponds



Strata 43, 45-47 Total Ducks

