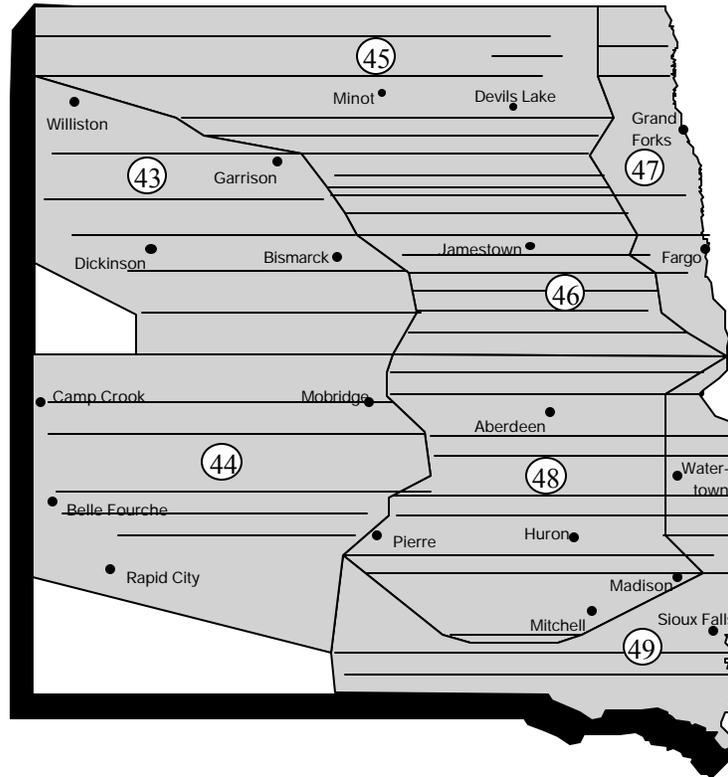


2003

**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 – 7 May 2003 (43 and 44)
7 - 26 May 2003 (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 - Sue Thomas, Migratory Bird Biologist, MBHP, R-1, Portland, OR

Ground Crew

Leader - George Allen, Wildlife Biologist, BSA/DMBM, Arlington, VA
Assistants - Kammie Kruse, Wildlife Biologist Central Flyway/DMBM,
Denver, CO
Tim Menard, Wildlife Biologist, Flint Hills NWR, Hartford, KS
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 - Pam Garrettson, Wildlife Biologist, PHAS/DMBM, Laurel, MD
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ABSTRACT: The 2003 Waterfowl Breeding Ground and Habitat Survey for Eastern South and North Dakota was conducted 7 - 26 May. Aerial coverage of the traditional sample was incomplete. Personnel changes occurred this year in the east river ground crew. Wetland counts increased in both states since 2002 and overall habitat conditions in the survey area were classed as poor to good. The estimated waterfowl breeding population in South Dakota (2.089 million) decreased 24% since 2002 and was lowest since 1993. In North Dakota, the waterfowl breeding population (3.866 million) decreased 15% since last year and was also lowest since 1993. The

2003 outlook for waterfowl production, overall in the Dakotas, is near average.

Selected information for 2003 is presented below:

South Dakota

	2003 Indices (thousands)	Percent Change From		
		2002	1993-2002 mean	1959-2002 mean
Mallard	577.5	-17%	-37%	22%
Gadwall	320.2	-28%	-38%	39%
Blue-winged Teal	859.9	-18%	-38%	2%
Northern Pintail	39.0	-56%	-84%	-82%
Redhead	27.7	-63%	-56%	-42%
Canvasback	3.1	-61%	-59%	-52%
Total Ducks	2089.1	-24%	-43%	-4%
May Ponds	473.9	9%	-41%	-12%

North Dakota

	2003 Indices (thousands)	Percent Change From		
		2002	1993-2002 mean	1959-2002 mean
Mallard	1051.1	-16%	-11%	75%
Gadwall	597.4	-14%	-23%	62%
Blue-winged Teal	1327.1	-1%	-16%	52%
Northern Pintail	116.1	-49%	-65%	-66%
Redhead	93.9	-34%	-58%	-32%
Canvasback	20.0	-38%	-56%	-33%
Total Ducks	3866.1	-15%	-23%	34%
May Ponds	933.1	37%	-2%	28%

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. Sampling during this year's survey was incomplete. In Stratum 45, 3 segments were omitted due to adverse weather conditions. The expansion factor for Stratum 45 was adjusted accordingly and all segments in the remaining strata were flown (Tables 3 and 6).

Personnel changes in 2003 included two ground crewmembers. Kammie Kruse, a DMBM/Central Flyway wildlife biologist from Denver, joined the east river ground crew this year. Terri Thorn, a wildlife biologist for Ecological Services in Bismarck, also teamed up with the ground crew in 2003. Remaining air and ground personnel were unchanged since 2002. All members participated in pre-survey training/review sessions relating to air and ground procedures. Participants were critiqued regarding species identification, judgment of transect width, and adherence to standard operating procedures.

Visibility Correction Factors (VCF's) in the crew area are typically calculated using observations collected from 17 air/ground comparison segments. All comparison segments in the crew area are co-located with operational survey segments and this year all were completed. The VCF for wetlands, established by comparison of air and ground observations, was 1.10. 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 65 hours of flight time including aerial observer review, reconnaissance, and the collection of footage for a video production. Aerial crews continued to utilize on-board computers, interfaced with the aircraft GPS, to capture geo-referenced waterfowl and wetland observations. Sampling commenced 7 May in the eastern Dakotas and was completed on the 26th (air) and 27th (ground).

Once the survey was initiated, 5 days were forfeited to adverse weather. Weather problems included rain, fog, and wind, which exceeded 30 mph on numerous occasions. Information from Stratum 43 and 44 was collected 2 - 7 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 area west of the Missouri River entered the fall of 2002 in moderate to extreme drought condition. Hot, dry weather during the first two weeks of September further reduced soil moisture levels west of the river. East of the river, conditions were normal with slightly higher than average precipitation. Colder than average temperatures extended through the month of October. During October, precipitation levels again dropped below normal throughout the Dakotas and drought conditions crept further east of the river. Extreme drought conditions continued in the southwestern portion of the crew area.

Dry conditions prevailed through November. Most states in the north central plains noted record low precipitation levels. Warmer than average temperatures during the later half of the month further exacerbated low soil moisture levels. During December, drought conditions expanded throughout the Dakotas with the exception of the eastern quarter. Although temperatures were up to 15°F higher than normal, dry conditions and patchy snow provided little insulation from cold winter temperatures.

The New Year began with higher than average temperatures. Just enough snow fell on the northern plains, in advance of the mid through late-month cold outbreak, to protect winter crops. Snow depths were reported as trace throughout most of South Dakota and 1-4 inches in North Dakota. Higher than average temperatures were reported during the first half of January, but then dropped to an average of 9°- 12°F below normal for the remainder of the month. Most of North Dakota reported snow coverage in February, while South Dakota again reported mainly trace levels. Precipitation levels averaged 25-50% less than normal throughout. As a result, the eastern Dakotas were reclassified to abnormally dry, while the central and western Dakotas remained in moderate to extreme drought stages. Temperatures were reported as 4-8°F below normal throughout the crew area for the month.

The first month of spring brought little relief from the drought with lower than average precipitation making for limited snow coverage throughout. March began with temperatures up to 21°F below normal, but warmed by the third week and continued throughout April, further reducing soil moisture. Despite near normal precipitation amounts in southeastern South and North Dakota during April, the area along the eastern border of the Dakotas was classified as abnormally dry. Drought indices remained at extreme levels west of the Missouri River.

Weather conditions during May were more like “early spring”. Conditions were characterized by rain, colder than normal temperatures, and gusty winds. May weather provided significant amounts of precipitation to the northern half of the survey unit. Of the two states, North Dakota benefited most. Two times normal precipitation fell, generally in the southeastern quarter of the state. This was particularly fortunate considering the drought conditions (in the south central region) during 2002 and through the winter of ‘02 – ’03. The northern third and eastern regions received 1.5 times normal precipitation during May. The remainder of North Dakota received normal precipitation during the period.

In South Dakota, the northern counties of McPherson, Brown, and Marshall received 1.5 times normal precipitation north of highway 12. East of the Missouri River and from about Huron north, average precipitation was received. Southeastern, south central, and most of the region west of the Missouri river received only normal to 50% of normal precipitation.

Overall habitat conditions in the reporting area were variable but ranged from poor to good. In South Dakota, development of upland cover was earlier than in 2002 and was triggered by near average precipitation and temperatures 2° to 4° above normal. With drought conditions lingering from the winter, average precipitation did little to improve the condition of wetland basins. Wetland conditions were improved in the northern half of South Dakota in May but less than average precipitation offered no improvement to basins in the southern half of the state. Agricultural producers, especially in southern portions of South Dakota, were capitalizing on this second year of dry conditions by negatively impacting Type I and Type III basins. In South Dakota, the total wetland index increased 9% since 2002 but remained 41% below the ten-year mean and 12% below the long-term average (Table 2).

In North Dakota, April precipitation delivered 150% of normal to the extreme northwest corner. The remainder of the state received only 50% to 75% of normal precipitation. April temperatures again were 2° to 4° above normal which encouraged the growth of upland cover. North Dakota benefited, to a greater degree than South Dakota, from May rains. During that month, normal to two times normal precipitation fell. In North Dakota, the statewide wetland count increased 37% compared to last year. Although similar to the ten-year average (-2%), the 2002 index remained 28% above the long-term mean (Table 5).

Descriptions by stratum are listed below.

SOUTH DAKOTA (St. 44: 2 - 3 May, St. 48, 49: 7 -15 May)

Stratum 44 - In early spring, the stratum was generally suffering from moderate drought. Water

levels in ponds, stock dams, and watercourses were described as reduced and the Missouri River and Lake Oahe were at their lowest level in years. April rains were light but persistent and coupled with warm temperatures, stimulated vegetation development over the entire area. Extensive rains fell in most areas during the first week of May delivering .25" to .5". Most of this moisture assisted in replenishing depleted soil moistures but in areas of thunderstorms, some run-off occurred and raised water levels in larger catch basins. Habitat ratings assigned to the stratum included good in approximately the southwestern half, good in the northwest – southeast third, and poor in the extreme northeast adjacent to stratum 48. Wetland counts in 2003 increased 30% compared to 2002 but were well below the ten-year (-44%) and long-term (-26%) averages.

Stratum 48 - Compared to 2002, wetland counts in the stratum increased 18%. The area exhibiting the most obvious improvement was the northern most portion of the stratum. In fact, restricted almost solely to the 2 northern most survey lines in the state. In this region, significant May rains combined with early development of vegetation provided the best habitat we encountered in South Dakota. This was the only area east of the Missouri River where we encountered any temporary or seasonal water. Other areas benefiting from the May rains were those portions of the stratum encompassing the southern end of the Missouri Coteau (Leola Hills) and the Prairie Coteau. In these areas, wetland basins generally contained water, but were in various stages of recession. On the drift plain, central and south central areas were very dry with the remainder of the prairie slightly wetter. Compared to the ten-year and long-term averages, wetland counts in 2003 decreased 41% and 5% respectively.

Stratum 49 – Nearly all of stratum 49 was considered in poor to fair condition. Although April moisture and warm temperatures did encourage vegetation development in the uplands (especially in south western 49, west of the Missouri River), Type I and Type III basins were empty. Producers, during this second year running of dry conditions, had taken many opportunities to till through and plant these smaller wetland basins. Dugouts and more permanent basins typically were only 30% - 60% full. Over water nest sites were nearly non-existent. Wetland counts in 49 decreased compared to 2002 (-16%), the ten-year average (-38%), and the long-term average (-10%).

NORTH DAKOTA (St. 43: 3 & 7 May, St. 45, 46, 47: 16 - 26 May)

Stratum 43 – In a similar trend, stratum 43 entered the waterfowl breeding season with depleted pond numbers, reduced water levels, and marginal stream flows. Nesting cover for early breeders was spotty, but widespread light rains and warm temperatures in April improved nesting cover throughout the stratum. Generally, habitat in eastern and western portions of stratum 43 is considered good with the remainder of the area fair. Wetland counts increased 11% since last year but were below ten-year (-26%) and long-term (-6%) levels.

Stratum 45 – In 2003, portions of stratum 45 showed improvement in wetland conditions since 2002. Particularly, the northern one-third of the Missouri Coteau and another region in parts of: Cavalier, Towner, Rolette, Benson, Ramsey, and Nelson counties all improved in quality and area of coverage. These two general areas are most responsible for the increase in the wetland index for the stratum. Portions of the northeast, north central, and northwest also improved since

last year and were upgraded to fair. Only small portions of the west central and north central remained in poor condition. Surveying didn't begin in stratum 45 until the third week of May by which time, early season grasses were well developed and were providing good upland nesting cover. The remainder of the stratum was considered fair with representative water and cover. Wetland counts in stratum 45 increased 34% since 2002, were unchanged (5%) compared to the ten-year average and was 28% above the long-term average.

Stratum 46 – This stratum offered the most significant habitat improvement in the survey unit since 2002. Primarily caused by May rains, Missouri Coteau wetlands were improved and large portions of the drift plain were upgraded to good. The drought stricken portions of south central and southeastern stratum 46 in 2002 were dramatically changed by the May (2003) rains. Although narrow fringes on the east and west were poor, the remainder of the stratum was in fair condition. Wetland indices increased 44% since 2002, were similar to (-6%) the ten-year mean, and nearly 41% above the long-term average.

Stratum 47 – Stratum 47 realized the largest increase in wetland counts of any stratum in the state. Early May rains more than doubled the number of basins with water since 2002 (149%) and the index was well above both the ten-year average (38%) and the long-term mean (90%). Farming intensity is high in most of the stratum leaving only tiny, localized areas of nesting cover.

DISCUSSION/BREEDING POPULATION ESTIMATES:

The crew arrived in southeastern South Dakota on 6 May. Mild temperatures and limited precipitation in April had triggered vegetation development 2 weeks earlier than last year. This was fortunate for birds seeking nesting cover in areas where intense haying had occurred during last year's drought emergency.

Breeding waterfowl too, appeared to be following a schedule earlier than in 2002. On the survey start date (5/7), all species were present in typical social groupings for the season and distributed in available habitat. An examination of drake to pair ratios further indicated the relatively more advanced progression of 2003 waterfowl breeding activities compared to 2002. Drake to pair ratios in the crew area for South Dakota mallards was 70:30. The mallard ratio in North Dakota (63:37) indicated breeding activities slightly later (expected) than in South Dakota, but further along than our "target" 50:50. Although a much smaller sample size, another early nesting species (pintails) exhibited a similar pattern. With the apparent stage of breeding activity, we anticipated large groups of post breeding males prior to the completion of the survey. This did not occur and as a result, we feel that our survey timing was acceptable.

General habitat conditions in east river South Dakota in March and April were quite dry. When early migrants arrived, existing habitat offered little attraction to settle and nest. This was particularly true in the southern three-quarters of the state where temporary and seasonal wetlands were dry. In the same region, semi-permanent and all but the largest permanent basins were in stages of recession. When significant rains arrived in May, many birds (certainly early nesting species) had over flown to search elsewhere for suitable conditions. Even in the extreme

northern portion of South Dakota where the effects of May rains were most evident, much of the “new” water was void of waterfowl. Although late for most initial breeders, the May precipitation created new and improved the quality of existing wetland habitat. These improvements will benefit mid and late nesting species to some degree and will certainly improve brooding conditions.

In South Dakota, the total duck index for 2003 (2.089 million) was the lowest of record since May 1993 (Appendix 1). The state’s waterfowl breeding population decreased 24% since last year and 43% from the ten-year mean. The 2003 index is similar (-4%) to the long-term average (Table 1). Most species of ducks decreased significantly from 2002 figures. Northern Pintails and American Coots were well below long-term averages yet Canada geese (322%) were well above the long-term mean.

A similar trend occurred with breeding waterfowl in North Dakota. The total breeding duck index (3.866 million) was also the lowest of record since 1993 (Appendix 2). The 2003 total duck index fell short of the 2002 (-15%) and ten-year (-23%) figures, but remained 34% above the long-term average (Table 4). All duck species were near or below 2002 values. As in South Dakota, pintails and coots were significantly below long-term averages and Canada geese (595%) were well above the long-term mean.

CONCLUSIONS:

1. Drought conditions from 2002 prevailed in much of the crew area through April 2003. May precipitation provided significant improvements to wetland habitat in the northern half of the survey area, yet habitat in the southern three-quarters of South Dakota remains depressed. Upland nesting cover, encouraged by average precipitation and warmer than normal temperatures in April, developed at least two weeks earlier than last year. Over water nesting sites are nearly non-existent in the southern portion of the unit. Availability of over water sites increases in the north, but are not plentiful due to the recessed condition of many wetlands. Wetland counts in South Dakota increased 9% since last year but were 41% below the ten-year mean and 12% below the long-term mean. In North Dakota, the 2003 wetland index increased 37% compared to 2002, was similar to the ten-year average (-2%), and remained 28% above the long-term average.
2. Migrant waterfowl arrived in the Dakotas in March and about two weeks earlier than last year. Dry conditions in the majority of South Dakota offered little attraction for breeding birds to settle and establish territories. In this region it appeared that some over flight had occurred. In northern South Dakota and in most of North Dakota, breeding birds were present in higher densities and more evenly distributed. The timing of significant improvements to wetland habitat was probably too late to further benefit early nesting species but should assist late-season and second attempt nesting birds.

The 2003 waterfowl breeding population index for South Dakota (2.089 million) decreased 24% since 2002 and compared to the ten-year average (-43%) but was similar to the long-term average (-4%). All species of ducks declined from 2002 levels.

In North Dakota, total breeding ducks (3.866 million) declined 15% since last year and -23% from the ten-year mean. The 2003 total index in North Dakota was 34% above the long-term average. Similar to the trend in South Dakota, most species of breeding ducks declined since 2002. Blue-winged Teal (-1%), Scaup (3%), and Buffelhead (NC) were similar to 2002 levels.

3. May precipitation has improved wetland habitat conditions for brooding and brood survival. We expect below average waterfowl production in South Dakota and average to above average waterfowl production from North Dakota in 2003.

John W. Solberg and Sue Thomas
July 2003

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			2003 Total	2002 Total	10-Year Mean	Long-Term Mean	% Change From		
	44	48	49					2002	10-Year Mean	Long-Term Mean
Ducks										
Dabblers										
Mallard	112.9	323.6	141.0	577.5	699.3	919.0	475.2	-17.4%	-37.2%	21.5%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	-100.0%
Gadwall	44.5	228.1	47.5	320.2	441.6	513.5	230.2	-27.5%	-37.7%	39.1%
Am. wigeon	9.3	13.7	4.1	27.0	33.0	54.7	39.6	-18.3%	-50.6%	-31.8%
Am. green-winged teal	11.8	14.6	0.0	26.4	28.2	47.6	29.7	-6.4%	-44.4%	-11.2%
Blue-winged teal	123.9	533.7	202.3	859.9	1043.1	1377.6	842.3	-17.6%	-37.6%	2.1%
N. shoveler	44.8	66.4	20.1	131.2	188.3	302.1	191.4	-30.3%	-56.6%	-31.4%
N. pintail	13.6	20.4	5.0	39.0	88.1	237.9	220.7	-55.7%	-83.6%	-82.3%
Subtotal	360.8	1200.5	420.0	1981.3	2521.6	3452.4	2029.2	-21.4%	-42.6%	-2.4%
Divers										
Redhead	1.1	19.4	7.2	27.7	75.6	63.3	48.0	-63.4%	-56.2%	-42.3%
Canvasback	0.0	2.1	1.0	3.1	7.8	7.6	6.4	-60.9%	-59.4%	-51.9%
Scaups	2.0	32.3	2.7	37.0	66.6	75.2	44.0	-44.4%	-50.8%	-15.9%
Ring-necked duck	1.0	7.7	1.3	9.9	13.3	16.2	8.3	-26.0%	-39.1%	18.7%
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.2	0.3	--	-100.0%	-100.0%
Bufflehead	0.6	0.0	0.8	1.4	1.9	2.6	1.5	-28.4%	-47.9%	-10.5%
Ruddy Duck	0.0	18.7	9.4	28.0	75.6	44.2	32.5	-63.0%	-36.6%	-13.9%
Subtotal	4.7	80.1	22.3	107.0	240.9	209.3	141.0	-55.6%	-48.9%	-24.1%
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	0.8	0.0	0.0	0.8	2.4	3.4	1.6	-66.7%	-76.8%	-50.2%
Subtotal	0.8	0.0	0.0	0.8	2.4	3.4	1.6	-66.7%	-76.8%	-51.3%
Total Ducks	366.3	1280.5	442.3	2089.1	2764.9	3665.2	2171.9	-24.4%	-43.0%	-3.8%
Canada Goose	12.0	92.1	26.3	130.4	88.7	93.6	30.9	47.0%	39.4%	322.5%
Am. coot	1.4	19.6	1.5	22.5	235.1	363.6	202.1	-90.4%	-93.8%	-88.9%
Ponds	111.9	240.7	121.4	473.9	433.9	806.3	539.6	9.2%	-41.2%	-12.2%

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
10-year Mean	201.0	409.4	195.9	806.3
Long-term Mean	151.1	253.2	135.3	539.6
Percent Change:				
From 2002	30.20%	17.90%	-15.60%	9.20%
From 10-year Mean	-44.30%	-41.20%	-38.00%	-41.20%
From Long-term Mean	-26.00%	-4.90%	-10.30%	-12.20%

Table 3. Survey design for South Dakota, May 2003.

	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
Ducks										
Dabblers										
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
Divers										
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
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	0.0	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
Ponds										
Species/Ponds	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Ducks										
Dabblers										
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
Divers										
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
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	0.8	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
Ponds										
						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.

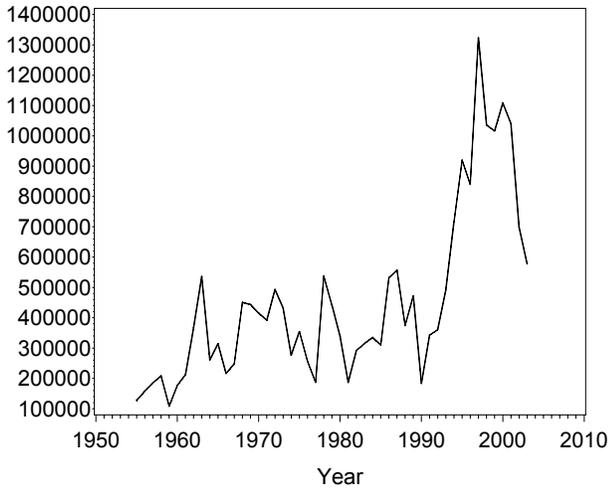
Species/Ponds	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Ducks										
Dabblers										
Mallard	441.7	338.9	186.8	291.7	314.9	334.9	310.1	532.0	556.8	374.1
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	136.7	69.8	113.6	189.1	219.0	263.7	145.5	254.3	205.7	222.5
Am. wigeon	33.6	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

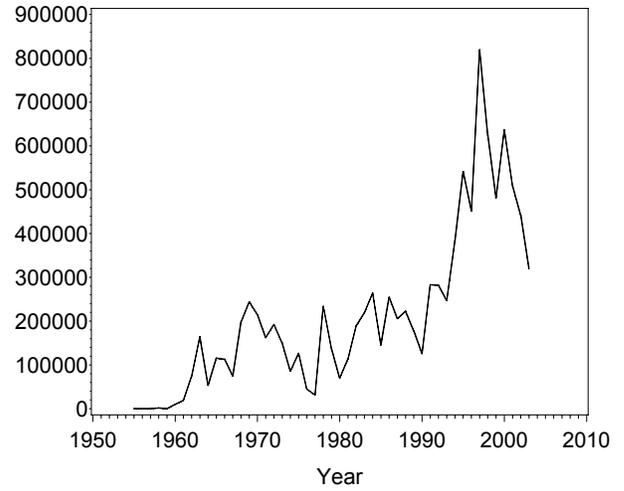
Appendix 1 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in South Dakota.

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

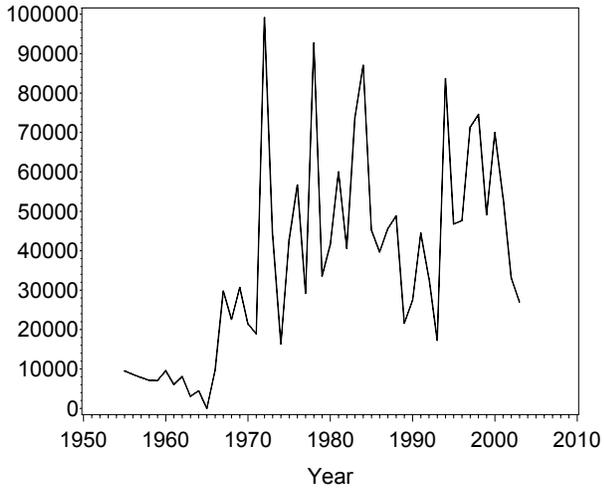
Strata 44, 48-49 Mallard



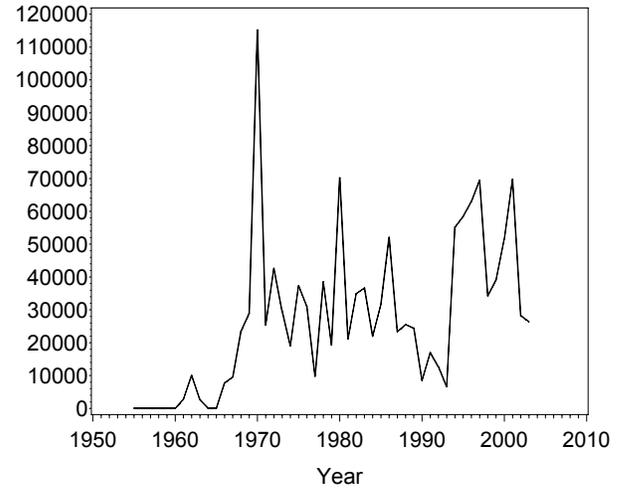
Strata 44, 48-49 Gadwall



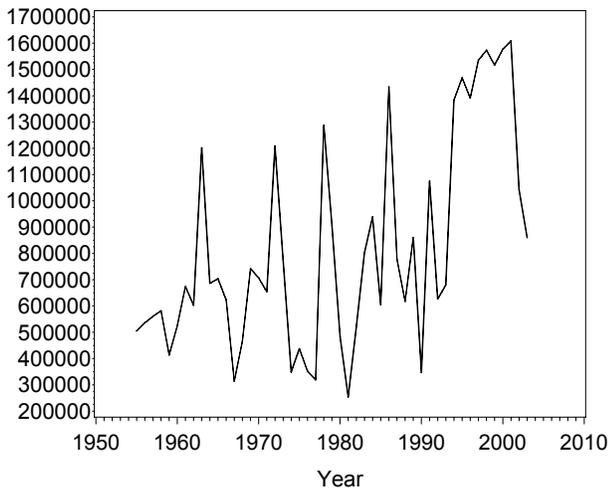
Strata 44, 48-49 American wigeon



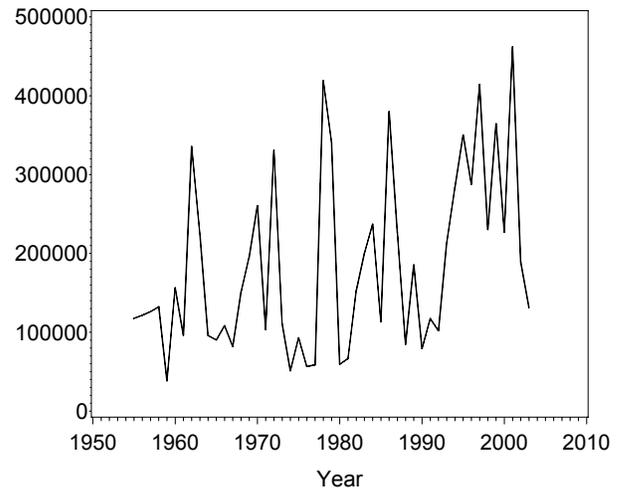
Strata 44, 48-49 American green-winged teal



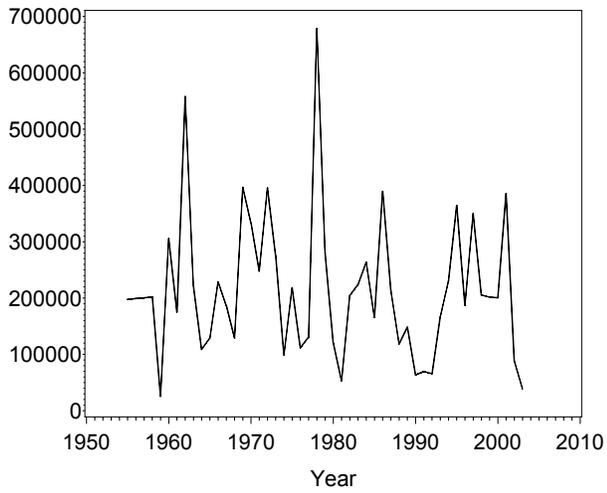
Strata 44, 48-49 Blue-winged teal



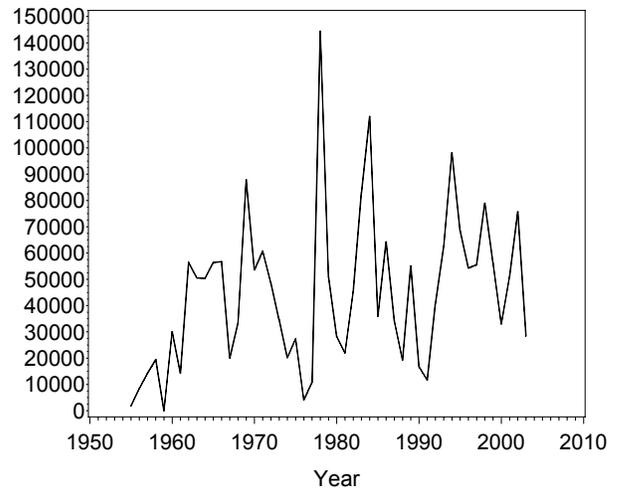
Strata 44, 48-49 Northern shoveler



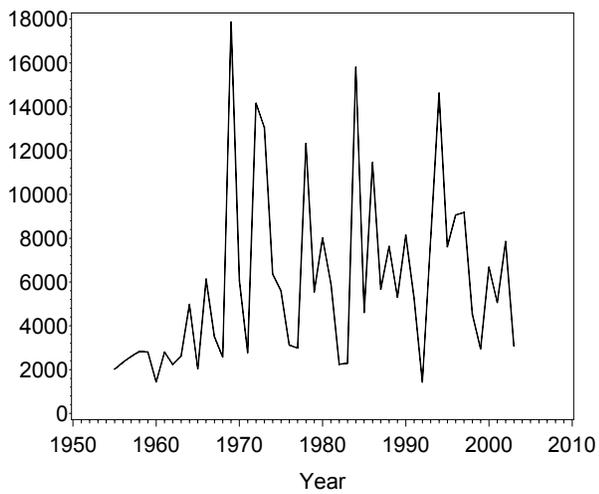
Strata 44, 48-49 Northern pintail



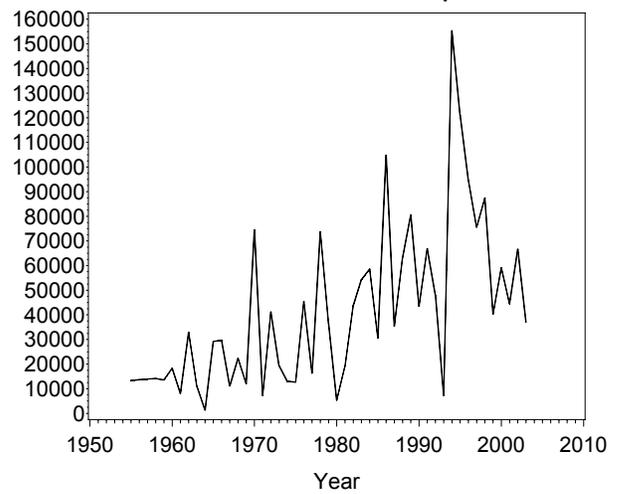
Strata 44, 48-49 Redhead



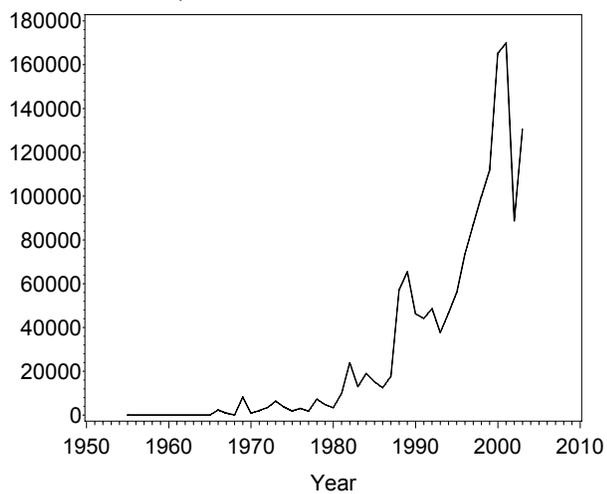
Strata 44, 48-49 Canvasback



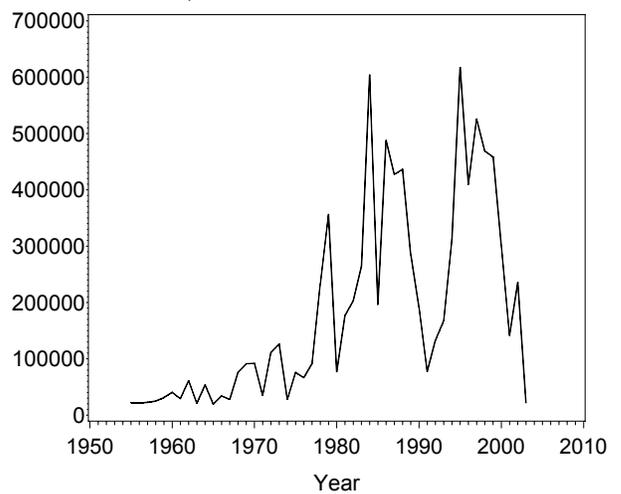
Strata 44, 48-49 Scaups



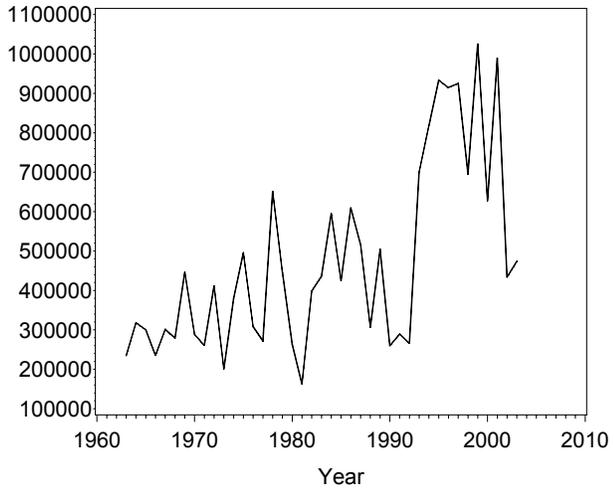
Strata 44, 48-49 Canada Goose



Strata 44, 48-49 American coot



Strata 44, 48-49 Ponds



Strata 44, 48-49 Total Ducks

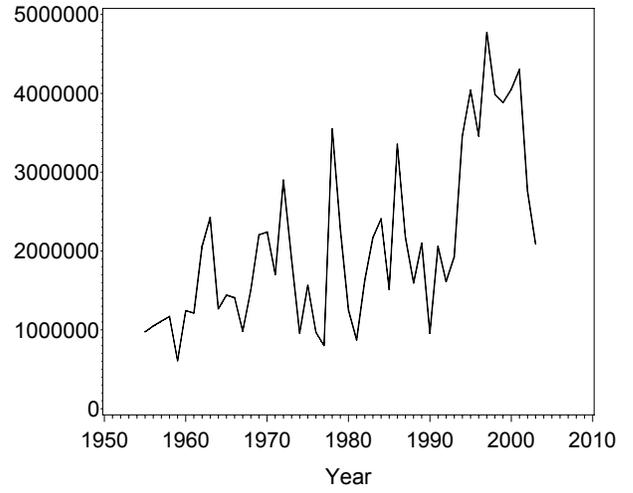


Table 4. Status of waterfowl breeding population estimates (thousands, adjusted for visibility bias) by species and stratum with comparisons against the previous year, the previous 10-year mean, and the long-term mean (from 1958) for North Dakota.

Species/Ponds	Stratum				2003 Total	2002 Total	10-Year Mean	Long-Term Mean	% Change From		
	43	45	46	47					2002	10-Year Mean	Long-Term Mean
Ducks											
Dabblers											
Mallard	113.5	576.7	322.5	38.5	1051.1	1247.7	1179.0	600.0	-15.8%	-10.9%	75.2%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	--	--	--
Gadwall	52.5	353.5	185.2	6.3	597.4	691.5	773.6	368.4	-13.6%	-22.8%	62.2%
Am. wigeon	3.4	48.6	14.3	0.0	66.3	87.5	77.8	45.3	-24.2%	-14.7%	46.4%
Am. green-winged teal	23.3	8.4	7.4	0.0	39.1	66.3	54.4	35.6	-41.0%	-28.2%	9.7%
Blue-winged teal	124.4	750.9	408.8	43.0	1327.1	1338.3	1584.2	871.1	-0.8%	-16.2%	52.4%
N. shoveler	43.3	207.1	67.5	3.7	321.5	378.8	500.6	275.3	-15.1%	-35.8%	16.8%
N. pintail	13.2	87.4	15.5	0.0	116.1	227.7	330.5	343.3	-49.0%	-64.9%	-66.2%
Subtotal	373.5	2032.5	1021.1	91.5	3518.6	4037.9	4500.1	2538.8	-12.9%	-21.8%	38.6%
Divers											
Redhead	3.5	75.3	13.1	2.0	93.9	143.5	221.3	137.2	-34.5%	-57.6%	-31.5%
Canvasback	0.5	16.7	2.8	0.0	20.0	32.5	45.7	29.8	-38.5%	-56.3%	-32.9%
Scaups	8.5	71.0	61.3	0.0	140.7	136.8	117.6	70.0	2.9%	19.7%	100.9%
Ring-necked duck	2.0	2.1	7.3	0.0	11.4	22.8	15.4	8.3	-49.8%	-25.7%	37.0%
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	--	-100.0%	-100.0%
Bufflehead	2.2	0.0	0.2	0.0	2.4	2.4	2.7	1.4	0.5%	-10.1%	78.3%
Ruddy Duck	6.8	51.1	20.4	0.8	79.0	192.6	142.2	93.5	-58.9%	-44.4%	-15.5%
Subtotal	23.4	216.2	105.1	2.8	347.6	530.5	545.0	340.4	-34.5%	-36.2%	2.1%
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	0.0	0.0	0.0	0.0	0.0	1.3	0.8	--	-100.0%	-100.0%
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.9	--	-100.0%	-100.0%
Total Ducks	396.9	2248.8	1126.2	94.3	3866.1	4568.4	5046.4	2880.1	-15.4%	-23.4%	34.2%
Canada Goose	16.9	91.0	64.8	2.6	175.3	122.9	88.8	25.2	42.6%	97.3%	595.2%
Am. coot	13.4	63.1	5.5	0.6	82.6	437.9	868.3	401.5	-81.1%	-90.5%	-79.4%
Ponds	107.0	499.4	277.1	49.5	933.1	682.5	952.4	726.0	36.7%	-2.0%	28.5%

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
10-year Mean	144.8	477.4	294.3	35.9	952.4
Long-term Mean	114.3	388.7	197.0	26.0	726.0
Percent Change:					
From 2002	+11.00%	+33.60%	+44.00%	+148.80%	+36.70%
From 10-year Mean	-26.10%	+4.60%	-5.80%	+38.00%	-2.00%
From Long-term Mean	-6.40%	+28.50%	+40.70%	+90.50%	+28.50%

Table 6. Survey design for North Dakota, May 2003.

	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	297.0	270.0	45.0	787.5
Linear miles in sample	702	1,188	1,080	180	3,150
Number of transects in sample	5	7	8	6	26
Number of segments in sample	39	66	60	10	175
Expansion factor	113.0199	89.6464	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
Ducks										
Dabblers										
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
Divers										
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
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	0.0	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
Ponds										
Species/Ponds	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Ducks										
Dabblers										
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
Divers										
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
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	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
Ponds										
							1252.2	1135.8	848.2	340.3

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

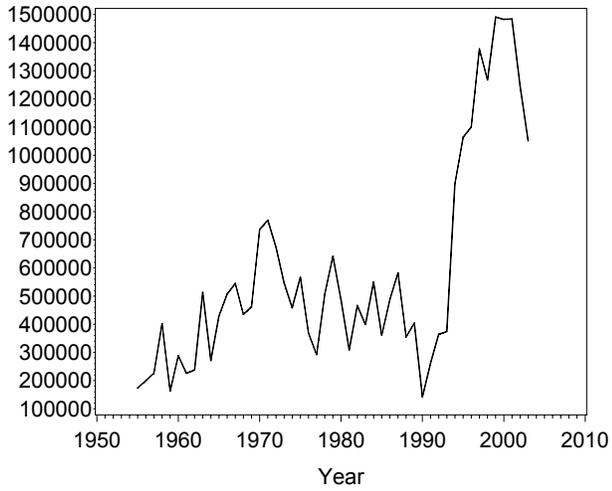
Species/Ponds	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Ducks										
Dabblers										
Mallard	506.6	641.4	485.4	308.6	466.5	398.9	550.3	361.4	487.8	582.6
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	243.9	369.2	224.3	255.6	381.2	435.0	528.8	274.0	287.7	275.9
Am. wigeon	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

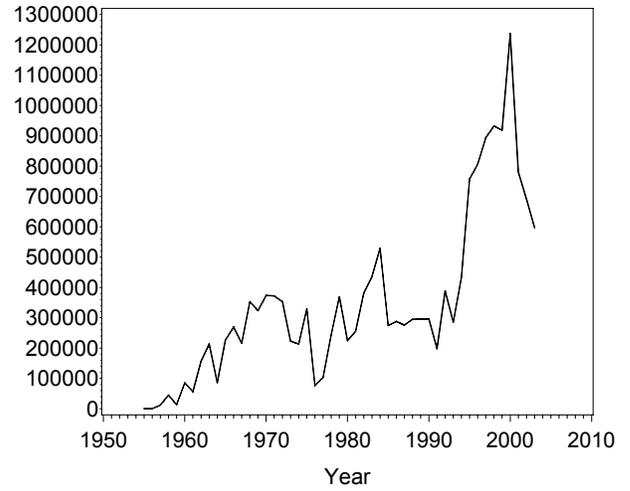
Appendix 2 (continued). Long-term trend in adjusted waterfowl breeding population estimates (thousands) in North Dakota.

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

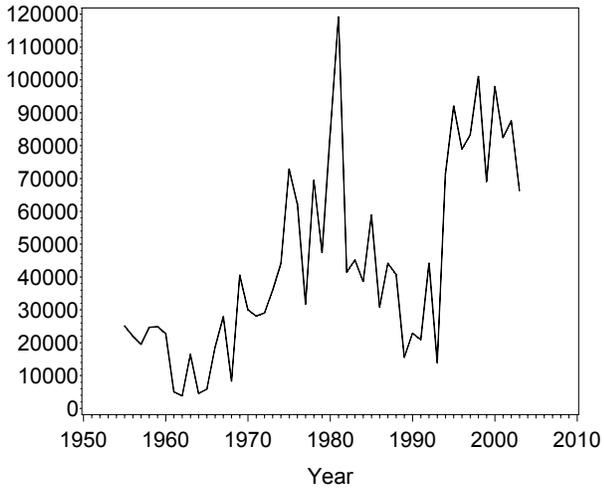
Strata 43, 45-47 Mallard



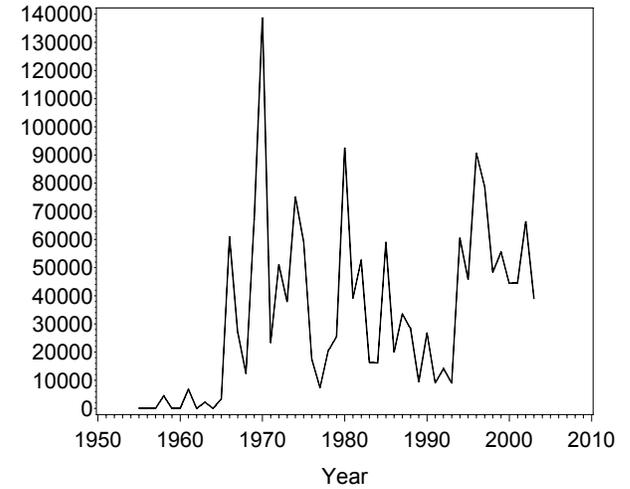
Strata 43, 45-47 Gadwall



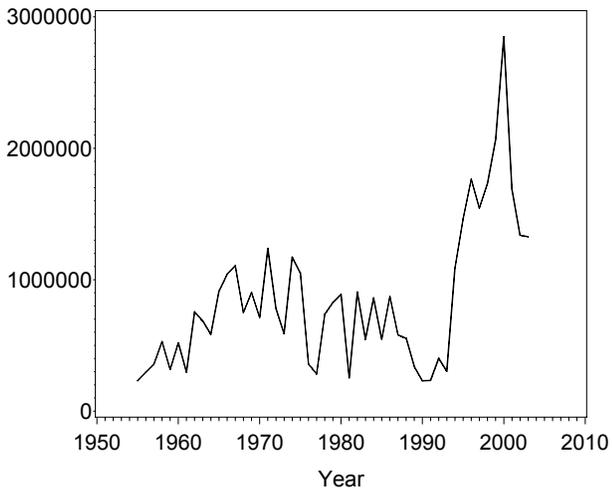
Strata 43, 45-47 American wigeon



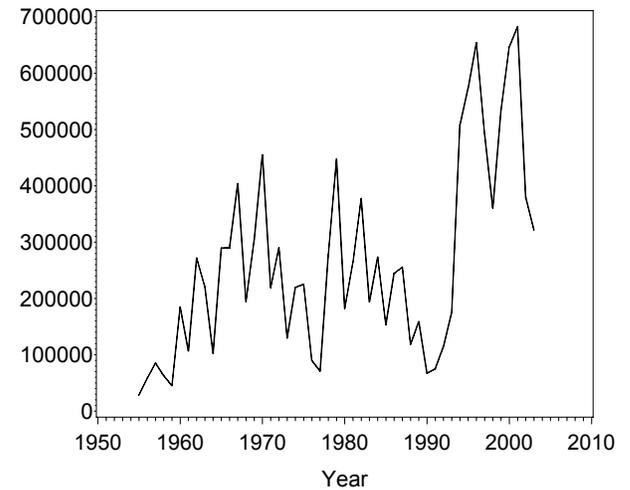
Strata 43, 45-47 American green-winged teal



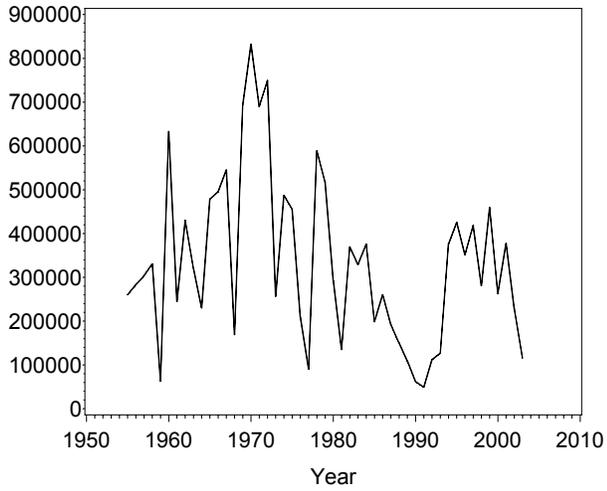
Strata 43, 45-47 Blue-winged teal



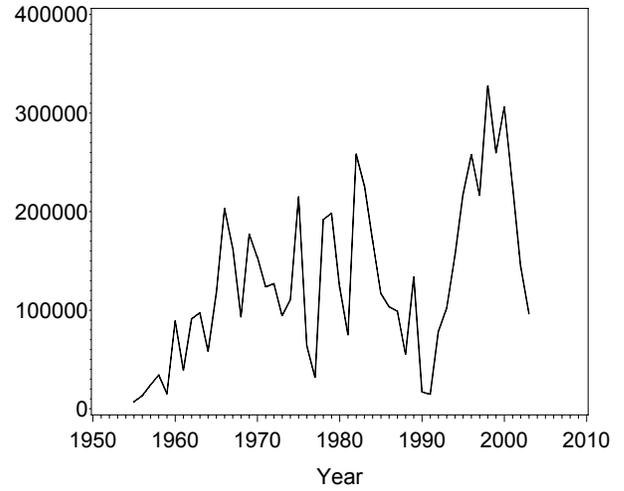
Strata 43, 45-47 Northern shoveler



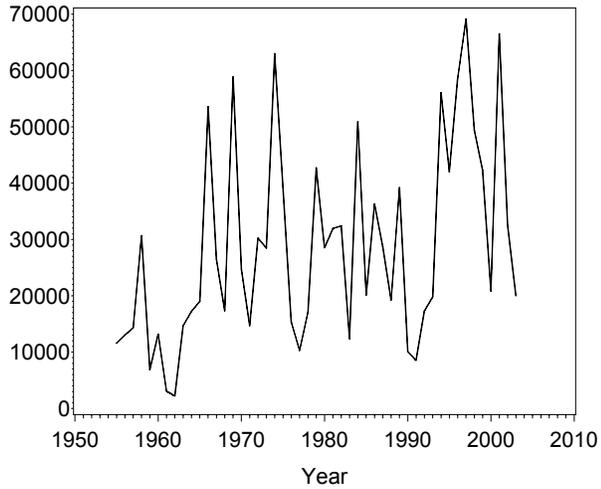
Strata 43, 45-47 Northern pintail



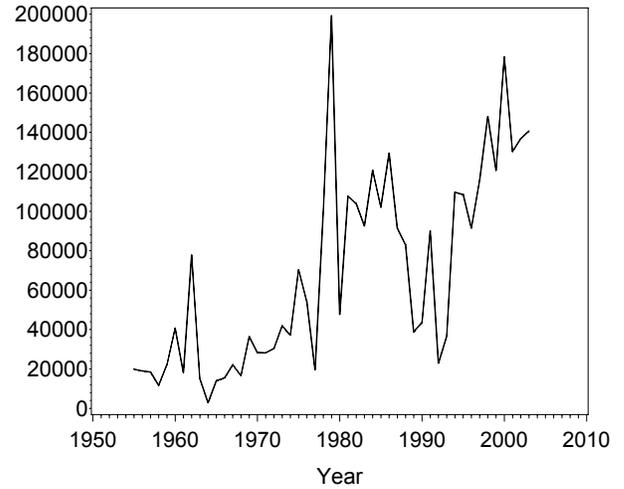
Strata 43, 45-47 Redhead



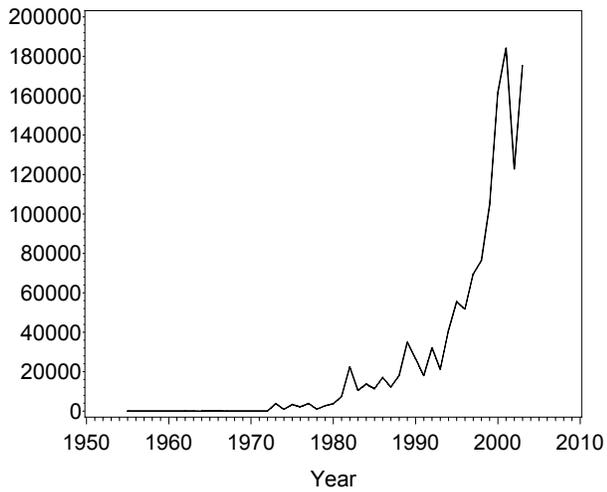
Strata 43, 45-47 Canvasback



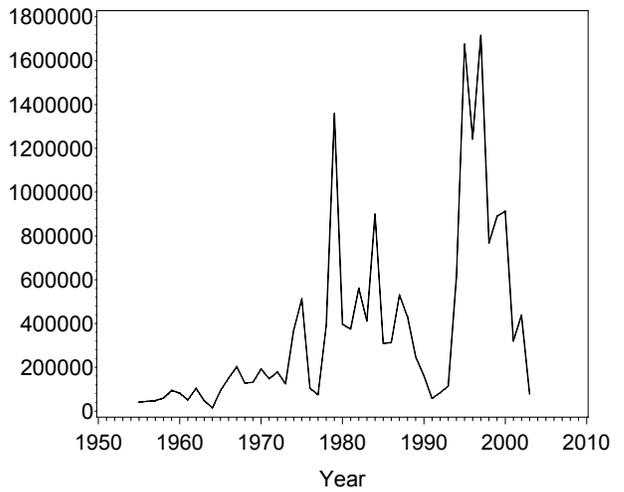
Strata 43, 45-47 Scaups



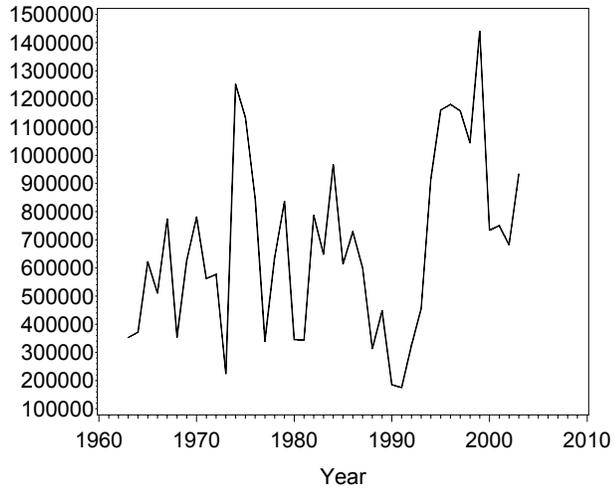
Strata 43, 45-47 Canada Goose



Strata 43, 45-47 American coot



Strata 43, 45-47 Ponds



Strata 43, 45-47 Total Ducks

