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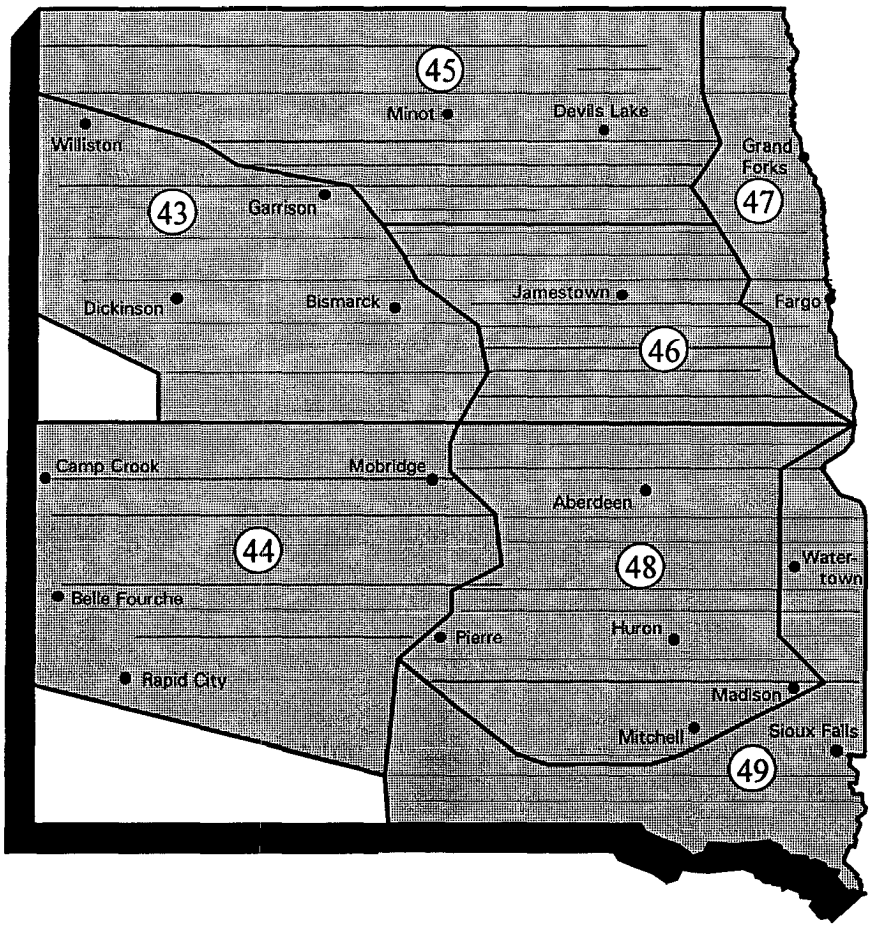
1998

WATERFOWL PRODUCTION SURVEY

FOR

SOUTH DAKOTA AND NORTH DAKOTA



U.S.
FISH & WILDLIFE
SERVICE

DEPARTMENT OF THE INTERIOR

TITLE: Waterfowl Production and Habitat Survey for South and North Dakota

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

DATES: 1 - 19 July 1998

DATA SUPPLIED BY: United States Fish and Wildlife Service

Strata 45, 46, 47, 48, 49

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Strata 43 and 44

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ABSTRACT: The 1998 Waterfowl Production and Habitat Survey for South and North Dakota was conducted during 1 - 19 July with no procedural changes and complete coverage accomplished. June precipitation assisted in maintaining remaining wetlands and has promoted good to excellent cover conditions in the uplands and basins. July wetland counts in South Dakota decreased (-24%) since May. Compared to July 1997, South Dakota wetland numbers increased 9% and were above the 10-year (34%) and long-term (69%) averages. North Dakota provided a slightly different pattern where July wetland counts decreased since May (-43%) and decreased -13% since July 1997 but remained above the 10-year (37%) and long-term (62%) figures. Duck Brood Indices (DBI) again posted record highs in both states (SD 119.5, ND 196.7). The DBI's are similar to or increased compared to 1997 figures (SD 1%, ND 15%) and are well above ten-year (SD 115%, ND 184%) and long-term (SD 204%, ND 301%) means. The Late Nesting Index increased compared to last year (SD 9%, ND 53%) but was well below historic averages in both states..

METHODS: The procedures followed in conducting the 1998 production survey are described in the Standard Operating Procedures (SOP) for Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America, Section IV, revised 1987. No changes occurred this year in operational procedures and the complete survey coverage was identical to last year (Tables 4 and 8). Survey personnel in the crew area have not changed since 1993. All survey data collected in 1998 are considered comparable. Transects in the Western Dakotas (strata 43 and 44) were completed by the Montana survey crew led by James Voelzer. Our appreciation is extended to the Montana crew for their help. Transect flying began in eastern South Dakota on 2 July and was completed in North Dakota on 19 July. Four days of survey flying were lost to inclement

weather (fog/rain/thunderstorms) or pilot fatigue. All survey flights were completed in N-721, a wheeled Cessna 185. Required flight time was about 68 hours.

WEATHER AND HABITAT CONDITIONS: The mild spring in the Dakotas ended abruptly when near record low temperatures arrived and were widespread in South Dakota. On the 3rd, Rapid City recorded a low of 32 degrees, only 1 degree above the June record established in 1951. Three inches of snow marked the second latest measurable snowfall for the city. Sleet in Sioux Falls on the same date was that locations latest recorded frozen precipitation.

Cold, wet weather prevailed throughout South Dakota during the second week of June with below normal temperatures and many locations receiving more than 1 inch of rainfall. Hay making was greatly hampered in many areas of the state. The same pattern of cooler than normal temperatures and scattered precipitation prevailed for the remainder of the month, except for the last week of June, when temperatures rose 2 to 11 degrees above normal.

A cold snap the first week of June brought frost and some snowfall to northern portions of North Dakota. Temperatures remained below or near normal the balance of the month. Rainfall was widespread with all stations recording precipitation greater than .25 inch during the second week of the month. Oakes received 2.4 inches. Dickinson and Fargo recorded 4.7 inches of rain during the third week of June. The month ended with warm and wet conditions as the jet stream pulled warm, moist air northward, triggering thunderstorms across the state. Most areas received at least .25 inch of rain. The most rainfall, 4.16 inches, was recorded at Oakes.

July began with near normal temperatures and predominantly dry conditions which prevailed across the survey area until a low pressure system ushered in unsettled conditions on the 3rd. The associated front, lying along the Nebraska/South Dakota border, provided highly unstable conditions and spawned numerous violent storms which tracked the frontal boundary. A second system developed on the 5th of the month. It extended from Huron, South Dakota north west into Canada and its eastward movement brought significant precipitation to much of the area. Cando, ND received 2+ inches of rainfall with 13 other stations recording over an inch. On the 6th, 1.5 inches of rain fell in Mitchell, SD and the Lake Andes - Yankton area received more than 4 inches of rain and crop destroying hail.

Above normal temperatures dominated the survey area during the second week of July with 96 degrees recorded in Pierre, SD and 92 degrees in Williston, ND. Precipitation was mostly light with Yankton, SD receiving 2.7 inches and little or no rainfall across the rest of the state. In North Dakota, Hazen and Minot received over 2 inches of rain while the remainder of the state saw lesser amounts.

July water conditions over much of the survey area were maintained and some even improved since May. Some areas resembled the excellent May conditions observed in the Dakotas since 1993-94. The majority of nesting cover and brood rearing conditions are considered good to excellent in the Dakotas with only a small portion of the area rated fair. Stands of residual cover coupled with the early development of current year growth provided the cover component for first nesters. Subsequent development of upland and emergent vegetation has improved overall

habitat quality when coupled with the protection to wetland margin vegetation offered by the favorable water levels. Once again, waterfowl appear to be taking advantage of the near optimum breeding habitat available in North and South Dakota. General habitat conditions are expected to remain favorable for late nesting attempts and brood rearing through the remainder of this breeding season.

SOUTH DAKOTA (St. 48/49: 2 - 10 July)

Statewide wetland counts in South Dakota posted a 9% increase since July of 1997 (Table 3). The index represents a -24% decrease since the May survey, but remains 34% above the 10-year mean and 69% above the long-term average (LTA).

Stratum 44 - Survey of the stratum was initiated by the west river crew on 1 July. Following beneficial June rains was the development of impressive vegetation and improved wetland conditions which resulted in only a -13% decrease since the May survey. Overall habitat conditions were considered excellent by the crew. The July water index increased compared to last year (56%), the 10-year (14%), and the long-term (43%) average.

Stratum 48 - Widespread June rains provided enough wetland maintenance in the stratum causing only a -26% decrease in water areas since May. The July pond index was essentially unchanged (-6%) since 1997 and is well above 10-year (52%) and long-term (100%) averages. Because of June precipitation and general vegetation development, the entire stratum offers good or excellent habitat. As usual, the Missouri Coteau, the Leola Hills, and the Prairie Coteau provide the best combinations of water and cover.

Stratum 49 - Wetland counts in Stratum 49 decreased -32% since May but are similar (-4%) to those observed in July of 1997. The index is 33% above the 10-year average and 59% above the LTA. The entire stratum is considered excellent in terms of habitat. This stratum realized the most widespread habitat improvements in South Dakota since May. The improved water and cover occurred primarily in the southern half of the area.

NORTH DAKOTA (St. 45/46/47: 11 - 19 July)

North Dakota wetland counts decreased -43% since the May survey but only -13% when compared to the 1997 index (Table 7). The July water index is 37% and 62% above the respective 10-year and long-term averages.

Stratum 43 - The west river crew reported improvements stratum wide since May. Generous June rains and development of vegetation resulted in an excellent habitat rating in all but the northwest portion, which was rated good. Wetland counts decreased -51% since the breeding population survey but were unchanged (6%) since July of 1997. The 1998 water count is -27% and -8% below 10-year and long-term levels and is the only stratum that remains below historic time comparisons.

Stratum 45 - Water counts in the stratum decreased a typical -41% since the May survey and

were below (-20%) July counts last year. The index is 45% above the 10-year mean and exceeds the LTA by 53%. The persistant June rains maintained wetlands quite well and again encouraged vegetation development. The entire Missouri Coteau remained in excellent condition with areas in the northern reaches actually improving since May. Also improving since the May survey were areas in the north central region of 45. The entire stratum was considered to be in good to excellent condition.

Stratum 46 - June rains again encouraged the excellent habitat conditions in the Missouri Coteau reported in May to extend eastward onto the drift prairie. The south east quarter of 46 also remained excellent with nearly the entire balance classed as good. The only exception was a small area in the extreme north east (extended from St. 47, the Red River Valley) which was classified fair. The wetland index decreased -39% since May but only -9% since July 1997. The stratum is 75% and 138% wetter than historic time comparisons.

Stratum 47 - The wetland index in Stratum 47 fell -61% since May but was similar to (-4%) the 1997 July index. The current year index is 82% above the 10-year average and 100% above the long-term mean. The southern quarter of the stratum remained very wet and for the most part "carried" the index. The majority of the remainder of the stratum was upgraded (poor in May) to fair. Nesting and brooding cover continue to be a limiting factor in 47.

Production Indices: For the sixth year running, outstanding habitat conditions exist for waterfowl breeding in the Dakotas. Adequate carryover moisture and the arrival of spring two weeks earlier than last year, has promoted excellent stands of nesting and brooding cover. Again this year, the importance of CRP properties to nesting waterfowl is obvious and the product of strong breeding populations in the Dakotas is record brood indices.

The South Dakota Duck Brood Index (DBI) of 119,500 is unchanged (1%) from the 1997 record. The index is 115% above the 10-year average and 204% above the long-term figure (Table 2). Examination by stratum shows a decline (-34%) in production from Stratum 44 since last year (see 1997 report) but increases of 12% and 106% for 48 and 49. The composition of age classes of observed broods suggests that nesting did occur earlier this year than in 1997. The average brood size in South Dakota was unchanged from last year and is larger than the 10-year (11%) and long-term (16%) averages. The coot brood index decreased (-16%) since last year but again is above the 10-year (45%) and long-term (152%) means.

North Dakota too, provided a record DBI (196,700) in 1998 (Table 6). The 1998 DBI surpasses the historic time comparisons by 15%, 184%, and 301% respectively. Comparing 1998 production figures to 1997 by stratum reveals decreases from 43 (-16%) and 46 (-10%), an increase from 45 (60%), and no change from Stratum 47. In agreement with our assessment of the spring arrival and observations in South Dakota, the brood age class composition in North Dakota also indicates that the hatch was farther advanced (related to similar survey timing) than in 1997. The average brood size in North Dakota increased slightly (9%) compared to last year and was 13% and 17% above 10-year and long-term averages. The coot brood index for the state did drop (-10%) from 1997 but is well above 10-year (214%) and long-term (482%) levels.

Again in 1998, we believe our DBI's are conservative. Weather wise, survey conditions were nearly ideal for both crews. East of the Missouri River, the excellent stands of wetland emergent cover hindered the observation or classification of some broods. With the nesting cycle farther advanced than in 1997, the omission of class III broods (confused with adult birds) was probably higher than last year. Once again, because of the excellent production witnessed, "sensory overload" continued to be a problem. Brood encounters were so numerous in some areas, it was impossible to record all of them. To illustrate the point, during the dry years of 1990 and 1991, 30 broods recorded by our crew during an average day of surveying (16-18 segments) was a "good" day. This year our highest one day counts were 209 broods in South Dakota and 230 broods in North Dakota.

Late Nesting Indices: The Late Nesting Index (LNI) is intended as a relative measure of late or secondary nesting effort (Tables 1 and 5). South Dakota total LNI increased 9% since 1997 but is below the 10-year (-58%) and long-term (-36%) averages. In North Dakota, total LNI increased 53% compared to last year but also is below 10-year (-33%) and long-term (-41%) figures. The helpful June precipitation delivered to both states assisted in an average or lower loss of wetlands since May. Excellent cover is established. These ingredients are providing very good habitat conditions to any hens attempting late nests.

Conclusions:

1. July wetland counts in South Dakota increased 9% but decreased slightly in North Dakota (-13%) since July of 1997. The statewide wetland indices for the Dakotas remain well above historic time comparisons. General habitat conditions are good to excellent for nearly the entire area. Only the northern 3/4 of Stratum 47 was considered fair. The Missouri and Prairie Coteau regions again look exceptionally good along with the Devils Lake region (extending south and north west). Habitat in the prairie drift area also is generally in good to excellent condition. Beneficial June rains maintained wetlands to the extent that adequate water should persist through the brood season.

2. Although little change occurred in the South Dakota brood index (1%) since 1997, record DBI's were again established in both states (ND 15%). The indices are well above the 10-year (SD 115%, ND 184%) and long-term (SD 204%, ND 301%) averages. Compared to 1997, the average brood size was unchanged in South Dakota and posted a slight increase (9%) in North Dakota. Average brood sizes are above 10-year and long-term means. Waterfowl production in North and South Dakota will be well above average in 1998.

3. Total LNI increased slightly in South Dakota (9%) and 53% in North Dakota compared to last year. LNI is below 10-year and long-term averages in both states. Good to excellent habitat conditions are in place for any late nesting attempts..

John W. Solberg and Michael M. Oliver
July 1998

Table 1. Long-term trend in waterfowl brood and late-nesting indices by species in South Dakota, 1959-1998 (index in thousands).[a]

Species	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Broods										
Duck brood index	25.7	18.9	27.5	14.3	36.4	110.9	68.5	114.4	118.8	119.5
Average brood size[b]	4.9	4.3	4.4	5.8	5.9	6.2	6.2	5.4	5.9	5.9
Coot brood index	2.6	1.9	1.5	5.0	4.7	15.6	12.9	15.3	12.6	10.6
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	11.1	38.0	30.2	21.7	25.4	5.2	30.8	17.9	8.0	7.6
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	6.6	23.7	16.8	11.3	17.4	4.3	24.1	9.5	4.9	4.7
Am. wigeon	1.8	3.0	2.7	1.8	2.2	1.5	4.8	3.5	1.5	3.0
Green-winged teal	0.0	0.3	0.0	0.3	0.2	0.0	0.7	0.5	0.0	0.0
Blue-winged teal	3.8	21.5	17.4	15.8	10.7	1.8	14.5	3.7	2.5	2.6
N. shoveler	0.4	2.2	2.4	1.5	3.5	0.3	0.8	1.0	0.5	1.0
N. pintail	4.5	1.9	6.2	1.3	4.4	1.8	4.9	2.5	1.0	1.8
Subtotal	28.3	90.5	75.7	53.7	63.8	14.9	80.6	38.6	18.4	20.7
Divers										
Redhead	1.6	1.1	1.6	2.0	5.5	0.3	3.5	0.0	0.6	0.2
Canvasback	0.2	0.5	0.3	0.3	0.0	0.0	0.8	0.0	0.0	0.0
Scaups	0.2	0.2	0.2	0.3	1.6	0.0	1.2	0.2	0.5	0.2
Ring-necked duck	0.0	0.5	0.0	0.0	0.0	0.0	0.3	0.2	0.0	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	0.0	0.0	0.0
Ruddy duck	1.6	2.8	1.6	3.1	2.4	1.1	1.7	0.8	0.5	0.7
Subtotal	3.5	5.0	3.7	5.7	9.5	1.4	7.5	1.2	1.6	1.1
Miscellaneous										
Oldsquaw	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	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	32.0	95.7	79.4	59.4	73.3	16.3	88.1	39.8	20.0	21.8

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 1 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in South Dakota, 1959-1998 (index in thousands).[a]

Species	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Broods										
Duck brood index	28.7	16.3	6.5	41.4	41.3	58.6	23.4	65.0	56.8	20.8
Average brood size[b]	5.0	4.6	4.7	4.6	4.5	4.3	4.2	4.5	5.0	4.3
Coot brood index	1.2	3.3	0.8	3.5	5.2	8.6	2.7	8.3	8.0	1.1
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	6.7	3.9	4.5	10.7	14.4	21.6	8.8	13.4	6.3	4.4
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	2.0	1.0	2.5	5.1	12.6	14.1	2.8	6.8	3.5	2.5
Am. wigeon	1.6	0.2	1.2	2.1	2.2	5.4	2.7	1.9	1.9	0.3
Green-winged teal	0.3	0.5	0.0	0.0	0.0	0.2	0.3	0.5	0.5	0.5
Blue-winged teal	0.7	1.2	1.7	5.1	8.9	19.8	2.6	8.7	3.5	2.9
N. shoveler	0.3	0.3	0.2	1.1	0.7	4.9	0.2	1.6	1.2	1.4
N. pintail	0.7	0.5	2.0	4.0	4.2	10.2	1.2	5.0	2.3	1.5
Subtotal	12.2	7.6	11.9	28.0	42.9	76.1	18.4	38.0	19.2	13.6
Divers										
Redhead	0.0	0.0	0.5	2.4	2.1	3.6	1.0	1.0	1.1	0.0
Canvasback	0.0	0.0	0.2	0.3	0.0	0.2	0.0	0.2	0.3	0.2
Scaups	0.0	0.0	0.0	0.3	0.8	0.0	0.2	0.3	0.7	0.0
Ring-necked duck	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	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	0.2	0.0	0.0	0.0	0.0	0.0
Ruddy duck	0.8	1.5	1.6	1.5	2.0	2.8	0.8	2.4	1.6	0.4
Subtotal	0.8	1.5	2.3	4.6	5.1	6.6	1.9	3.8	3.7	0.6
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	13.0	9.1	14.2	32.7	48.0	82.8	20.3	41.8	22.9	14.2

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 1 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in South Dakota, 1959-1998 (index in thousands).[a]

Species	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978
Broods										
Duck brood index	41.5	38.7	26.3	58.8	42.3	18.8	21.1	10.9	20.7	45.3
Average brood size[b]	5.5	5.7	5.5	5.4	4.4	4.8	5.0	4.8	4.7	5.0
Coot brood index	4.7	3.3	1.0	6.6	1.8	0.3	0.0	0.3	0.3	0.9
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	12.6	11.9	5.9	13.8	11.0	9.1	12.3	5.2	4.7	8.5
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	9.0	4.6	3.8	8.1	3.4	8.2	8.0	2.4	1.8	6.3
Am. wigeon	1.3	2.4	0.0	2.5	2.3	1.0	1.5	1.2	2.2	2.3
Green-winged teal	0.9	2.1	0.0	0.0	0.0	0.7	0.2	0.0	0.0	0.6
Blue-winged teal	6.8	3.3	3.7	7.6	4.1	5.0	7.5	0.6	2.8	4.1
N. shoveler	1.1	1.6	0.0	0.3	1.2	0.0	0.0	0.0	0.4	0.8
N. pintail	2.4	2.0	1.0	2.8	4.3	1.7	1.5	2.5	1.1	3.4
Subtotal	34.1	27.9	14.4	35.0	26.3	25.7	31.0	11.9	13.0	26.1
Divers										
Redhead	1.0	0.8	0.0	0.8	0.0	0.2	0.5	0.0	0.0	2.9
Canvasback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.5
Scaups	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.0	0.3	0.4
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0
Ruddy duck	1.4	2.2	0.9	3.4	2.0	1.3	2.7	0.0	0.2	1.8
Subtotal	2.4	3.9	0.9	4.2	2.5	1.5	3.1	0.3	0.4	5.5
Miscellaneous										
Oldsquaw	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	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mergansers	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	0.0	0.4	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	36.5	32.2	15.3	40.9	28.8	27.2	34.1	12.2	13.4	31.6

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 1 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in South Dakota, 1959-1998 (index in thousands).[a]

Species	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Broods										
Duck brood index	11.2	33.5	41.2	42.2	62.8	11.6	18.8	45.1	22.7	23.3
Average brood size[b]	4.4	5.2	5.2	5.1	5.0	6.4	4.5	7.2	4.6	4.9
Coot brood index	0.3	0.6	2.2	2.7	1.0	1.1	0.4	15.2	2.6	2.4
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	6.6	11.1	7.4	14.0	3.5	6.1	19.1	8.4	14.3	6.6
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	0.0	1.4	0.1	5.9	3.3	2.5	7.2	6.0	7.3	2.6
Am. wigeon	0.0	0.1	0.3	0.3	0.0	0.0	0.0	0.0	2.3	1.3
Green-winged teal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0
Blue-winged teal	1.3	2.6	4.5	21.7	2.2	7.6	9.2	1.0	6.2	1.0
N. shoveler	0.0	0.0	0.0	0.9	0.0	0.4	0.0	2.2	0.8	0.3
N. pintail	0.3	2.4	1.9	4.5	0.9	0.0	0.0	0.6	0.5	0.0
Subtotal	8.2	17.6	14.1	47.3	9.9	16.7	35.5	18.1	31.6	11.8
Divers										
Redhead	0.0	0.3	0.1	1.7	0.3	0.6	3.0	0.0	0.2	0.0
Canvasback	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.0
Scaups	0.0	0.4	0.5	0.9	0.0	0.0	0.0	0.1	0.3	0.0
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0
Ruddy duck	0.0	1.1	4.7	1.9	2.4	0.4	6.0	4.7	1.6	0.8
Subtotal	0.0	1.8	5.3	4.5	2.7	1.1	9.0	4.9	2.7	0.8
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	8.2	19.5	19.4	51.8	12.6	17.8	44.4	22.9	34.4	12.5

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepanices may exist in column totals.

Table 2. Status of waterfowl brood and late-nesting indices by stratum in South Dakota, comparing 1998 with 1997, the 1988-1997 previous 10-year mean, and the 1959-1997 long-term mean (index in thousands).[a]

Species	Strata (1998) 44	48	49	1998 Total	1997 Total	10-year Mean	Long-term Mean	Percent change from 1997	10-year Mean	Long-term Mean
Broods										
Duck brood index	29.6	74.2	15.7	119.5	118.8	55.6	39.3	1%	115%	204%
Average brood size[b]	5.3	6.1	6.5	5.9	5.9	5.3	5.1	NC	11%	16%
Coot brood index	0.3	7.5	2.8	10.6	12.6	7.3	4.2	-16%	45%	152%
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	6.6	0.6	0.4	7.6	8.0	19.3	12.2	- 5%	-61%	-38%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Gadwall	2.8	1.9	0.0	4.7	4.9	12.1	6.8	- 4%	-61%	-31%
Am. wigeon	3.0	0.0	0.0	3.0	1.5	2.3	1.6	100%	30%	87%
Green-winged teal	0.0	0.0	0.0	0.0	0.0	0.3	0.2	NC	-	-
Blue-winged teal	1.3	0.9	0.4	2.6	2.5	9.5	6.4	4%	-73%	-59%
N. shoveler	1.0	0.0	0.0	1.0	0.5	1.4	0.9	100%	-29%	11%
N. pintail	1.8	0.0	0.0	1.8	1.0	3.0	2.4	80%	-40%	-25%
Subtotal	16.5	3.4	0.8	20.7	18.4	47.8	30.5	13%	-57%	-32%
Divers										
Redhead	0.0	0.2	0.0	0.2	0.6	1.6	1.0	-67%	-88%	-80%
Canvasback	0.0	0.0	0.0	0.0	0.0	0.2	0.1	NC	-	-
Scaups	0.0	0.2	0.0	0.2	0.5	0.4	0.3	-60%	-50%	-33%
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.1	0.0	NC	-	NC
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Ruddy duck	0.0	0.5	0.2	0.7	0.5	1.6	1.8	40%	-56%	-61%
Subtotal	0.0	0.9	0.2	1.1	1.6	4.0	3.3	-31%	-73%	-67%
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Mergansers	0.0	0.0	0.0	0.0	0.0	0.1	0.1	NC	-	-
Subtotal	0.0	0.0	0.0	0.0	0.0	0.1	0.1	NC	-	-
Total ducks	16.5	4.3	1.0	21.8	20.0	51.8	33.8	9%	-58%	-36%

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 3. Long-term trend in July pond indices by stratum in South Dakota, comparing 1998 with 1997, the 1988-1997 previous 10-year mean, the 1970-19 long-term mean, and comparison of May with July ponds in 1998 (estimates in thousands).

Year	Strata 44	48	49	Total
1970	77.6	98.3	52.6	228.5
1971	115.1	117.7	70.5	303.3
1972	145.6	129.0	59.4	334.0
1973	119.3	76.0	54.8	250.2
1974	62.7	61.0	38.1	161.9
1975	105.4	80.7	39.4	225.5
1976	95.3	64.0	43.5	202.8
1977	93.8	43.2	25.5	162.6
1978	99.3	100.5	43.9	243.8
1979	114.6	61.4	37.4	213.3
1980	52.3	33.3	18.1	103.7
1981	75.8	37.5	31.7	145.0
1982	122.3	88.2	55.7	266.3
1983	74.6	134.3	125.9	334.7
1984	102.9	341.7	184.8	629.4
1985	120.1	93.2	71.8	285.1
1986	139.0	175.8	99.1	413.9
1987	133.7	102.1	60.2	296.0
1988	92.0	59.3	46.5	197.8
1989	119.6	74.2	46.3	240.0
1990	117.5	81.2	52.6	251.3
1991	113.2	130.8	64.4	308.4
1992	93.8	128.8	72.0	294.6
1993	406.4[b]	224.3	129.4	760.1
1994	143.8	194.7	94.1	432.6
1995	186.0	252.0	105.0	543.0
1996	112.5	223.9	100.2	436.6
1997	109.2	263.4	114.2	486.8
1998	170.4	248.5	110.0	528.9
10-year mean	149.4	163.3	82.5	395.1
Long-term mean	119.4	123.9	69.2	312.5
Percent Change				
1998 from 1997	56%	-6%	-4%	9%
1998 from 10-year mean	14%	52%	33%	34%
1998 from long-term mean	43%	100%	59%	69%
May ponds 1998 (adjusted)	195.3	337.8	162.0	695.1
Percent change May to July 1998 (adjusted) (unadjusted)	-13%	-26%	-32%	-24%

[a]July ponds unadjusted for visibility bias.

[b]Due to an abnormally high visibility rate in May, 1993 July ponds for stratum 44 were calculated by applying % change from May to July raw data, to adjusted May ponds.

Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 4. Survey design for South Dakota, July 1998.

	Stratum 44	48	49	Total
Survey design				
Square miles in stratum	27,299	24,587	15,830	67,716
Square miles in sample - water	216	315	171	702
Square miles in sample - ducks	108	157.5	85.5	351.0
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 - water	126.3843	78.0539	92.5731	-
Expansion factor - ducks	252.7685	156.1079	185.1462	-
Current year coverage				
Square miles in sample - water	216	315	171	702
Square miles in sample - ducks	108	157.5	85.5	351.0
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 - water	126.3843	78.0539	92.5731	-
Expansion factor - ducks	252.7685	156.1079	185.1462	-

Table 5. Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-1998 (index in thousands).[a]

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Broods										
Duck brood index	196.7									
Average brood size[b]	6.2									
Coot brood index	78.6									
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	3.3									
Am. black duck	0.0									
Gadwall	3.1									
Am. wigeon	0.9									
Green-winged teal	0.0									
Blue-winged teal	2.4									
N. shoveler	0.8									
N. pintail	0.0									
Subtotal	10.5									
Divers										
Redhead	0.7									
Canvasback	0.0									
Scaups	0.1									
Ring-necked duck	0.1									
Goldeneyes	0.0									
Bufflehead	0.0									
Ruddy duck	4.7									
Subtotal	5.6									
Miscellaneous										
Oldsquaw	0.0									
Eiders	0.0									
Scoters	0.0									
Mergansers	0.0									
Subtotal	0.0									
Total ducks	16.1									

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 5 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-1998 (index in thousands).[a]

Species	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Broods										
Duck brood index	46.9	40.9	14.3	23.5	17.5	29.3	85.3	107.3	155.9	171.1
Average brood size[b]	4.8	4.8	4.5	5.3	5.7	6.1	5.7	6.1	6.0	5.7
Coot brood index	5.7	3.7	1.3	1.1	4.3	5.1	25.2	52.8	62.9	87.7
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	3.8	11.7	11.8	9.0	7.8	10.7	3.1	5.5	7.5	2.3
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	3.1	3.4	5.7	3.4	3.6	13.0	0.9	6.5	7.1	2.6
Am. wigeon	1.0	1.5	0.7	0.9	1.3	1.5	0.9	0.7	1.4	0.4
Green-winged teal	0.1	0.0	0.0	0.0	0.2	0.1	0.2	0.1	0.1	0.2
Blue-winged teal	2.8	3.3	6.2	5.0	4.0	4.1	0.5	4.5	2.4	2.3
N. shoveler	0.5	0.3	0.6	0.8	0.1	0.4	0.0	0.0	0.0	0.7
N. pintail	2.2	3.9	0.8	1.5	1.1	0.8	0.7	0.3	1.7	0.0
Subtotal	13.5	24.1	25.9	20.7	18.1	30.6	6.3	17.6	20.2	8.5
Divers										
Redhead	0.8	1.2	1.3	0.4	1.4	4.0	0.9	1.8	1.0	0.7
Canvasback	0.0	0.8	1.2	0.3	0.0	0.3	0.0	0.1	0.0	0.0
Scaups	0.3	0.3	0.5	0.0	0.2	0.0	0.2	0.1	0.3	0.0
Ring-necked duck	0.0	0.2	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.1
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	0.2	0.0	0.0	0.0
Ruddy duck	0.7	3.0	1.0	1.6	3.5	4.8	2.9	7.8	9.6	1.2
Subtotal	1.8	5.5	4.1	2.4	5.1	9.3	4.2	9.8	10.9	2.0
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Total ducks	15.2	29.6	29.9	23.1	23.2	40.1	10.5	27.4	31.1	10.5

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 5 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-1998 (index in thousands).[a]

Species	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Broods										
Duck brood index	37.6	30.7	37.8	25.5	72.7	52.2	84.3	46.6	62.0	91.9
Average brood size[b]	5.5	5.1	4.8	4.8	5.0	4.7	4.3	4.6	4.5	4.8
Coot brood index	1.2	3.4	3.6	3.5	30.6	12.1	11.9	11.9	14.4	28.8
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	5.2	2.7	2.3	3.8	13.1	9.3	13.9	5.3	4.8	4.7
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	1.9	2.0	0.3	1.6	6.7	14.2	10.4	2.7	1.3	4.2
Am. wigeon	0.5	0.4	0.1	1.0	3.0	2.1	1.5	1.2	1.1	0.9
Green-winged teal	0.0	0.0	0.2	0.2	0.2	0.9	0.1	0.1	0.3	0.3
Blue-winged teal	1.4	1.0	0.0	1.2	7.1	8.2	6.2	2.3	2.7	4.1
N. shoveler	0.0	0.5	0.0	0.2	1.7	1.0	1.1	0.7	0.6	1.1
N. pintail	3.5	1.9	0.2	1.1	1.6	6.3	2.8	1.5	1.2	3.0
Subtotal	12.5	8.4	3.1	9.1	33.4	42.0	36.0	13.8	12.0	18.2
Divers										
Redhead	2.7	0.7	0.0	0.0	3.4	2.4	1.6	0.9	0.3	2.3
Canvasback	0.4	0.1	0.2	0.3	0.7	0.2	1.0	0.1	0.2	0.2
Scaups	0.3	0.3	0.0	0.0	0.9	3.5	4.3	1.1	0.4	1.8
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ruddy duck	2.3	1.3	0.7	1.2	13.2	9.6	9.0	3.2	2.5	4.5
Subtotal	5.8	2.4	0.8	1.5	18.2	16.2	16.1	5.3	3.4	8.8
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	18.3	10.8	3.9	10.6	51.5	58.1	52.1	19.2	15.4	27.0

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 5 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-1998 (index in thousands).[a]

Species	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977
Broods										
Duck brood index	27.3	50.0	57.6	39.0	51.9	36.9	34.1	41.1	28.3	29.9
Average brood size[b]	5.5	6.2	6.5	5.6	5.5	5.2	5.8	5.7	5.7	4.5
Coot brood index	5.2	14.2	19.5	15.0	16.0	8.1	12.6	6.4	5.4	1.2
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	7.9	9.4	9.7	9.0	9.6	7.7	8.5	33.1	8.6	3.6
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	4.9	9.6	5.9	6.3	10.7	2.0	15.1	31.4	3.2	2.0
Am. wigeon	0.6	0.9	0.0	0.3	1.0	1.6	0.4	1.1	0.6	0.4
Green-winged teal	0.0	1.0	2.6	0.5	0.2	0.2	0.3	0.0	0.4	0.2
Blue-winged teal	0.4	11.7	2.4	4.8	7.7	2.9	11.0	29.8	1.4	1.7
N. shoveler	0.0	0.7	0.1	0.0	0.2	0.0	0.0	0.8	1.0	0.0
N. pintail	0.0	3.2	2.0	0.6	1.5	0.6	0.4	3.1	3.1	1.5
Subtotal	13.8	36.6	22.7	21.5	30.8	15.0	35.7	99.3	18.3	9.3
Divers										
Redhead	0.2	1.4	1.6	0.1	0.7	0.5	0.6	3.4	0.3	0.3
Canvasback	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.2	0.0	0.2
Scaups	0.0	0.6	0.3	0.3	0.3	0.2	0.9	0.3	0.0	0.0
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ruddy duck	3.1	4.7	5.0	1.4	5.6	1.6	4.8	8.4	4.0	0.5
Subtotal	3.3	6.7	7.0	1.9	6.7	2.9	6.2	12.3	4.4	1.0
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	17.1	43.3	29.8	23.3	37.5	17.9	41.9	111.6	22.7	10.3

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 5 (cont). Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-1998 (index in thousands).[a]

Species	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
Broods										
Duck brood index	68.7	13.5	42.5	26.7	24.3	31.6	15.6	15.9	41.6	49.5
Average brood size[b]	5.6	4.9	5.4	4.1	4.7	5.0	5.6	6.1	6.6	5.4
Coot brood index	13.3	1.3	4.8	1.1	1.4	1.4	3.1	4.0	21.7	14.9
Late-nesting index[c]										
Ducks										
Dabblers										
Mallard	4.5	4.2	9.4	3.5	19.9	6.7	5.5	6.0	9.9	17.4
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gadwall	1.7	0.6	2.7	2.3	6.2	0.6	2.8	6.5	3.2	14.0
Am. wigeon	1.1	0.0	0.0	0.0	0.0	0.8	0.0	0.3	0.0	0.9
Green-winged teal	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.2	0.5
Blue-winged teal	2.1	0.6	4.0	1.5	13.9	3.8	5.5	3.6	3.3	10.5
N. shoveler	0.2	0.0	0.2	0.0	0.9	0.0	1.0	0.0	1.3	0.2
N. pintail	0.0	1.1	0.6	2.1	4.1	0.0	0.0	0.0	1.2	1.6
Subtotal	9.6	6.4	16.9	9.7	45.0	12.1	14.7	16.3	19.0	45.0
Divers										
Redhead	0.0	0.0	1.3	0.2	3.8	0.2	0.0	0.3	0.7	0.8
Canvasback	0.3	0.6	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Scaups	0.0	0.3	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	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	0.0	0.0	0.0
Ruddy duck	0.0	1.9	3.8	1.7	4.3	2.4	0.6	1.5	5.7	4.4
Subtotal	0.3	2.8	5.8	2.2	8.1	2.6	0.6	1.8	6.4	5.4
Miscellaneous										
Oldsquaw	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	0.0	0.0	0.0
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total ducks	9.9	9.3	22.8	11.8	53.1	14.7	15.3	18.1	25.4	50.4

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 6. Status of waterfowl brood and late-nesting indices by stratum in North Dakota, comparing 1998 with 1997, the 1988-1997 previous 10-year mean, and the 1958-1997 long-term mean (index in thousands).[a]

Species	Strata (1998) 43	45	46	47	1998 Total	1997 Total	10-year Mean	Long-term Mean	Percent change from 1997	10-year Mean	Long-term Mean
Broods											
Duck brood index	23.2	102.7	69.8	1.0	196.7	171.1	69.2	49.0	15%	184%	301%
Average brood size[b]	5.9	6.4	6.2	-	6.2	5.7	5.5	5.3	9%	13%	17%
Coot brood index	1.8	53.2	23.6	-	78.6	87.7	25.0	13.5	-10%	214%	482%
Late-nesting index[c]											
Ducks											
Dabblers											
Mallard	1.4	0.9	0.7	0.3	3.3	2.3	7.3	8.3	43%	-55%	-60%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Gadwall	0.9	0.9	1.3	0.0	3.1	2.6	4.9	5.7	19%	-37%	-46%
Am. wigeon	0.9	0.0	0.0	0.0	0.9	0.4	1.0	0.8	125%	-10%	12%
Green-winged teal	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.2	-	-	-
Blue-winged teal	0.7	0.9	0.8	0.0	2.4	2.3	3.5	4.8	4%	-31%	-50%
N. shoveler	0.5	0.2	0.1	0.0	0.8	0.7	0.3	0.4	14%	167%	100%
N. pintail	0.0	0.0	0.0	0.0	0.0	0.0	1.3	1.6	NC	-	-
Subtotal	4.4	2.9	2.9	0.3	10.5	8.5	18.6	21.8	24%	-44%	-52%
Divers											
Redhead	0.0	0.2	0.5	0.0	0.7	0.7	1.4	1.1	NC	-50%	-36%
Canvasback	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	NC	-	-
Scaups	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.5	+	-50%	-80%
Ring-necked duck	0.0	0.0	0.1	0.0	0.1	0.1	0.1	0.0	NC	NC	+
Goldeneyes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Bufflehead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Ruddy duck	0.2	3.4	1.1	0.0	4.7	1.2	3.6	3.7	292%	31%	27%
Subtotal	0.2	3.6	1.8	0.0	5.6	2.0	5.5	5.6	180%	2%	NC
Miscellaneous											
Oldsquaw	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Eiders	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Scoters	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Mergansers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Total ducks	4.6	6.5	4.7	0.3	16.1	10.5	24.1	27.3	53%	-33%	-41%

[a]Unadjusted for visibility bias.
[b]From complete Class II and III broods observed.
[c]As indicated by observed adult pairs and singles.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 7. Long-term trend in July pond indices by stratum in North Dakota, comparing 1998 with 1997, the 1988-1997 previous 10-year mean, the 1970-1997 long-term mean, and comparison of May with July ponds 1998 (estimates in thousands).[a]

Year	Strata 43	45	46	47	Total
1970	46.1	286.1	80.4	23.2	435.7
1971	104.4	230.8	77.9	9.7	422.9
1972	71.9	191.1	57.5	10.4	330.9
1973	87.3	130.7	24.5	7.3	249.7
1974	42.0	194.7	44.5	15.6	296.8
1975	73.9	213.2	155.6	25.0	467.7
1976	74.0	215.2	63.4	8.7	361.3
1977	68.7	71.2	32.4	2.8	175.0
1978	59.4	104.3	64.4	2.1	230.2
1979	79.1	156.7	66.0	15.6	317.5
1980	38.7	51.1	30.3	2.4	122.5
1981	55.2	95.9	35.0	8.7	194.7
1982	97.6	175.6	73.8	10.8	357.9
1983	50.4	281.3	140.4	21.6	493.6
1984	75.0	265.0	143.6	15.6	499.3
1985	94.9	132.1	51.4	9.7	288.1
1986	101.9	182.8	94.1	18.8	397.6
1987	88.6	149.9	93.4	5.2	337.2
1988	63.3	79.2	34.1	4.2	180.8
1989	105.1	63.3	39.3	5.6	213.3
1990	99.5	75.3	36.2	5.6	216.5
1991	99.2	60.4	53.4	5.6	218.6
1992	76.2	70.0	44.6	9.7	200.5
1993	229.8[b]	312.0	174.4	18.4	734.6
1994	97.6	211.8	156.4	19.1	484.9
1995	146.2	343.9	260.3	27.5	777.9
1996	73.2	330.1	206.9	15.6	625.8
1997	73.5	344.2	238.9	26.1	682.7
1998	78.0	274.4	218.3	25.0	595.7
10-year mean	106.4	189.0	124.5	13.7	433.6
Long-term mean	84.7	179.2	91.9	12.5	368.4
Percent Change					
1998 from 1997	6%	-20%	-9%	-4%	-13%
1998 from 10-year mean	-27%	45%	75%	82%	37%
1998 from long-term mean	- 8%	53%	138%	100%	62%
May ponds 1998 (adjusted)	159.4	462.4	359.0	64.0	1,044.8
Percent change May to July 1998 (adjusted)(unadjusted)	-51%	-41%	-39%	-61%	-43%

[a]July ponds unadjusted for visibility bias.
[b]Due to an abnormally high visibility rate in May, 1993 July ponds for stratum 43 were calculated by applying % change from May to July raw data, to adjusted May ponds.
Resulting from rounding techniques, slight discrepancies may exist in column totals.

Table 8. Survey design for North Dakota, July 1998.

	Stratum				
	43	45	46	47	Total
Survey design					
Square miles in stratum	19,835	26,625	14,238	7,821	68,519
Square miles in sample - water	175.5	310.5	270	45	801
Square miles in sample - ducks	87.75	155.25	135.0	22.5	400.5
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 - water	113.0200	85.7488	52.7334	173.8000	-
Expansion factor - ducks	226.0399	171.4976	105.4667	347.6000	-
Current year coverage					
Square miles in sample - water	175.5	310.5	270	45	801
Square miles in sample - ducks	87.75	155.25	135.0	22.5	400.5
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 - water	113.0200	85.7488	52.7334	173.8000	-
Expansion factor - ducks	226.0399	171.4976	105.4667	347.6000	-