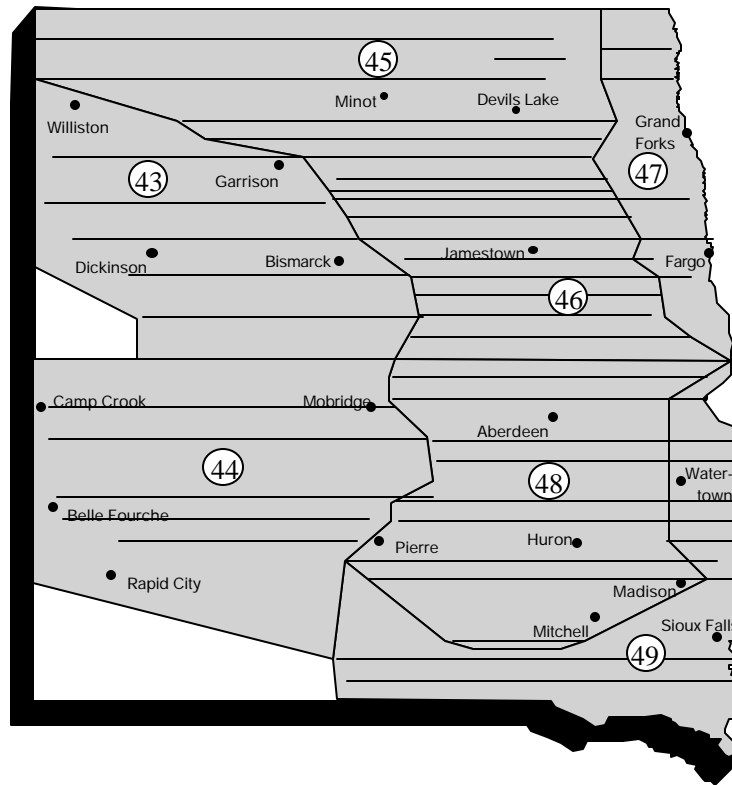


2002

**WATERFOWL PRODUCTION SURVEY
FOR
SOUTH DAKOTA AND NORTH DAKOTA**



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 - 17 July 2002

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 2002 Waterfowl Production and Habitat Survey for eastern South and North Dakota was conducted during 1 - 17 July. Survey procedures in 2002 were unchanged but traditional coverage was incomplete. June precipitation and temperatures were more detrimental to habitat in South Dakota than in North Dakota. Wetland counts decreased in South Dakota compared to July of 2001 (-43%), the ten-year average (-52%), and the long-term average (-27%). In North Dakota, water counts were lower than July 2001 (-21%) and the ten-year average (-26%), but were above (18%) above the long-term mean. The Duck Brood Index (DBI) in South Dakota (47.2) was below the 2001 figure (-47%) and the ten-year mean (-49%) and is average (2%) compared to the long-term. In North Dakota, the 2002 DBI (118.1) fell 32% since last year, is 12% below the ten-year average, but remains well above (90%) the long-term average. The total duck late nesting index (LNI) in both states was well below the three standard time comparisons (SD: -48%, -52%, -42%, ND: -15%, -50%, -62%).

METHODS: The procedures followed in conducting the 2002 waterfowl 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. Aerial observations were recorded using laptop computers and were georeferenced. Survey coverage in 2002 was incomplete. Due to weather (fog), coverage of one segment in Stratum 48 was incomplete. The expansion factor (and resulting estimates) for the stratum were adjusted accordingly. Survey design and 2002 coverage are depicted in Tables 4 and 8. All survey data reported in 2002 are considered comparable to earlier years. There were no personnel changes in the crew area or reporting unit in 2002. 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 south eastern South Dakota on 1 July and was completed in North Dakota on 17 July. Four days of surveying were lost to inclement weather (rain/wind) and on another day, one segment in Stratum 48 was not completed because of fog. Survey time parameters, outlined in the SOP, were violated during one day of sampling. On this day, thunderstorms lasting into the late morning caused us to survey later than the noon cut-off specified in the SOP. All survey flights were conducted in N-761, a wheeled Cessna 185. Required flight time was about 61 hours.

WEATHER AND HABITAT CONDITIONS: Following the generally cooler and drier than normal spring, June weather provided no assistance in improving the already degraded habitat conditions in South Dakota. Temperatures during the first half of June were 5° to 10° above normal, then moderated to near normal. Many locations received precipitation during the first week, but significant amounts fell only in the south east. Little or no precipitation was delivered during the second week. During the second half of the month, above average temperatures returned, which included many stations experiencing temperatures at or above 100° late in the month (Milesville - 113°). Although many stations reported some precipitation during the third week (of significance: Sisseton 3.23", Pierre 3.12"), the final week of the month provided only spotty rain and of much lesser amounts than the previous week. The higher than normal temperatures, coupled with the common prairie winds, continued to deplete soil moisture levels and degrade wetland conditions. By months end, nearly the entire state was experiencing 3" - 6" precipitation deficits (since Jan. 1). During the last week of June alone, the agricultural department reported 10% increases in the short and very short topsoil moisture ratings and the western 3/4 of the state was considered abnormally dry or in moderate or severe drought condition.

Hot, windy conditions continued into the first week of July. One localized storm (7/2) delivered 3.5" to the Redfield-Faulkton area. Three days following this event we surveyed the area. No evidence of recent rain was observed as the thirsty soil had absorbed the downpour. Near the end of the first week of July, a weather system triggered rains to the northeastern quarter of the state. Areas in the north (Pierre - Mobridge east), collected nearly a half inch. Environmental conditions in the aircraft were hot and humid with winds increasing, generally in the afternoon.

Cover was quite variable in South Dakota. Crops in (particularly) the western portion of the drift plain looked stunted and stressed. As expected, no seasonal water was observed in stratum 48 or 49. Many of the semi-permanent wetlands and creeks in central and western portions of the drift prairie had completely dried since the May survey. Those (semi-permanents) in the eastern quarter of the state survived at a higher rate but were further receded than in May. Even some of the permanent wetlands again, mainly on the drift plain, are showing indications of recession. Wetlands in the coteau areas, although degraded since May, are generally in better condition than those on the plain. Throughout the area, temporary and seasonal basins now sport the row crop of the surrounding acreage. These basins will require excessive moisture and no agricultural impact next spring to begin recovery. Those semi-permanent basins that have dried since May have produced good stands of wetland vegetation. If undisturbed and flooded next spring, these basins will offer the required associations of cover and water. Cover in permanent basins has responded to the warm temperatures and looks fairly decent. The artificial dugouts (now ranging from dry to near full) occurring in fields that contain livestock, have perimeters and vegetation

“pounded” by stock entering the water to cool off. Upland cover often appeared stressed from heat and the lack of moisture. These conditions vary with location but again were most pronounced in the west. Although first attempt early nesting species probably weren’t threatened by swathers, mid- and late-season nesting birds are now contending with aggressive haying being conducted in anticipation of the drought caused, livestock feed shortage. Habitat conditions in South Dakota will be grim in 2003 without normal to above precipitation in the upcoming weather cycle.

SOUTH DAKOTA (St. 48/49: 1 - 9 July)

Wetland counts statewide decreased 43% in South Dakota compared to July 2001 (Table 3). The 2002 index (253,100) was similar to and the lowest since 1990. Total counts were well below the ten-year (-52%) and long-term (-27%) averages.

Stratum 44 - Although the west river crew reported a 7% increase in wetland numbers since May of this year, the July 2002 index is the lowest since 1992. The 2002 index decreased compared to July of 2001 (-38%), the ten-year average (-48%), and the long-term average (-28%). Conditions in the stratum were described by the crew as parched and devoid of new grasses. Central and northeastern portions were considered poor while northwest, eastern, and southern areas were rated fair.

Stratum 48 - Wetland counts in Stratum 48 declined 50% since the May survey and were at their lowest level since 1990. The index was well below the July 2001 figure (-48%), the ten-year mean (-55%), and the long-term average (-27%). Probably a bit generous in our habitat rating, narrow north-south strips in the Leola Hills and the Prairie coteau were considered good. Much of the western two-thirds of the stratum was considered poor habitat and remaining portions in the south central and south eastern areas were classed as fair.

Stratum 49 - Stratum 49 experienced the greatest decrease in wetland numbers since May (-59%) of any stratum in the state. As in Stratum 48, the 2002 July wetland count was the lowest since 1990. The 2002 index decreased 42% since 2001 and was below both the ten-year (-49%) and long-term (-24%) averages. The majority of the stratum was in fair condition. Two tiny areas, the southern end of the Prairie coteau and a localized area near Platte, were considered good; while a forty mile-wide strip extending down from Stratum 48, was poor.

June weather patterns in North Dakota more closely approached habitat maintenance and in some cases, improvement. Temperatures in early June were above normal but returned to cooler than normal the second week. Precipitation was generally light to moderate statewide with the heaviest areas of rain in the north east (Grand Forks 5" on 6/8). Following the night of the 8th, sheetwater was present in the northern 2/3rds of the Red River Valley, an area considered in poor condition in May. Heavier rains fell during week two (2 week total for Cavalier in the north east was 6.1") and the statewide trend of negative departure from normal precipitation was reversed. During the third week, and for the second week in a row, widespread thunderstorms provided additional precipitation, mostly in the norther 2/3rds of the state. By this time, temperatures were seasonal and the southern 1/3 (particularly the south central region) was driest. The blast

furnace turned on the final week of June when temperatures soared to 10° to 15° above normal. Reporting stations were in the 90°'s for most of the week and many areas reached 100° at least once (Bismarck 104° on 6/28, 111° on 6/29). Little precipitation fell during the last week but by month's end, the north east region of the state (considered poor in May) had entered into positive values for average precipitation for the year. The remaining eight general regions of North Dakota remained 1" to 5" below average with the south central region being driest (-5").

North Dakota temperatures returned closer to normal during the first week of July. Isolated thunderstorms provided much needed precipitation to central, east central, and south eastern regions. The south west and south central areas remained dry. In the second week, temperatures were normal to slightly above. Fire danger was reduced by rain in the south central region, where moisture levels were significantly below normal. Much of the state received precipitation during this week with eastern areas (particularly east central - the Red River Valley) experiencing widespread flooding and inundated farm land. During the final period of the survey, a weather system provided cooler temperatures, less humidity, and calmer winds until the last day when thunderstorms delivered significant precipitation across the entire northern 1/3 of the state. By survey's end, the south central region and the southwestern 1/4 of the state were considered abnormally dry or in moderate or severe stages of drought.

As in South Dakota, habitat conditions in east river North Dakota were highly variable. Wetland conditions looked fairly "typical" for July in northern regions. Conditions were much drier to the south, especially the south central and south west areas. Temporary and seasonal wetlands in North Dakota have suffered less agricultural impact this year than those in South Dakota. Although many temporary basins were planted (more so in southern North Dakota than in the north) some seasonal and most semi-permanent basins were too wet for mechanical encroachment. Burning of some cover was accomplished earlier in the season (especially in semi-permanent basins) and they have since responded with lush regrowth. A small portion of the seasonal and semi-permanent basins have been partially recharged and now offer good areas for brooding. Permanent wetlands have diminished slightly in the drier areas, but in regions where rain has fallen they are maintaining. Typically following heavy rains, we encountered small complexes of temporary and seasonal water ...a rare commodity during any July survey. As expected though for this time of year, most temporary and seasonal basins were dry.

Emergent wetland cover in North Dakota appeared less impacted by livestock. Many of the basins in recessed condition are offering the same perimeter cover condition described in South Dakota. That is, the perimeter vegetation is not providing safe escape cover to broods. The emergents are responding though, to the drawdown conditions, by expanding coverage toward the water. Following this growth cycle, additional water will create very good combinations of water/cover. As expected, both crops and upland cover appear best in the northern 1/3 of the state with lessening conditions to the south and west. By the end of the survey, CRP lands had been opened to grazing and haying under the auspices of drought emergency. This loss of cover will lower brood survival and will impact residual nesting cover stores for next year. Normal or above precipitation is required, especially in the southern 1/3 of the state, to improve habitat conditions for 2003.

NORTH DAKOTA (St. 45/46/47: 11 - 17 July)

Total wetland counts in North Dakota decreased 26% since the May 2002 survey. The 2002 index dropped 21% compared to the July 2002 and was below the ten-year average (-26%) as well. The 2002 index (503,600 wetlands) is the lowest of record since 1994 yet exceeded the long-term mean by 18% (Table 7).

Stratum 43 - Rated by the west river crew, conditions in the extreme western and northeastern portions of the stratum were considered good while the central and southern parts were considered only fair. Stratum 43 posted the only gains (34%) in wetland numbers since the May survey. The 2002 water index was similar to the 2001 figure (-1%) and was above both the ten-year (13%) and long-term (47%) averages.

Stratum 45 - Although wetland counts in Stratum 45 decreased 36% since May, overall conditions actually improved since that survey. Areas in the north west, north central and north east, that were classed as poor in May, were upgraded to fair. A significant area in the eastern half of the stratum (considered mostly fair in May) improved to good condition. As in May, much of the Missouri coteau remained in the good category. The 2002 July index trailed 2001 (-29%) and ten-year (-31%) figures, but was slightly above (11%) the long-term average. The 2002 index was lowest of record since July of 1994.

Stratum 46 - During the July survey, observed wetlands posted a 39% decrease since May. The 2002 index for Stratum 46 was similar to the long-term average (+7%) but below last year's July figure (-27%) and the preceding ten-year average (-42%). Habitat conditions in the stratum deteriorated since May with areas of poor creeping into south western and south central regions from South Dakota. Areas considered good in May, including the Missouri coteau and the extreme south east portion of the drift prairie remained, but were smaller in size. The balance of the stratum was considered fair waterfowl habitat.

Stratum 47 - As in Stratum 45, habitat conditions in Stratum 47 actually improved since the Breeding Population survey. Northern reaches, considered poor in May, improved to fair. In the central region, a wedge of good habitat extended in from 45/46. Crop damage (from excessive moisture) and standing water was observed in the central region of 47. The July wetland index was similar to May 2002 (-6%) and the ten-year (-6%) figure, and was well above July 2002 (50%) and long-term (38%) indices.

Production Indices: Each year, the schedule of the pre-season waterfowl banding program in August, is a major determinant in initiation/completion of the July waterfowl production survey. Because of the banding commitment, the July surveys are typically conducted earlier than would provide for capturing the maximum number of pre-fledged waterfowl broods. This annual problem of surveying too early, was further aggravated this year by the late spring and corresponding late initial nesting attempts. It is possible that some early nesting species were negatively impacted by May snow. The late migration delayed mid- and late season nesting species in becoming active one to two weeks later than last year. As a result, we observed a slight shift to younger age classes this year. Through the last day of our survey, we witnessed many class I broods. This observation was supported by other field personnel conducting

experimental brood counts in the Dakotas.

We suspect this year that brood survival may be more of a challenge than “normal.” Intense grazing and haying in the upland areas, drought caused reduction in wetland numbers, and generally receded conditions (below emergent vegetation levels) in those basins containing water, are offering less available escape cover to broods. Reduced wetland numbers have also caused nesting and brooding activities to concentrate, thereby increasing the effectiveness of predators. Furthermore, wetlands in certain areas are drying rapidly, forcing brood relocation and added exposure to the peril of predators. Lastly, with the late hatch and time required to fledge, some birds may not attain flight prior to the fall arrival of inclement weather to the north central prairies. Despite these negative influences, overall production appears near the long-term average (2%) in South Dakota and well above average (90%) in North Dakota (Tables 2 and 6).

In South Dakota, the DBI (47,200) was the lowest recorded since 1993 but 14th highest in 44 years of record (Table 1). The 2002 index decreased compared to 2001 (-47%) and the ten-year (-49%) average. Although no change in production (8,500 broods) was observed in Stratum 49, significant decreases occurred in Stratum 48 (-46%) and Stratum 44 (-66%) compared to last year (see 2001 report). Average brood size in South Dakota was unchanged since 2001 and is similar to the ten-year (-7%) and long-term (6%) average. Responding to degraded habitat conditions, the South Dakota coot brood index fell sharply compared to last year (-73%), the ten-year mean (-80%), and the long-term average (-54%).

Waterfowl production in North Dakota (118,100 broods) suffered smaller losses than in South Dakota. The 2002 index was 7th highest in 45 years of record (Table 5). Compared to 2001, the 2002 DBI decreased 32% and was 12% below the ten-year average. Decreases in observed broods since last year (see 2001 report) were significant in all strata (St. 43 -37%, St. 45 -32%, and St. 46 -26%). Even though the sample is typically small, no duck broods were observed in Stratum 47 this year. Average brood size state wide was similar to last year (6%), the ten-year average (-9%), and the long-term average (-2%). Coot broods in North Dakota (-70%, -80%, -46%) provided decreases similar to those in South Dakota.

As always, we believe our DBI's are conservative. Admittedly, our survey timing was early this year and we forfeited the opportunity to count successful broods after 7/17. And though we feel brood visibility in 2002 was better than normal (reduced water levels removing emergent vegetation as cover), the proportion of observed/actual broods, without ground truthing, remains unknown. Even though DBI's in the Dakotas remained average or above the long-term, production comparisons to last year and the ten-year mean correspond to the drought conditions present in many areas.

Late Nesting Indices: The Late Nesting Index is intended as a relative measure of late or secondary nesting effort. (Tables 1 and 5). In South Dakota, total LNI decreased 48% compared to last year, was 52% below the ten-year mean, and 42% short of the long-term average. In North Dakota, LNI decreased 15%, 50%, and 62% from the respective 2001, ten-year, and long-term figures.

The lack of apparent late nesting activity is not surprising considering the depressed habitat conditions. This is particularly evident in South Dakota. The absence of water, widespread deterioration of existing wetlands, the poor offering of emergent wetland cover, diminished cover (stunted, grazed, hayed) in many upland areas, all coupled with late initial nesting efforts, suggest that the late/second nesting effort will be minimal.

Conclusions:

1. June/July weather patterns provided slightly more benefit to habitat conditions in North Dakota (particularly the northern 1/3) than in South Dakota. Although wetland counts in North Dakota fell below 2001 (-21%) and ten-year (-26%) levels, the 2002 index was 18% above the long-term average. In South Dakota, this year's wetland counts fell short of all three time comparisons (-43%, -52%, and -27%). Generally in the crew area, coteau regions are considered good along with the north east portion of Stratum 45. Nearly the western 2/3rds of east river South Dakota are poor and the remainder of the crew area is considered fair.
2. The DBI in South Dakota decreased 47% compared to 2001 and is the lowest of record since 1993. The 2002 index is below the ten-year average (-49%) but similar to (2%) the long-term average. In North Dakota, the 2002 DBI decreased 32% since last year and the ten-year (-12%) average, but is 90% above the long-term mean. The 2002 North Dakota DBI is lowest of record since 1995. Average brood size in both states was similar to last year. Although down significantly from last year and the (wet) ten-year average, waterfowl production in these states is above average for 2002.
3. Total LNI decreased in South Dakota (-48%) and North Dakota (-15%) compared to 2001. The 2002 LNI was below ten-year averages (SD -52%, ND -50%) and long-term figures (SD -42%, ND -62%) as well. Low LNI's and degraded habitat conditions suggest that additional recruitment from late nesting efforts will be negligible.

John W. Solberg
July 2002

Table 1. Long-term trend in waterfowl brood and late-nesting indices by species in South Dakota, 1959-2002 (index in thousands).^a

Species	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Broods										
Duck brood index	130.2	115.4	89.7	47.2						
Average brood size ^b	5.8	5.3	5.4	5.4						
Coot brood index	20.7	5.4	8.1	2.2						
Late-nesting index ^c										
Ducks										
Dabblers										
Mallard	13.6	6.0	18.6	10.2						
Am. black duck	0.0	0.0	0.0	0.0						
Gadwall	6.9	2.1	6.3	4.2						
Am. wigeon	1.5	1.1	1.0	0.3						
Green-winged teal	0.0	0.0	0.5	0.3						
Blue-winged teal	4.8	1.0	3.9	2.0						
N. shoveler	0.3	1.1	1.0	0.9						
N. pintail	<u>0.5</u>	<u>2.2</u>	<u>0.5</u>	<u>0.8</u>						
Subtotal	27.6	13.5	31.8	18.7						
Divers										
Redhead	1.1	0.2	1.8	0.2						
Canvasback	0.0	0.0	0.2	0.0						
Scaups	0.2	0.8	0.5	0.0						
Ring-necked duck	0.0	0.0	0.2	0.0						
Goldeneyes	0.0	0.0	0.0	0.0						
Bufflehead	0.0	0.0	0.0	0.0						
Ruddy duck	<u>0.9</u>	<u>0.9</u>	<u>1.9</u>	<u>0.2</u>						
Subtotal	2.2	1.9	4.6	0.4						
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0						
Eiders	0.0	0.0	0.0	0.0						
Scoters	0.0	0.0	0.0	0.0						
Mergansers	<u>0.0</u>	<u>0.3</u>	<u>0.0</u>	<u>0.0</u>						
Subtotal	0.0	0.3	0.0	0.0						
Total ducks	29.8	15.7	36.4	19.1						

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1959-2002 (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	<u>4.5</u>	<u>1.9</u>	<u>6.2</u>	<u>1.3</u>	<u>4.4</u>	<u>1.8</u>	<u>4.9</u>	<u>2.5</u>	<u>1.0</u>	<u>1.8</u>
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	<u>1.6</u>	<u>2.8</u>	<u>1.6</u>	<u>3.1</u>	<u>2.4</u>	<u>1.1</u>	<u>1.7</u>	<u>0.8</u>	<u>0.5</u>	<u>0.7</u>
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	<u>0.3</u>	<u>0.2</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1959-2002 (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	<u>0.7</u>	<u>0.5</u>	<u>2.0</u>	<u>4.0</u>	<u>4.2</u>	<u>10.2</u>	<u>1.2</u>	<u>5.0</u>	<u>2.3</u>	<u>1.5</u>
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	<u>0.8</u>	<u>1.5</u>	<u>1.6</u>	<u>1.5</u>	<u>2.0</u>	<u>2.8</u>	<u>0.8</u>	<u>2.4</u>	<u>1.6</u>	<u>0.4</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1959-2002 (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	<u>2.4</u>	<u>2.0</u>	<u>1.0</u>	<u>2.8</u>	<u>4.3</u>	<u>1.7</u>	<u>1.5</u>	<u>2.5</u>	<u>1.1</u>	<u>3.4</u>
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	<u>1.4</u>	<u>2.2</u>	<u>0.9</u>	<u>3.4</u>	<u>2.0</u>	<u>1.3</u>	<u>2.7</u>	<u>0.0</u>	<u>0.2</u>	<u>1.8</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>1.7</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1959-2002 (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	<u>0.3</u>	<u>2.4</u>	<u>1.9</u>	<u>4.5</u>	<u>0.9</u>	<u>0.0</u>	<u>0.0</u>	<u>0.6</u>	<u>0.5</u>	<u>0.0</u>
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	<u>0.0</u>	<u>1.1</u>	<u>4.7</u>	<u>1.9</u>	<u>2.4</u>	<u>0.4</u>	<u>6.0</u>	<u>4.7</u>	<u>1.6</u>	<u>0.8</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs indicated by observed adult pairs and singles.

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

Table 2. Status of waterfowl brood and late-nesting indices by stratum in South Dakota, comparing 2002 with 2001, the 1992-2001 previous 10-year mean, and the 1959-2001 long-term mean (index in thousands).^a

Species	Strata (2002)			2002 Total	2001 Total	10-year Mean	Long-term Mean	Percent change from		
	44	48	49					2001	10-year Mean	Long-term Mean
Broods										
Duck brood index	8.0	30.7	8.5	47.2	89.7	91.8	46.2	-47%	-49%	2%
Average brood size ^b	4.5	5.6	5.0	5.4	5.4	5.8	5.1	NC%	-7%	6%
Coot brood index	0.0	1.3	0.9	2.2	8.1	11.1	4.8	-73%	-80%	-54%
Late-nesting index ^c										
Ducks										
Dabblers										
Mallard	5.1	2.7	2.4	10.2	18.6	15.5	12.1	-45%	-34%	-16%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Gadwall	1.6	1.1	1.5	4.2	6.3	9.2	6.6	-33%	-54%	-36%
Am. wigeon	0.3	0.0	0.0	0.3	1.0	2.2	1.6	-70%	-86%	-81%
Green-winged teal	0.3	0.0	0.0	0.3	0.5	0.2	0.2	-40%	50%	50%
Blue-winged teal	0.8	0.6	0.6	2.0	3.9	6.1	6.1	-49%	-67%	-67%
N. shoveler	0.5	0.2	0.2	0.9	1.0	1.1	0.9	-10%	-18%	NC
N. pintail	0.5	0.3	0.0	0.8	0.5	2.1	2.3	60%	-62%	-65%
Subtotal	9.1	4.9	4.7	18.7	31.8	36.4	29.8	-41%	-49%	-37%
Divers										
Redhead	0.0	0.0	0.2	0.2	1.8	1.5	1.0	-89%	-87%	-80%
Canvasback	0.0	0.0	0.0	0.0	0.2	0.1	0.1	-	-	-
Scaups	0.0	0.0	0.0	0.0	0.5	0.6	0.3	-	-	-
Ring-necked duck	0.0	0.0	0.0	0.0	0.2	0.1	0.0	-	-	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	0.2	0.0	0.2	1.9	1.4	1.7	-89%	-86%	-88%
Subtotal	0.0	0.2	0.2	0.4	4.6	3.7	3.2	-91%	-89%	-88%
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	0.0	0.1	-	NC	-
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.1	-	NC	-
Total ducks	9.1	5.1	4.9	19.1	36.4	40.1	33.1	-48%	-52%	-42%

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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 2002 with 2001, the 1992-2001 previous 10-year mean, the 1970-2001 long-term mean, and comparison of May with July ponds in 2002 (estimates in thousands).^a

Year	Strata			Total
	44	48	49	
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
1999	246.4	394.6	250.7	891.7

Table 3 (cont). Long-term trend in July pond indices by stratum in South Dakota, comparing 2002 with 2001, the 1992-2001 previous 10-year mean, the 1970-2001 long-term mean, and comparison of May with July ponds in 2002 (estimates in thousands).^a

Year	Strata			Total
	44	48	49	
2000	160.7	182.5	78.5	421.7
2001	146.8	197.0	101.5	445.3
2002	91.6	102.8	58.7	253.1
2003				
2004				
2005				
2006				
2007				
2008				
2009				
10-year mean	177.6	231.0	115.6	524.1
Long-term mean	127.1	140.4	77.4	345.0
<u>Percent Change</u>				
2002 from 2001	-38%	-48%	-42%	-43%
2002 from 10-year mean	-48%	-55%	-49%	-52%
2002 from long-term mean	-28%	-27%	-24%	-27%
May ponds 2002 (adjusted)	85.9	204.1	143.8	433.9
<u>Percent change</u>				
May to July 2002 (adjusted) (unadjusted)	7%	-50%	-59%	-42%

^aJuly ponds unadjusted for visibility bias.

^bDue 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 2002.

	44	Stratum 48	49	Total
<u>Survey design</u>				
Square miles in stratum	28,930	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	133.9370	78.0539	92.5731	-
Expansion factor - ducks	267.8740	156.1079	185.1462	-
<u>Current year coverage</u>				
Square miles in sample - water	216	310.5	171	697.5
Square miles in sample - ducks	108	155.25	85.5	348.75
Linear miles in sample	864	1,242	684	2,790
Number of transects in sample	5	9	11	25
Number of segments in sample	48	69	38	155
Expansion factor - water	133.9370	79.1852	92.5731	-
Expansion factor - ducks	267.8740	158.3704	185.1462	-

Table 5. Long-term trend in waterfowl brood and late-nesting indices by species in North Dakota, 1958-2002 (index in thousands).^a

Species	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Broods										
Duck brood index	196.7	189.4	217.6	173.8	118.1					
Average brood size ^b	6.2	6.6	5.3	5.0	5.3					
Coot brood index	78.6	82.5	66.7	33.2	9.8					
Late-nesting index ^c										
Ducks										
Dabblers										
Mallard	3.3	5.1	3.9	4.7	5.2					
Am. black duck	0.0	0.0	0.0	0.0	0.0					
Gadwall	3.1	1.5	2.6	1.2	0.8					
Am. wigeon	0.9	0.5	0.0	0.8	0.5					
Green-winged teal	0.0	0.0	0.1	0.0	0.0					
Blue-winged teal	2.4	1.1	2.6	1.6	1.5					
N. shoveler	0.8	0.2	0.5	0.5	0.7					
N. pintail	<u>0.0</u>	<u>0.5</u>	<u>1.0</u>	<u>0.0</u>	<u>0.4</u>					
Subtotal	10.5	8.9	10.7	8.8	9.1					
Divers										
Redhead	0.7	0.4	0.5	0.3	0.0					
Canvasback	0.0	0.0	0.0	0.0	0.0					
Scaups	0.1	0.0	0.9	0.0	0.3					
Ring-necked duck	0.1	0.0	0.0	0.2	0.0					
Goldeneyes	0.0	0.0	0.0	0.0	0.0					
Bufflehead	0.0	0.0	0.0	0.0	0.0					
Ruddy duck	<u>4.7</u>	<u>2.6</u>	<u>2.8</u>	<u>2.2</u>	<u>0.4</u>					
Subtotal	5.6	3.0	4.2	2.7	0.7					
Miscellaneous										
Oldsquaw	0.0	0.0	0.0	0.0	0.0					
Eiders	0.0	0.0	0.0	0.0	0.0					
Scoters	0.0	0.0	0.0	0.0	0.0					
Mergansers	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>					
Subtotal	0.0	0.0	0.0	0.0	0.0					
Total ducks	16.1	11.9	14.9	11.5	9.8					

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1958-2002 (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	<u>2.2</u>	<u>3.9</u>	<u>0.8</u>	<u>1.5</u>	<u>1.1</u>	<u>0.8</u>	<u>0.7</u>	<u>0.3</u>	<u>1.7</u>	<u>0.0</u>
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	<u>0.7</u>	<u>3.0</u>	<u>1.0</u>	<u>1.6</u>	<u>3.5</u>	<u>4.8</u>	<u>2.9</u>	<u>7.8</u>	<u>9.6</u>	<u>1.2</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.2</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1958-2002 (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	<u>3.5</u>	<u>1.9</u>	<u>0.2</u>	<u>1.1</u>	<u>1.6</u>	<u>6.3</u>	<u>2.8</u>	<u>1.5</u>	<u>1.2</u>	<u>3.0</u>
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	<u>2.3</u>	<u>1.3</u>	<u>0.7</u>	<u>1.2</u>	<u>13.2</u>	<u>9.6</u>	<u>9.0</u>	<u>3.2</u>	<u>2.5</u>	<u>4.5</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1958-2002 (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	<u>0.0</u>	<u>3.2</u>	<u>2.0</u>	<u>0.6</u>	<u>1.5</u>	<u>0.6</u>	<u>0.4</u>	<u>3.1</u>	<u>3.1</u>	<u>1.5</u>
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	<u>3.1</u>	<u>4.7</u>	<u>5.0</u>	<u>1.4</u>	<u>5.6</u>	<u>1.6</u>	<u>4.8</u>	<u>8.4</u>	<u>4.0</u>	<u>0.5</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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, 1958-2002 (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	<u>0.0</u>	<u>1.1</u>	<u>0.6</u>	<u>2.1</u>	<u>4.1</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>1.2</u>	<u>1.6</u>
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	<u>0.0</u>	<u>1.9</u>	<u>3.8</u>	<u>1.7</u>	<u>4.3</u>	<u>2.4</u>	<u>0.6</u>	<u>1.5</u>	<u>5.7</u>	<u>4.4</u>
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
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

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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 2002 with 2001, the 1992-2001 previous 10-year mean, and the 1958-2001 long-term mean (index in thousands).^a

Species	Strata (2002)				2002 Total	2001 Total	10-year Mean	Long-term Mean	Percent change from		
	43	45	46	47					2001	10-year Mean	Long-term Mean
Broods											
Duck brood index	12.9	62.4	42.8	0.0	118.1	173.8	134.4	62.2	-32%	-12%	90%
Average brood size ^b	5.2	5.5	5.2	0.0	5.3	5.0	5.8	5.4	6%	-9%	-2%
Coot brood index	1.1	7.0	1.7	0.0	9.8	33.2	49.9	18.2	-70%	-80%	-46%
Late-nesting index^c											
Ducks											
Dabblers											
Mallard	3.8	0.7	0.7	0.0	5.2	4.7	5.4	7.9	11%	-4%	-34%
Am. black duck	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Gadwall	0.0	0.5	0.3	0.0	0.8	1.2	4.2	5.3	-33%	-81%	-85%
Am. wigeon	0.5	0.0	0.0	0.0	0.5	0.8	0.8	0.8	-38%	-38%	-38%
Green-winged teal	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	NC	-	-
Blue-winged teal	0.7	0.7	0.1	0.0	1.5	1.6	2.6	4.5	-6%	-42%	-67%
N. shoveler	0.7	0.0	0.0	0.0	0.7	0.5	0.3	0.4	40%	133%	75%
N. pintail	<u>0.2</u>	<u>0.2</u>	<u>0.0</u>	<u>0.0</u>	<u>0.4</u>	<u>0.0</u>	<u>0.6</u>	<u>1.5</u>	<u>+</u>	<u>-33%</u>	<u>-73%</u>
Subtotal	5.9	2.1	1.1	0.0	9.1	8.8	14.0	20.7	3%	-35%	-56%
Divers											
Redhead	0.0	0.0	0.0	0.0	0.0	0.3	1.2	1.0	-	-	-
Canvasback	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	NC	NC	NC
Scaups	0.0	0.0	0.3	0.0	0.3	0.0	0.2	0.4	+	50%	-25%
Ring-necked duck	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.0	-	-	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	<u>0.2</u>	<u>0.0</u>	<u>0.2</u>	<u>0.0</u>	<u>0.4</u>	<u>2.2</u>	<u>4.2</u>	<u>3.7</u>	<u>-82%</u>	<u>-90%</u>	<u>-89%</u>
Subtotal	0.2	0.0	0.5	0.0	0.7	2.7	5.7	5.4	-74%	-88%	-87%
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	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>NC</u>	<u>NC</u>	<u>NC</u>
Subtotal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	NC	NC	NC
Total ducks	6.1	2.1	1.6	0.0	9.8	11.5	19.7	26.1	-15%	-50%	-62%

^aUnadjusted for visibility bias.

^bFrom complete Class II and III broods observed.

^cAs 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 2002 with 2001, the 1992-2001 previous 10-year mean, the 1970-2001 long-term mean, and comparison of May with July ponds in 2002 (estimates in thousands).^a

Year	Strata				Total
	43	45	46	47	
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
1999	137.4	811.9	338.7	27.1	1315.1

Table 7 (cont). Long-term trend in July pond indices by stratum in North Dakota, comparing 2002 with 2001, the 1992-2001 previous 10-year mean, the 1970-2001 long-term mean, and comparison of May with July ponds in 2002 (estimates in thousands).^a

Year	Strata				Total
	43	45	46	47	
2000	99.8	416.8	219.9	19.8	756.3
2001	131.1	334.2	160.1	12.5	637.9
2002	129.5	238.2	117.1	18.8	503.6
2003					
2004					
2005					
2006					
2007					
2008					
2009					
10-year mean	114.3	344.9	201.9	20.1	681.1
Long-term mean	88.1	214.2	109.7	13.6	425.6
<u>Percent Change</u>					
2002 from 2001	-1%	-29%	-27%	50%	-21%
2002 from 10-year mean	13%	-31%	-42%	-6%	-26%
2002 from long-term mean	47%	11%	7%	38%	18%
May ponds 2002 (adjusted)	96.4	373.7	192.5	19.9	682.5
<u>Percent change</u>					
May to July 2002 (adjusted)(unadjusted)	34%	-36%	-39%	-6%	-26%

^aJuly ponds unadjusted for visibility bias.

^bDue 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.